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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

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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

1. It will be recalled that the United Kingdom has during the last two biennia of the UN Sub-Committee of Experts on the Transport of Dangerous Goods advocated in a number of working and information papers closer harmonisation of text dealing with Class 7 substances in both the UN Model Regulations and the IAEA's Regulations for the Safe Transport of Radioactive Material. At the recent 28th session of the UN Sub-Committee of Experts on the Transport of Dangerous Goods held during December 2005, the expert from the United Kingdom produced informal document INF.28 as a means of continuing the work. During the debate it was noted with satisfaction that the IAEA intended to convene a Consultants Services Meeting to consider harmonisation and invite experts from the UN Sub-Committee to participate.
2. The expert from the United Kingdom along with other members from the Transport Sub-Committee together with IAEA representatives attended an IAEA consultants meeting held February 13-17 2006 in Vienna. As a result of this meeting the expert from the United Kingdom agreed to present a paper to the July 2006 Sub-Committee. This would include the consolidated text of the two previous documents produced by the expert from the United Kingdom, ST/SG/AC.10/C.3/2005/19 and UN/SCETDG/28/INF35, as amended and agreed by the joint UNSCOE/IAEA working group and those parts of the

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IAEA regulations that could be changed to align with the UN Model Regulations. In addition the United Kingdom included a further Annex indicating where it feels further work is now needed. This paper consists of the following;

Annex 1 is the consolidated revised text based on ST/SG/AC.10/C.3/2005/19 and UN/SCETDG/28/INF 35 and agreed at the consultants meeting in Vienna. This contains the following;

1. New text for Section 1.2.1 definitions;
2. Text for the new Chapter 1.5 dealing with general requirements for Class 7;
3. A revised Chapter 2.7;
4. Changes to 4.1.9 on packaging;
5. Amendments to Chapter 5.1 which deal with the requirements before shipments and minor changes to Chapter 5.2 which cover marking and labelling;
6. A revised Chapter 6.4 which deals with the inclusion of portable tanks for Class 7 packaging.

Annex 2 shows the proposed changes to the IAEA transport regulations in order to achieve harmonisation with the UN Model Regulations.

Annex 3 is the revised version of the table of correspondence; 14th revised edition of the UN Model Regulations and the 2005 IAEA transport regulations.

Annex 4 consists of comments from the United Kingdom on areas that still need further work.

3. The expert from the United Kingdom commends the hard work put in by those present at the Vienna meeting earlier this year and would welcome discussion by members of the Sub-Committee. The United Kingdom hopes that proposed changes can be adopted by both the Un Sub-Committee and the IAEA at the earliest opportunity.

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Annex 1 (ENGLISH ONLY)**PROPOSED CONSOLIDATED AMENDMENTS TO THE UN MODEL REGULATIONS**

Amend 1.2.1

Approval

Multilateral approval for the transport of Class 7 material means 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 shall 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 for the transport of Class 7 material 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.

Competent authority means any body or authority designated or otherwise recognized as such for any purpose in connection with these Regulations.

Confinement system for the transport of Class 7 material 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 for the transport of Class 7 material means the assembly of components of the packaging specified by the designer as intended to retain the radioactive material during transport.

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 for the transport of Class 7 material 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 for the transport of Class 7 material 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.

Freight container means an article of transport equipment that is of a permanent character and accordingly strong enough to be suitable for repeated use; specially designed to facilitate the

transport of goods, by one or other modes of transport, without intermediate reloading: designed to be secured and /or readily handled, having fittings for these purposes. The term “freight container” includes neither vehicle nor packaging. However a freight container that is carried on a chassis is included. For the transport of Class 7 material a freight container may be used as a packaging.

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 m³. Any other freight container is considered to be a large freight container.

Maximum normal operating pressure for the transport of Class 7 material 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.

Packaging means one or more receptacles and any other components or materials necessary for the receptacles to perform the containment and other safety functions.

Radiation level for the transport of Class 7 material means the corresponding dose rate expressed in millisieverts per hour.

Radioactive contents for the transport of Class 7 material mean the radioactive material together with any contaminated or activated solids, liquids, and gases within the packaging.

Transport index (TI) assigned to a package, overpack or freight container, or to unpackaged LSA-I or SCO-I, for the transport of Class 7 material means a number which is used to provide control over radiation exposure.

Chapter 1.5 General requirements concerning Class 7

1.5.1 *Scope and Application*

1.5.1.1 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, [(2005 Edition)]. 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.

1.5.1.2 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.

1.5.1.3 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.

1.5.1.4 These Regulations do not apply to:

- (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;
- (e) 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 which 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 2.7.7.2.1 (b), or calculated in accordance with 2.7.7.2.2 to 2.7.7.2.6;
- (f) Non-radioactive solid objects with radioactive substances present on any surfaces in quantities not in excess of the limit set out in the definition for “contamination” in 2.7.2.

1.5.1.5

1.5.1.5.1 Excepted packages which may contain radioactive material in limited quantities, instruments, manufactured articles as specified in 2.7.7.1.2 and empty packagings as specified in 2.7.9.6 may be transported under the following conditions:

- (a) The applicable requirements specified in 2.0.3.2, 2.7.9.2, 2.7.9.3 to 2.7.9.6 (as applicable), 2.7.9.6 (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), 7.1.8.5.2;
- (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.

1.5.1.5.2 The following provisions do not apply to excepted packages and the controls for transport of excepted packages: Chapter 1.4, 2.7.4.1, 2.7.4.2, 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, 7.1.7.5.1, 7.1.7.5.3 to 7.1.7.5.5, 7.1.8.1.1, 7.1.8.1.3, 7.1.8.3.1, 7.1.8.6.1 and section 7.2.4.

1.5.2 *Radiation protection programme*

1.5.2.1 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.

1.5.2.2 Doses to persons shall be below the relevant dose limits. 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.

1.5.2.3 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 1.5.2.2, 1.5.2.4 to 1.5.2.7. Programme documents shall be available, on request, for inspection by the relevant competent authority.

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

- (a) is likely to be between 1 and 6 mSv in a year, a dose assessment programme via work place monitoring or individual monitoring shall be conducted;
- (b) is likely to exceed 6 mSv in a year, individual monitoring shall be conducted.

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

1.5.2.5 In the event of accidents or incidents during the transport of radioactive material, emergency provisions, as established by relevant national and/or international organizations, shall be observed to protect persons, property and the environment. Appropriate guidelines for such provisions are contained in "Planning and Preparing for Emergency Response to Transport Accidents Involving Radioactive Material", Safety Standard Series No. TS-G-1.2 (ST-3), IAEA, Vienna.

1.5.2.6 Emergency procedures shall take into account the formation of other dangerous substances that may result from the reaction between the contents of a consignment and the environment in the event of an accident.

1.5.2.7 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.

1.5.3 *Quality assurance*

1.5.3.1 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.

1.5.4 *Special arrangement*

1.5.4.1 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.

1.5.4.2 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.

1.5.5 *Radioactive material possessing other dangerous properties*

1.5.5.1 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.

1.5.6 *Non-compliance*

1.5.6.1 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) 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.

Renumber in Chapter 1.1 Existing provisions in 1.1.3 becomes new 1.1.2

1.1.2 Dangerous goods forbidden from transport

1.1.2.1 Unless provided

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CHAPTER 2.7

2.7.1 CLASS 7 - RADIOACTIVE MATERIAL

Introductory Note

Note 1: For class 7 the type of packaging may have a decisive effect on classification.

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 2.7.6.2.1 to 2.7.6.2.6.

2.7.1.2 *Contamination:*

Contamination means the presence of a radioactive substance on a surface in quantities in excess of 0.4 Bq/cm² for beta and gamma emitters and low toxicity alpha emitters, or 0.04 Bq/cm² 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.

2.7.1.3 **Definition of terms**

A_1 and A_2

A_1 means the activity value of special form radioactive material which is listed in the Table in 2.7.2.2.1 or derived in 2.7.2.2 and is used to determine the activity limits for the requirements of these Regulations.

A_2 means the activity value of radioactive material, other than special form radioactive material, which is listed in the Table in 2.7.2.2.1 or derived in 2.7.2.2 and is used to determine the activity limits for the requirements of these Regulations.

Contamination:

Contamination means the presence of a radioactive substance on a surface in quantities in excess of 0.4 Bq/cm² for beta and gamma emitters and low toxicity alpha emitters, or 0.04 Bq/cm² 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.

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.

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

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.

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 of the material in which the radionuclides are essentially uniformly distributed.

Special form radioactive material, means either:

- (a) An indispersible solid radioactive material; or
- (b) A sealed capsule containing radioactive material.

Surface contaminated object (SCO) means a solid object which is not itself radioactive but which has radioactive material distributed on its surfaces.

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 2×10^3 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 means the following:

Natural uranium means uranium (which may be chemically separated) 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.

2.7.2 Classification

2.7.2.1 General provisions

2.7.2.1.1 Radioactive material shall be assigned to one of the UN number specified in Table 2.7.2.1.1 below 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 2.7.2.2 to 2.7.2.5 below.

<u>Table 2.7.2.1.1</u>	<u>Assignment of UN numbers</u>
Excepted packages	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	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
Surface contaminated objects	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

Table 2.7.2.1.1**Assignment of UN numbers**

Type A packages

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

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

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

UN 3323	RADIOACTIVE MATERIAL, TYPE C PACKAGE, non fissile or fissile-excepted
UN 3330	RADIOACTIVE MATERIAL, TYPE C PACKAGE, FISSILE

Special arrangement

UN 2919	RADIOACTIVE MATERIAL, TRANSPORTED UNDER SPECIAL ARRANGEMENT, non-fissile or fissile-excepted
UN 3331	RADIOACTIVE MATERIAL, TRANSPORTED UNDER SPECIAL ARRANGEMENT, FISSILE

Uranium hexafluoride

UN 2977	RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE, FISSILE
UN 2978	RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE, non-fissile or fissile-excepted

2.7.2.2 Determination of activity level

2.7.2.2.1 The following basic values for individual radionuclides are given in Table 2.7.2.2.1:

- (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 2.7.2.2.1: Basic radionuclides values for individual radionuclides

2.7.2.2.2 For individual radionuclides which are not listed in Table 2.7.2.2.1 the determination of the basic radionuclide values referred to in 2.7.2.2.1 shall require multilateral

approval. It is permissible to use an 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 2.7.2.2.2 may be used without obtaining competent authority approval.

Table 2.7.2.2.2: Basic radionuclide values for unknown radionuclides or mixtures

2.7.2.2.3 In the calculations of A_1 and A_2 for a radionuclide not in Table 2.7.2.2.1, 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_1 or A_2 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.

2.7.2.2.4 For mixtures of radionuclides, the determination of the basic radionuclide values referred to in 2.7.2.2.1 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.

2.7.2.2.5 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 2.7.2.2.4 and 2.7.2.4.4. 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.

2.7.2.2.6 For individual radionuclides or for mixtures of radionuclides for which relevant data are not available, the values shown in Table 2.7.2.2.2 shall be used.

2.7.2.3 Determination other material characteristics

2.7.2.3.1 Low specific activity (LSA) material

2.7.2.3.1 Reserved

2.7.2.3.1.2 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) 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 6.4.11.2; 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 2.7.2.2.1 to 2.7.2.2.6, 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 - 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 $2 \times 10^{-3} A_2/g$.

2.7.2.3.1.3 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 2.7.2.3.1.4 the activity in the water would not exceed $0.1 A_2$.

2.7.2.3.1.4 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.

2.7.2.3.1.5 Demonstration of compliance with the performance standards in 2.7.2.3.1.4 shall be in accordance with 6.4.12.1 and 6.4.12.2.

2.7.2.3.2 Surface contaminated object (SCO)

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 $4 \times 10^4 \text{ Bq/cm}^2$ for beta and gamma emitters and low toxicity alpha emitters, or $4 \times 10^3 \text{ Bq/cm}^2$ 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 $4 \times 10^4 \text{ Bq/cm}^2$ for beta and gamma emitters and low toxicity alpha emitters, or $4 \times 10^3 \text{ Bq/cm}^2$ 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 cm² (or the area of the surface if less than 300 cm²) does not exceed 8×10^5 Bq/cm² for beta and gamma emitters and low toxicity alpha emitters, or 8×10^4 Bq/cm² for all other alpha emitters; and
- (iii) the non-fixed contamination plus the fixed contamination on the inaccessible surface averaged over 300 cm² (or the area of the surface if less than 300 cm²) does not exceed 8×10^5 Bq/cm² for beta and gamma emitters and low toxicity alpha emitters, or 8×10^4 Bq/cm² for all other alpha emitters.

2.7.2.3.3 Special form radioactive material

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

2.7.2.3.3.2 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 2.7.2.3.3.4 to 2.7.2.3.3.8, it shall meet the following requirements:

- (a) It would not break or shatter under the impact, percussion and bending tests 2.7.2.3.3.5 (a) (b) (c), 2.7.2.3.3.6 (a) as applicable;
- (b) It would not melt or disperse in the applicable heat test 2.7.2.3.3.5 (d) or 2.7.2.3.3.6 (b) as applicable; and
- (c) The activity in the water from the leaching tests specified in 2.7.2.3.3.7 and 2.7.2.3.3.8 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.

2.7.2.3.3.3 Demonstration of compliance with the performance standards in 2.7.2.3.3.2 shall be in accordance with 6.4.12.1 and 6.4.12.2.

2.7.2.3.3.4 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 2.7.2.3.3.5 or alternative tests as authorized in 2.7.2.3.3.6. A different specimen may be used for each of the tests. Following each test, a leaching assessment or volumetric leakage test shall be performed on the specimen by a method no less sensitive than the methods given in 2.7.2.3.3.7 for indispersible solid material or 2.7.2.3.3.8 for encapsulated material.

2.7.2.3.3.5 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 ± 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 ± 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.

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

- (a) The tests prescribed in 2.7.2.3.3.5 (a) and (b) provided the mass of the special form radioactive material:
 - (i) 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”;
 - or
 - (ii) is less than 500 g and they are alternatively subjected to the Class 5 impact test prescribed in ISO 2919:1990: “Sealed Radioactive Sources – Classification”; and
- (b) The test prescribed in 2.7.2.3.3. 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”.

2.7.2.3.3.7 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 ± 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 ± 5) °C and maintained at this temperature for 4 hours;
- (f) The activity of the water shall then be determined.

2.7.2.3.3.8 For specimens which comprise or simulate radioactive material enclosed in a sealed capsule, either a leaching assessment or a volumetric leakage assessment 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 ± 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.

2.7.2.3.4 Low dispersible material

2.7.2.3.4.1 The design for low dispersible radioactive material shall require multilateral approval. 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 A₂. A separate specimen may be used for each test; and
- (c) If subjected to the test specified in 2.7.2.3.1.4 the activity in the water would not exceed 100 A₂. In the application of this test, the damaging effects of the tests specified in (b) above shall be taken into account.

2.7.2.3.4.2 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 2.7.2.3.1.4. After each test it shall be determined if the applicable requirements of 2.7.2.3.4.1 have been met.

2.7.2.3.4.3 Demonstration of compliance with the performance standards in 2.7.2.3.4.1 and 2.7.2.3.4.2 shall be in accordance with 6.4.12.1 and 6.4.12.2.

2.7.2.3.5 *Fissile material*

Packages containing fissile radionuclides shall be classified under the relevant entry of table 2.7.2.1.1 for fissile material unless the following conditions are met:

- (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 2.7.2.3.5, 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 shall apply to the consignment being carried in or on the conveyance; or
- (ii) the fissile material is a homogeneous hydrogenous solution or mixture where the ratio of fissile nuclides to hydrogen is less than 5% by mass; or
- (iii) there are not more than 5 g of fissile material in any 10 litre volume of material.

Neither beryllium nor deuterium shall be present in quantities exceeding 1% of the applicable consignment mass limits provided in Table 2.7.2.3.5, except for deuterium in natural concentration in hydrogen.

- (b) Uranium enriched in uranium-235 to a maximum of 1% by mass, and with a total plutonium and uranium-233 content not exceeding 1% 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 shall not form a lattice arrangement;
- (c) Liquid solutions of uranyl nitrate enriched in uranium-235 to a maximum of 2% by mass, with a total plutonium and uranium-233 content not exceeding 0.002% 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% by mass may consist of plutonium-239, plutonium-241 or any combination of those radionuclides.

Table 2.7.2.3.5: Consignment mass limits for exceptions from the requirements for packages containing fissile material

2.7.2.4 Classification of packages or unpackaged material

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

2.7.2.4.1 Classification as excepted package

2.7.2.4.1.1 Packagings 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.

2.7.2.4.1.2 A package containing radioactive material may be classified as an excepted package only if the radiation level at any point on its external surface does not exceed 5 $\mu\text{Sv/h}$.

Table 2.7.2.4.1.2: Activity limits for excepted packages

Physical state of contents	Instruments or article		Materials Package limits ^a
	Item limits ^a	Package limits ^a	
(1)	(2)	(3)	(4)
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	$2 \times 10^{-2} A_2$	$2 \times 10^{-1} A_2$	$2 \times 10^{-2} A_2$
special form	$10^{-3} A_1$	$10^{-2} A_1$	$10^{-3} A_1$
other forms	$10^{-3} A_2$	$10^{-2} A_2$	$10^{-3} A_2$

^a For mixtures of radionuclides, see 2.7.2.2.4 to 2.7.2.2.6.

2.7.2.4.1.3 Radioactive material which is enclosed in or included as a component part of an instrument or manufactured article may be classified under UN 2911, RADIOACTIVE MATERIAL, EXCEPTED PACKAGE - INSTRUMENTS or ARTICLES, only if:

- (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 manufactured article bears the marking "RADIOACTIVE" except:
 - (i) radioluminescent time-pieces or devices;
 - (ii) 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 2.7.2.2.1 (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).
- (d) The limit limits specified in column 2 of Table 2.7.2.4.1.2 are met for each instrument or manufactured article and the limits specified in column 3 of Table 2.7.2.4.1.2 are met for each individual item and each package, respectively.

2.7.2.4.1.4 Radioactive material with an activity not exceeding the limit specified in column 4 of Table 2.7.2.4.1.2, may be 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.

2.7.2.4.1.5 Empty packagings which had previously contained radioactive material with an activity not exceeding the limit specified in column 4 of Table 2.7.2.4.1.2 may be classified under UN 2908, RADIOACTIVE MATERIAL, EXCEPTED PACKAGE - EMPTY PACKAGING, only if:

- (a) They are 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, when averaged over any 300 cm², does not exceed:
 - (i) 400 Bq/cm² for beta and gamma emitters and low toxicity alpha emitters; and
 - (ii) 40 Bq/cm² for all other alpha emitters ; and
- (d) Any labels which may have been displayed on it in conformity with 5.2.2.1.11.1 are no longer visible.

2.7.2.4.1.6 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, only if the outer surface of the uranium or thorium is enclosed in an inactive sheath made of metal or some other substantial material.

2.7.2.4.2 *Classification as Low specific activity (LSA) material*

Radioactive material may only be classified as LSA material if the conditions of 2.7.2.3.1 and 4.1.9.2 are met.

2.7.2.4.3 *Classification as Surface contaminated object (SCO)*

Radioactive material may be classified as SCO if the conditions of 2.7.2.3.2.1 and 4.1.9.2 are met.

2.7.2.4.4 *Classification as Type A package*

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

Type A packages shall not contain activities greater than the following:

- (a) For special form radioactive material - A_1 ; or
- (b) For all other radioactive material - A_2 .

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:

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

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 ;

$C(j)$ 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 .

2.7.2.4.5 *Classification of Uranium hexafluoride*

Uranium hexafluoride shall only be assigned to UN Nos 2977, RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE, FISSILE, or 2978, RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE, non-fissile or fissile-excepted.

2.7.2.4.5.1 A package may only be classified as a Uranium Hexafluoride package if it does 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 % at the maximum temperature of the package as specified for the plant systems where the package shall be used; or
- (c) uranium hexafluoride other than in solid form or at an internal pressure above atmospheric pressure when presented for transport.

2.7.2.4.6 *Classification as Type B(U), Type B(M) or Type C packages*

Packages not otherwise classified in 2.7.2.4 shall be classified in accordance with the competent authority approval certificate for the package issued by the country of origin of design.

2.7.2.4.6.1 A package may only be classified as a Type B(U) 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 the certificate of approval.

2.7.2.4.6.2 A package may only be classified as a Type B(M) 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 the certificate of approval.

2.7.2.4.6.3 A package may only be classified as a Type C 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 the certificate of approval.

2.7.2.5 *Special arrangements*

Radioactive material shall be classified as a special arrangement when it is intended to be carried in accordance with 1.3.4.2.

Part 4

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 ADD TO THE END: The types of packages for radioactive materials covered by these Regulations, 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.

4.1.9.1.1 to 5 **Unchanged but add new**

4.1.9.1.6 Before the first shipment of any package, the following requirements shall be fulfilled:

- (a) If the design pressure of the containment system exceeds 35 kPa (gauge), it shall be ensured that the containment system of each package conforms to the approved design requirements relating to the capability of that system to maintain its integrity under that pressure;
- (b) For each Type B(U), Type B(M) and Type C package and for each package containing fissile material, it shall be ensured that the effectiveness of its shielding and containment and, where necessary, the heat transfer characteristics and the effectiveness of the confinement system, are within the limits applicable to or specified for the approved design;
- (c) For packages containing fissile material, where, in order to comply with the requirements of 6.4.11.1, neutron poisons are specifically included as components of the package, checks shall be performed to confirm the presence and distribution of those neutron poisons.

4.1.9.1.7 Before each shipment of any package, the following requirements shall be fulfilled:

- (a) For any package it shall be ensured that all the requirements specified in the relevant provisions of these Regulations have been satisfied;
- (b) It shall be ensured that lifting attachments which do not meet the requirements of 6.4.2.2 have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with 6.4.2.3;
- (c) For each package requiring competent authority approval, it shall be ensured that all the requirements specified in the approval certificates have been satisfied;
- (d) Each Type B(U), Type B(M) and Type C package shall be held until equilibrium conditions have been approached closely enough to demonstrate compliance with the requirements for temperature and pressure unless an exemption from these requirements has received unilateral approval;
- (e) For each Type B (U), Type B (M) and Type C package, it shall be ensured by inspection and/or appropriate tests that all closures, valves, and other openings of the containment system through which the radioactive contents might escape are properly closed and, where appropriate, sealed in the manner for which the demonstrations of compliance with the requirements of 6.4.8.8 and 6.4.10.3 were made;
- (f) For each special form radioactive material, it shall be ensured that all the requirements specified in the approval certificate and the relevant provisions of these Regulations have been satisfied;
- (g) For packages containing fissile material the measurement specified in 6.4.11.4(b) and the tests to demonstrate closure of each package as specified in 6.4.11.7 shall be performed where applicable;
- (h) For each low dispersible radioactive material, it shall be ensured that all the requirements specified in the approval certificate and the relevant provisions of these Regulations have been satisfied.

4.1.9.1.8 The consignor shall also have a copy of any instructions with regard to the proper closing of the package and any preparation for shipment before making any shipment under the terms of the certificates.

4.1.9.Y

4.1.9.Y.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.

4.1.9.Y.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.

4.1.9.Y.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.

4.1.9.Z.1 *Packages containing fissile material*

Unless excepted by 6.4.11.2, packages containing fissile material shall 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.

Chapter 4.2 Portable tank

4.2.1.16 ***DELETE***

Part 5

Chapter 5.1

5.1.2 Use of overpacks

5.1.2.1 An overpack shall be marked with the word "OVERPACK", with the proper shipping name and the UN Number and labelled, as required for packages by Chapter 5.2, for each item of dangerous goods contained in the overpack unless markings and labels representative of all dangerous goods in the overpack are visible, except as required in 5.2.2.1.12.

5.1.3.2 Packagings used for the transport of radioactive material shall not be used for the storage or transport of other goods unless decontaminated below the level of 0.4 Bq/cm² for beta and gamma emitters and low toxicity alpha emitters and 0.04 Bq/cm² for all other alpha emitters.

5.1.5 General provisions for Class 7

5.1.5.1 Requirements before shipments

DELETED

Paragraphs will need to be renumbered and some cross references updated.

5.1.5.3.2 The consignor shall be in possession of a copy of each applicable certificate.

5.1.5.X

5.1.5.X.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 5.1.5.X.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 5.1.5.X.1: Multiplication factors for tanks, freight containers and unpackaged LSA-I and SCO-I

Size of load ^a	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

^a *Largest cross-sectional area of the load being measured.*

5.1.5.X.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.

5.1.5.X.3 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.

5.1.5.X.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 2.7.6.1.1 and 2.7.6.1.2;
- (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 except under the provisions of 2.7.8.5;
- (e) An overpack which contains packages transported under special arrangement shall be assigned to category III-YELLOW except under the provisions of 2.7.8.5.

Table 2.7.8.4: Categories of packages and overpacks

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

^a *If the measured TI is not greater than 0.05, the value quoted may be zero in accordance with 2.7.6.1.1(c).*

^b *Shall also be transported under exclusive use.*

Chapter 5.2

5.2.1.5.2 In the case of excepted packages marking the proper shipping name is not required.

5.2.2.1.12.1 Except when enlarged labels are used in accordance with 5.3.1.1.5.1, ...

5.2.2.1.12.1

(d) *Transport index*: The number determined in accordance with paras 2.7.6.1.1 and 2.7.6.1.2. (No *transport index* entry is required for category I-WHITE.)

Chapter 6.4

6.4.5.2 Portable tanks may also be used as *Type IP-2* or *Type IP-3*, provided that:

- (a) They satisfy the requirements of 6.4.5.1;
- (b) They are designed to conform to the standards prescribed in Chapter 6.7 of these Regulations, or other requirements at least equivalent to those standards, and are capable of withstanding a test pressure of 265 kPa; and
- (c) They are designed so that any additional shielding which is provided shall be capable of withstanding the static and dynamic stresses resulting from handling and routine conditions of transport and of preventing an increase of more than 20% in the maximum radiation level at any external surface of the portable tanks.

6.4.5.4.1 Packages may be used as *Type IP-2* package provided that:

- (a) They satisfy the requirements of 6.4.5.1;

- (b) They are designed to satisfy the requirements prescribed for UN Packing Group I or II in Chapter 6.1 of these Regulations; and
- (c) When subjected to the tests required for packing group I or II in Chapter 6.1, they would prevent:
 - (i) loss or dispersal of the radioactive contents; and
 - (ii) more than a 20% increase in the maximum radiation level at any external surface of the package.

6.4.5.4.2 Portable tanks may also be used as *Type IP-2* or *Type IP-3*, provided that:

- (a) They satisfy the requirements of 6.4.5.1;
- (b) They are designed to satisfy the requirements prescribed in Chapter 6.7 of these Regulations and are capable of withstanding a test pressure of 265 kPa; and
- (c) They are designed so that any additional shielding which is provided shall be capable of withstanding the static and dynamic stresses resulting from handling and routine conditions of transport and of preventing an increase of more than 20% in the maximum radiation level at any external surface of the portable tanks.

6.4.5.4.3 Tanks, other than portable tanks, may also be used as *Type IP-2* or *Type IP-3* for transporting LSA-I and LSA-II liquids and gases as prescribed in Table 4.1.9.2.4, provided that:

- (a) They satisfy the requirements of 6.4.5.1;
- (b) They are designed to satisfy the requirements prescribed in regional or national regulations for the transport of dangerous goods and are capable of withstanding a test pressure of 265 kPa; and
- (c) They are designed so that any additional shielding which is provided shall be capable of withstanding the static and dynamic stresses resulting from handling and routine conditions of transport and of preventing an increase of more than 20% in the maximum radiation level at any external surface of the tanks.

6.4.5.4.4 Freight containers of a permanent enclosed character may also be used as *Type IP-2* or *IP-3* package, provided that:

- (a) The radioactive contents are restricted to solid materials;
- (b) They satisfy the requirements of 6.4.5.1; and
- (c) They are designed to conform to ISO 1496-1:1990: "Series 1 Freight Containers - Specifications and Testing - Part 1: General Cargo Containers" excluding dimensions and ratings. They shall be designed such that if subjected to the tests prescribed in that document and the accelerations occurring during routine conditions of transport they would prevent:
 - (i) loss or dispersal of the radioactive contents; and
 - (ii) any increase of more than 20% in the maximum radiation level at any external surface of the freight containers.

6.4.11.13 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).

6.4.23.14

- (o) For Type B(M) packages, a statement specifying those prescriptions of 6.4.7.5, 6.4.8.4, 6.4.8.5, 6.4.8.6 and 6.4.8.9 to 6.4.8.15 with which the package does not conform and any amplifying information which may be useful to other competent authorities;

6.4.23.15 ADD “under paras 6.4.22.2, 6.4.22.3, 6.4.22.4, 6.4.24.2 and 6.4.24.3”

Annex 2 (ENGLISH ONLY)**PROPOSED CHANGES TO THE IAEA TRANSPORT REGULATIONS IN ORDER TO
ACHIEVE HARMONISATION WITH PROPOSED AMENDMENTS TO THE UN
MODEL REGULATIONS**

ONLY PARAGRAPHS WITH TEXT CHANGE SHOWN

105. Recommend aligning with UN (see 104)
109. For *radioactive material* having subsidiary risks, and for transport of *radioactive material* with other dangerous goods, the relevant transport regulations for dangerous goods shall apply in addition to these Regulations.
207. *Competent authority* shall mean any body or authority designated or otherwise recognized as such for any purpose in connection with these Regulations.
210. *Consignee* shall mean any person, organization or government which is entitled to take delivery of a consignment;
223. *Freight container* means an article of transport equipment that is of a permanent character and accordingly strong enough to be suitable for repeated use; specially designed to facilitate the transport of goods, by one or other modes of transport, without intermediate reloading: designed to be secured and /or readily handled, having fittings for these purposes, The term “freight container” includes neither vehicle nor packaging. However a freight container that is carried on a chassis is included. A freight container may be used as a packaging.
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 m³. Any other freight container is considered to be a large freight container.
224. *Intermediate bulk container (IBC)* shall mean a portable packaging that;
(a) has a capacity of not more than 3 m³,
(b) is designed for mechanical handling, and
(c) is resistant to the stresses produced in handling and transport, as determined by tests.
229. *Overpack* means an enclosure used by a single consignor to contain one or more packages and to form one unit for convenience of handling and stowage during transport. Examples of overpacks are a number of packages either:
- (a) Placed or stacked on to a load board such as a pallet and secured by strapping, shrink wrapping, stretch wrapping, or other suitable means; or
 - (b) Placed in a protective outer packaging such as a box or crate;

230. *Package* means the complete product of the packing operation, consisting of the packaging and its contents prepared for transport. (plus remaining description of package types)

231. *Packaging* shall mean one or more receptacles and any other components or materials necessary for the receptacles to perform the containment and other safety functions.

242. *Tank* shall mean a portable tank, including a tank container, a road tank vehicle, a rail tank wagon or a receptacle to contain solids, liquids, or gases, having a capacity of not less than 450 litres when used for the transport of substances of Class 2.

313bis. NEW TEXT Records of all safety training undertaken shall be kept by the employer and made available to the employee if requested.

504. Packagings used for the transport of radioactive material shall not be used for the storage or transport of other goods unless decontaminated below the level of 0.4 Bq/cm² for beta and gamma emitters and low toxicity alpha emitters and 0.04 Bq/cm² for all other alpha emitters.

505. DELETE

517. Consider moving to Section IV

518. Consider moving to Section IV

519. Consider moving to Section IV

520. Consider moving to Section IV

528. This is directly related to 681 and 682, so IAEA should consider moving these together

536. For each *package*, other than *excepted packages*, the United Nations number (see Table VIII), preceded by the letters "UN", and the proper shipping name (see Table VIII) shall be legibly and durably marked on the outside of the *packaging*. In the case of *excepted packages* marking the proper shipping name is not required. For *packages* accepted for international movement by post the requirement of para. 581 shall apply.

538. IAEA should study marking issue with reference to the situation where the type of package changes

544. (d) *Transport index*: The number determined in accordance with paras 526 and 527. (No *transport index* entry is required for category I-WHITE.)

549. Except as otherwise provided in these Regulations, no person may offer radioactive material for transport unless it is properly marked, labelled, placarded, described and

certified on a transport document, and otherwise in a condition for transport as required by these Regulations.

550. Adopt UN sequence from 5.4.1.4.2. IAEA could consider reviewing the need for the information obligations

551. Adopt UN declaration: "I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labelled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations."

552. Is this still valid?

553.bis If the dangerous goods documentation is presented to the carrier by means of electronic data processing (EDP) or electronic data interchange (EDI) transmission techniques, the signature(s) may be replaced by the name(s) (in capitals) of the person authorized to sign.

553.bis+1 When radioactive material, other than when carried in tanks, is packed or loaded into any freight container or vehicle which will be transported by sea, those responsible for packing of the container or vehicle shall provide a "container/vehicle packing certificate" specifying the container/vehicle identification number(s) and certifying that the operation has been carried out in accordance with the following conditions:

- (a) The container/vehicle was clean, dry and apparently fit to receive the goods;
- (b) Packages, which need to be segregated in accordance with applicable segregation requirements, have not been packed together onto or in the container/vehicle;
- (c) All packages have been externally inspected for damage, and only sound packages have been loaded;
- (d) All goods have been properly loaded and, where necessary, adequately braced with securing material to suit the mode(s) of transport for the intended journey;
- (e) Goods loaded in bulk have been evenly distributed within the container/vehicle;
- (f) For consignments including goods of Class 1 other than Division 1.4, the container/vehicle is structurally serviceable in accordance with 7.1.3.2.1;
- (g) The container/vehicle and packages are properly marked, labelled and placarded, as appropriate;
- (h) When solid carbon dioxide (CO₂-dry ice) is used for cooling purposes, the container/vehicle is externally marked or labelled in a conspicuous place, such as, at the door end, with the words: "DANGEROUS CO₂ (DRY ICE) INSIDE. VENTILATE THOROUGHLY BEFORE ENTERING"; and
- (i) A transport document, as indicated in 550, has been received for each dangerous goods consignment loaded in the container/vehicle.

553.bis+2 The information required in the transport document and the container/vehicle packing certificate may be incorporated into a single document, if not, these documents shall be attached one to the other. If the information is incorporated into a single document, the document shall include a signed declaration such as “It is declared that the packing of the goods into the container/vehicle has been carried out in accordance with the applicable provisions”. This declaration shall be dated and the person signing this declaration shall be identified on the document.

555. Delete – already covered in 520(d)

624. *Packages* may be used as *Type IP-2* provided that:

- (a) They satisfy the requirements for *Type IP-1* specified in para. 621;
- (b) They are designed to satisfy the requirements prescribed for UN Packing Group I or II in Chapter 6.1 of United Nations Recommendations on the Transport of Dangerous Goods [7]; and
- (c) When subjected to the tests required for UN Packing Group I or II, they would prevent:
 - (i) loss or dispersal of the *radioactive contents*; and
 - (ii) more than a 20% increase in the maximum radiation level at the external surface of the package.

625. Portable tanks may also be used as *Type IP-2* or *Type IP-3*, provided that:

- (a) They satisfy the requirements for *Type IP-1* specified in para. 621;
- (b) They are designed to satisfy the requirements prescribed in chapter 6.7 of the United Nations Recommendations on the Transport of Dangerous Goods [7] and are capable of withstanding a test pressure of 265 kPa; and
- (c) They are designed so that any additional shielding which is provided shall be capable of withstanding the static and dynamic stresses resulting from handling and routine conditions of transport and of preventing an increase of more than 20% in the maximum radiation level at any external surface of the portable tanks.

626. Tanks, other than portable tanks, may also be used as *Type IP-2* or *Type IP-3* for transporting *LSA-I* and *LSA-II* liquids and gases as prescribed in Table IV, provided that:

- (a) They satisfy the requirements for *Type IP-1* specified in para. 621;
- (b) They are designed to satisfy the requirements prescribed in regional or national regulations for the transport of dangerous goods and are capable of withstanding a test pressure of 265 kPa; and
- (c) They are designed so that any additional shielding which is provided shall be capable of withstanding the static and dynamic stresses resulting from handling and routine conditions of transport and of preventing an increase of more than 20% in the maximum radiation level at any external surface of the tanks.

627. Freight containers of a permanent enclosed character may also be used as *Type IP-2* or *Type IP-3*, provided that:

- (a) The *radioactive contents* are restricted to solid materials;
- (b) They satisfy the requirements for *Type IP-1* specified in para. 621; and
- (c) They are designed to conform the International Organization for Standardization document ISO 1496/1: “Series 1 Freight Containers — Specifications and Testing — Part 1: General Cargo Containers” [9] excluding dimensions and ratings. They shall be designed such that if - subjected to the tests prescribed in that document and the accelerations - occurring during routine conditions of transport they would prevent:
 - (i) loss or dispersal of the *radioactive contents*; and
 - (ii) more than a 20% increase in the maximum *radiation level* at the external surface of the *freight containers*.

628. Metal *intermediate bulk containers* may also be used as *Type IP-2* or *Type IP-3*, provided that:

- (a) They satisfy the requirements for *Type IP-1* specified in para. 621; and
- (b) They are designed to satisfy the requirements prescribed in Chapter 6.5 of the Recommendations on Intermediate Bulk Containers (IBC’s) of the United Nations Recommendations on the Transport of Dangerous Goods [7], for Packing Group I or II, and if they were subjected to the tests prescribed in that document, but with the drop test conducted in the most damaging orientation, they would prevent:
 - (i) loss or dispersal of the *radioactive contents*; and
 - (ii) more than a 20% increase in the maximum *radiation level* at the external surface of the *intermediate bulk container*.

IAEA could discuss whether they really wish to have the most damaging attitude for tests. Can formatting reflect 624?

709. Check Ref

NEW Classification chapter 4

An attempt has been made to restructure the Class 7 text in the UN Orange book into an order consistent with the other dangerous goods. This work started looking at classification (chapter 2.7 of the Orange book). This has resulted in a structure that is helpful to the user. The text following is an attempt to present this in IAEA format and IAEA text.

The original paragraph numbers are shown to enable the reader to understand where the text is drawn from. This is a restructuring of existing text, with some additional text to direct the user through the process. No changes are proposed to the actual process – this is intended as a simplification exercise only.

Formula and tables have been omitted where possible to aid reading.

CHAPTER 4

Radioactive material

236. *Radioactive material* shall mean any material containing radionuclides where both the activity concentration and the total activity in the *consignment* exceed the values specified in paras 401–406.

NEW Radioactive material shall be assigned to one of the UN number specified in Table 8 below 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 XXX to XXX below.

Table 8 (Revised) Assignment of UN numbers

Excepted packages

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

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

Table 8 (Revised)**Assignment of UN numbers**

	UN 3324	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-II), FISSILE
	UN 3325	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY, (LSA-III), FISSILE
Surface contaminated objects	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	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	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	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	UN 3323	RADIOACTIVE MATERIAL, TYPE C PACKAGE, non fissile or fissile-excepted
	UN 3330	RADIOACTIVE MATERIAL, TYPE C PACKAGE, FISSILE
Special arrangement	UN 2919	RADIOACTIVE MATERIAL, TRANSPORTED UNDER SPECIAL ARRANGEMENT, non-fissile or fissile-excepted
	UN 3331	RADIOACTIVE MATERIAL, TRANSPORTED UNDER SPECIAL ARRANGEMENT, FISSILE
Uranium hexafluoride	UN 2977	RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE, FISSILE
	UN 2978	RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE, non-fissile or fissile-excepted

BASIC RADIONUCLIDE VALUES

401. The following basic values for individual radionuclides are given in Table 1:
- (a) $A1$ and $A2$ in TBq;
 - (b) activity concentration for exempt material in Bq/g; and
 - (c) activity limits for exempt consignments in Bq.

DETERMINATION OF BASIC RADIONUCLIDE VALUES

402. For individual radionuclides which are not listed in Table 1 the determination of the basic radionuclide values referred to in para. 401 shall require *multilateral approval*. It is permissible to use an $A2$ 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 may be used without obtaining *competent authority* approval.

403. In the calculations of $A1$ and $A2$ for a radionuclide not in Table 1, a single radioactive decay chain in which the radionuclides are present in their naturally occurring proportions, and in which no progeny 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 $A1$ or $A2$ 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 progeny nuclide has a half-life either longer than 10 days or greater than that of the parent nuclide, the parent and such progeny nuclides shall be considered as mixtures of different nuclides.

TABLE 1. BASIC RADIONUCLIDE VALUES

404. For mixtures of radionuclides, the determination of the basic radionuclide values referred to in para. 401 may be determined as follows:
where

FORMULA

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

$X(i)$ is the appropriate value of $A1$ or $A2$, 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 $A1$ or $A2$, or the activity concentration for exempt material or the activity limit for an exempt consignment in the case of a mixture.

405. 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 paras 404 and 414. 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.

406. For individual radionuclides or for mixtures of radionuclides for which relevant data are not available, the values shown in Table 2 shall be used.

Determination other material characteristics

Low specific activity (LSA) material

NEW TO REGULATIONS (from definitions) *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) 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 para. 672; 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 paras 401–406, excluding *fissile material* in quantities not excepted under para. 672.
- (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 $10-4A_2/g$ for solids and gases, and $10-5A_2/g$ for liquids.
- (c) *LSA-III*

Solids (e.g. consolidated wastes, activated materials), excluding powders, meeting the requirements of para 601, 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 $0.1A_2$; and
 - (iii) The estimated average *specific activity* of the solid, excluding any shielding material, does not exceed $2 \times 10-3A_2/g$.

Surface contaminated object (SCO)

NEW (from defs) SCO shall be 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 cm² (or the area of the surface if less than 300 cm²) does not exceed 4 Bq/cm² for beta and gamma emitters and *low toxicity alpha emitters*, or 0.4 Bq/cm² for all other alpha emitters; and
 - (ii) the *fixed contamination* on the accessible surface averaged over 300 cm² (or the area of the surface if less than 300 cm²) does not exceed 4×10^4 Bq/cm² for beta and gamma emitters and *low toxicity alpha emitters*, or 4×10^3 Bq/cm² for all other alpha emitters; and
 - (iii) the *non-fixed contamination* plus the *fixed contamination* on the inaccessible surface averaged over 300 cm² (or the area of the surface if less than 300 cm²) does not exceed 4×10^4 Bq/cm² for beta and gamma emitters and *low toxicity alpha emitters*, or 4×10^3 Bq/cm² 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 cm² (or the area of the surface if less than 300 cm²) does not exceed 400 Bq/cm² for beta and gamma emitters and *low toxicity alpha emitters*, or 40 Bq/cm² for all other alpha emitters; and
 - (ii) the *fixed contamination* on the accessible surface, averaged over 300 cm² (or the area of the surface if less than 300 cm²) does not exceed 8×10^5 Bq/cm² for beta and gamma emitters and *low toxicity alpha emitters*, or 8×10^4 Bq/cm² for all other alpha emitters; and
 - (iii) the *non-fixed contamination* plus the *fixed contamination* on the inaccessible surface averaged over 300 cm² (or the area of the surface if less than 300 cm²) does not exceed 8×10^5 Bq/cm² for beta and gamma emitters and *low toxicity alpha emitters*, or 8×10^4 Bq/cm² for all other alpha emitters.

Special form radioactive material

WAS 602. and 604.

Special form radioactive material shall have at least one dimension not less than 5 mm. When a sealed capsule constitutes part of the special form radioactive material, the capsule shall be so manufactured that it can be opened only by destroying it. The design for special form radioactive material shall meet the requirement of para 603 and requires unilateral approval.

Low dispersible radioactive material

NEW The design for low dispersible radioactive material shall require multilateral approval. Low dispersible radioactive material shall be such that the total amount of this radioactive material in a package shall meet the requirements of para 605.

*Fissile material***MOST OF 672**

Packages containing fissile radionuclides shall be classified under the relevant entry of table 8 for fissile material unless one of the following conditions are met:

- (a) A mass limit per *consignment* such that:

FORMULA

where X and Y are the mass limits defined in Table 12, 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 shall apply to the *consignment* being carried in or on the *conveyance*; or
- (ii) the *fissile material* is a homogeneous hydrogenous solution or mixture where the ratio of fissile nuclides to hydrogen is less than 5% by mass; or
- (iii) there are not more than 5 g of *fissile material* in any 10 litre volume of material.

Neither beryllium nor deuterium shall be present in quantities exceeding 1% of the applicable consignment mass limits provided in Table 12, except for deuterium in natural concentration in hydrogen.

- (b) Uranium enriched in uranium-235 to a maximum of 1% by mass, and with a total plutonium and uranium-233 content not exceeding 1% 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 shall not form a lattice arrangement.
- (c) Liquid solutions of uranyl nitrate enriched in uranium-235 to a maximum of 2% by mass, with a total plutonium and uranium-233 content not exceeding 0.002% 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% by mass may consist of plutonium-239, plutonium-241 or any combination of those radionuclides.

Classification of packages or unpackaged material

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

Classification as excepted package

NEW Packagings may be classified as 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.

516. A package containing radioactive material may be classified as an excepted package only if the radiation level at any point on its external surface does not exceed 5 $\mu\text{Sv/h}$.

408. 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 3 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 3.

WAS 517, part 408 Radioactive material which is enclosed in or included as a component part of an instrument or manufactured article may be classified under UN 2911, RADIOACTIVE MATERIAL, EXCEPTED PACKAGE - INSTRUMENTS or ARTICLES, only if:

- (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 manufactured article bears the marking "RADIOACTIVE" except:
 - (i) radioluminescent time-pieces or devices;
 - (ii) consumer products that either have received regulatory approval according to 107 (d) or do not individually exceed the activity limit for an exempt consignment in Table.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).
- (d) The limits specified in column 2 of Table 3 are met for each instrument or manufactured article and the limits specified in column 3 of Table 3 are met for each individual item and each package, respectively.

WAS 518 408 Radioactive material with an activity not exceeding the limit specified in column 4 of Table 2.7.2.4.1.2, may be 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*.

WAS 520

Empty packagings which had previously contained radioactive material with an activity not exceeding the limit specified in column 4 of Table 3 may be classified under UN 2908, RADIOACTIVE MATERIAL, EXCEPTED PACKAGE - EMPTY PACKAGING, only if:

- (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 para. 508; and
- (d) Any labels which may have been displayed on it in conformity with para. 542 are no longer visible.

WAS 519

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, only if the outer surface of the uranium or thorium is enclosed in an inactive sheath made of metal or some other substantial material.

WAS 413, 414

Classification as Low specific activity (LSA) material

NEW Radioactive material may only be classified as LSA material if the conditions of XXX and XXX are met.

Classification as Surface contaminated object (SCO)

NEW Radioactive material may be classified as SCO if the conditions of YYY and YYY are met.

Classification as Type A package

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

413. *Type A packages* shall not contain activities greater than the following:

- (a) for *special form radioactive material* — A1; or
- (b) for all other *radioactive material* — A2.

414. 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*:

FORMULA

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

A1(i) is the A1 value for radionuclide i; and

C(j) is the activity of radionuclide j as other than *special form radioactive material* and A2(j) is the A2 value for radionuclide j.

Classification of Uranium hexafluoride

NEW Uranium hexafluoride shall only be assigned to UN Nos 2977, RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE, FISSILE, or 2978, RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE, non-fissile or fissile-excepted.

From 419 A package may only be classified as a Uranium Hexafluoride package if it does 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 % at the maximum temperature of the package as specified for the plant systems where the package shall be used; or
- (c) uranium hexafluoride other than in solid form or at an internal pressure above atmospheric pressure when presented for transport.

Classification as Type B(U), Type B(M) or Type C packages

NEW Packages not otherwise classified [in the previous paragraphs of this section] shall be classified in accordance with the competent authority approval certificate for the package issued by the country of origin of design.

FROM 415 A package may only be classified as a Type B(U) 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 the certificate of approval.

FROM 415 A package may only be classified as a Type B(M) 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 the certificate of approval.

- FROM 417** A package may only be classified as a Type C 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 the certificate of approval.

Special arrangements

Radioactive material shall be classified as a special arrangement when it is intended to be carried in accordance with 310.

Annex 3 (ENGLISH ONLY)

**REVISED VERSION: TABLE OF CORRESPONDENCE:
14th VERSION OF THE UN MODEL REGULATIONS AND IAEA REGULATIONS AS AMENDED 2005.**

TS-R-1	UN	Move to	Comment	Proposed change to UN text	Proposed change to IAEA text
101	1.1.2.1.1	1.5.1.1	General Provisions should be applicable to all classes. This and other paragraphs are specific additional requirements for class 7 and should be clearly identified. Possibly consider harmonised modal numbering (e.g. 1.7 is used in ADR)	TRANSSEC to advise on edition numbers	
102	X		Relates only to structure of TS-R.		
103	1.1.1.3	No change			
104	1.1.2.1.2	1.5.1.2	See 101		
105	1.1.1.4	No change	Model Regulations text includes reference to the protection of property/ the environment.		Recommend aligning with UN (see 104)
106	1.1.2.1.3	1.5.1.3	See 101		
107	2.7.1.2	1.5.1.4	But compare 107(d) and 3.4.9	Align with IAEA and check references	
108	X	No change			
109	4.1.9.1.5+ 1.1.2.5.1	4.1.9.1.5 + 1.5.5.1	Wording is very different between TS-R and the Model Regulations TS-R mentions "other dangerous goods" but the references here in the Model Regulations do not. This difference is justified.		Amend text to remove national reg reference since it is misleading that it does not deal with international shipments
110	X	No change	Relates only to structure of TS-R.		

TS-R-1	UN	Move to	Comment	Proposed change to UN text	Proposed change to IAEA text
201	2.7.2	2.7.1.3			
202	1.2.1	No change			
203	1.2.1	No change			
204	2.7.2	1.2.1	204 and 205 should be kept together. This definition is used in packaging standards and in material standards, so is appropriate for 1.2.1		
205	2.7.2	1.2.1			
206	1.2.1	No change			
207	1.2.1	No change	Text not harmonised. IAEA permits international bodies to be competent authorities, UN does not. Compromise text proposed.	<i>Competent authority</i> shall mean any body or authority designated or otherwise recognized as such for any purpose in connection with these Regulations.	<i>Competent authority</i> shall mean any body or authority designated or otherwise recognized as such for any purpose in connection with these Regulations.
208	1.2.1	No change	This definition is a class 7 definition, but is suitable for use in other classes.		
209	2.7.2	1.2.1			
210	1.2.1	No change	IAEA definition and UN definition are different.		Adopt UN text
211	1.2.1	No change			
212	1.2.1	No change			
213	2.7.2	1.2.1			
214	2.7.2	2.7.1.2	Contamination is used in material classification (SCO)		
215	2.7.2	2.7.1.2			
216	2.7.2	2.7.1.2			
217	1.2.1	No change			
218	2.7.2	1.2.1			

TS-R-1	UN	Move to	Comment	Proposed change to UN text	Proposed change to IAEA text
219	1.2.1	No change			
220	2.7.2	1.2.1			
221	2.7.2	1.2.1			
222	2.7.2	2.7.1.3			
223	1.2.1	No change But move small freight container to 1.2.1	Adopt UN and add enclosed nature 627. Change UN part 7 to reference CSC	<i>Freight container</i> means an article of transport equipment that is of a permanent character and accordingly strong enough to be suitable for repeated use; specially designed to facilitate the transport of goods, by one or other modes of transport, without intermediate reloading: designed to be secured and /or readily handled, having fittings for these purposes, The term “freight container” includes neither vehicle nor packaging. However a freight container that is carried on a chassis is included. For the transport of Class 7 material a freight container may be used as a packaging. 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 ³ . Any other freight container is considered to be a large freight container.	<i>Freight container</i> means an article of transport equipment that is of a permanent character and accordingly strong enough to be suitable for repeated use; specially designed to facilitate the transport of goods, by one or other modes of transport, without intermediate reloading: designed to be secured and /or readily handled, having fittings for these purposes, The term “freight container” includes neither vehicle nor packaging. However a freight container that is carried on a chassis is included. A freight container may be used as a packaging. 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 ³ . Any other freight container is considered to be a large freight container.

TS-R-1	UN	Move to	Comment	Proposed change to UN text	Proposed change to IAEA text
224	1.2.1	No change			Delete “performance” in sub-para (c) and delete sub-para (d)
225	2.7.2	2.7.1.3			
226	2.7.2 and 2.7.3	2.7.1.3 and 2.7.2.3.1.2		Move 2.7.3.1 to 2.7.1.3 reference. 2.7.3.1 reserved remainder moved to 2.7.2.3.1.2	
227	2.7.2	2.7.1.3			
228	1.2.1	No change			
229	1.2.1	No change	UN text to be adopted, but add reference to 5.1.2.1. and add 5.1.2.1 to 2007 IAEA 536	In 5.1.2.1 add reference to 5.2.2.1.12	Adopt UN text and add 5.1.2.1 to 2007 IAEA 536
230	2.7.2	1.2.1 4.1.9.1.1	Adopt UN and move list from 2.7.2 to 4.1.9.1.1	Delete 2.7.2 reference and move list to 4.1.9.1.1	Adopt UN definition from 1.2.1
231	2.7.2	1.2.1	Harmonise definition by adopting UN with minor changes.	<i>Packaging</i> means one or more receptacles and any other components or materials necessary for the receptacles to perform the containment and other safety functions.	<i>Packaging</i> shall mean one or more receptacles and any other components or materials necessary for the receptacles to perform the containment and other safety functions. (rest moved to guidance)
232	1.2.1	No change			
233	2.7.2	1.2.1			
234	1.1.2.2.1	1.5.2.1			
235	2.7.2	1.2.1			
236	2.7.1.1	No change			
237	1.2.1	No change			

TS-R-1	UN	Move to	Comment	Proposed change to UN text	Proposed change to IAEA text
238	1.1.2.4.1	1.5.4.1			
239	2.7.2 refers on to (2.7.4.1)	2.7.1.3		Use definition from 239 in 2.7.2. IAEA 602 and 604 stays in 2.7.4.1.	
240	2.7.2	2.7.1.3			
241	2.7.5 refers on to (2.7.2)	2.7.1.3 and 2.7.2.3.2		Move 2.7.5 first sentence to 2.7.1.3 reference. Move remainder to 2.7.2.3.2	
242	1.2.1	No change			<i>Tank</i> shall mean a portable tank, including a tank container, a road tank vehicle, a rail tank wagon or a receptacle to contain solids, liquids, or gases, having a capacity of not less than 450 litres when used for the transport of substances of Class 2.
243	2.7.2	1.2.1			
244	2.7.2	2.7.1.3	This is material classification.		
245	2.7.2	2.7.1.3	This is material classification.		
246	2.7.2	2.7.1.3	This is material classification.		
247	1.2.1	No change			
248	1.2.1	No change			
301	1.1.2.2.3	1.5.2.2			
302	1.1.2.2.1.2	1.5.2.3			
303	1.1.2.2.5	1.5.2.4			

TS-R-1	UN	Move to	Comment	Proposed change to UN text	Proposed change to IAEA text
304	Intro para 16	1.5.2.5 But leave first part of para 16 in place.	Required in IAEA 302	In the event of accidents or incidents during the transport of <i>radioactive material</i> , emergency provisions, as established by relevant national and/or international organizations, shall be observed to protect persons, property and the environment. Appropriate guidelines for such provisions are contained in "Planning and Preparing for Emergency Response to Transport Accidents Involving Radioactive Material", Safety Standard Series No. TS-G-1.2 (ST-3), IAEA, Vienna.	
305	X	1.5.2.6	Required in IAEA 302	Emergency procedures shall take into account the formation of other dangerous substances that may result from the reaction between the contents of a <i>consignment</i> and the environment in the event of an accident.	
306	1.1.2.3.1	1.5.3.1			
307	Introduction para 17	No change			
308	Introduction para 18	No Change			
309	1.1.2.6.1	1.5.6.1			
310	1.1.2.4.2	1.5.4.2			

TS-R-1	UN	Move to	Comment	Proposed change to UN text	Proposed change to IAEA text
311	1.1.2.2.4	1.5.2.7			
312	1.3.1	No change			
313	1.3.2	No change			
X	1.3.3	No change			313bis Records of all safety training undertaken shall be kept by the employer and made available to the employee if requested.
314	1.3.4	No change			
401	2.7.7.2.1	2.7.2.2.1			
402	2.7.7.2.2	2.7.2.2.2			
403	2.7.7.2.3	2.7.2.2.3			
404	2.7.7.2.4	2.7.2.2.4			
405	2.7.7.2.5	2.7.2.2.5			
406	2.7.7.2.6	2.7.2.2.6			
407	2.7.7.1.1	2.7.2.4			
408	2.7.7.1.2.1	2.7.2.4.1.1 2.7.2.4.1.3			
409	2.7.7.1.2.2	2.7.2.4.1.6			
410	1.1.1.6 b)	No change			
411	2.7.7.1.3	X	2.7.2.4.2 and 2.7.2.4.3 already give effect to this		
412	2.7.7.1.3	SP XXX		Adopt IAEA text	
413	2.7.7.1.4.1	2.7.2.4.4			
414	2.7.7.1.4.2	2.7.2.4.4			

TS-R-1	UN	Move to	Comment	Proposed change to UN text	Proposed change to IAEA text
415	2.7.7.1.5.1	2.7.2.4.6.1 2.7.2.4.6.2			
416	2.7.7.1.5.2	SP YYY		Adopt IAEA text	
417	2.7.7.1.6	2.7.2.4.6.3			
418	2.7.7.1.7	4.1.9.Z			
419	2.7.7.1.8	2.7.2.4.5.1			
501	5.1.5.1.1	4.1.9.1.6			
502	5.1.5.1.2	4.1.9.1.7			
503	4.1.9.1.3	No change			
504	5.1.3.2 4.2.1.16	No change	Add “packagings” to 5.1.3.2 and delete 4.2.1.16	Packagings used for the transport of radioactive material shall not be used for the storage or transport of other goods unless decontaminated below the level of 0.4 Bq/cm ² for beta and gamma emitters and low toxicity alpha emitters and 0.04 Bq/cm ² for all other alpha emitters.	Packagings used for the transport of radioactive material shall not be used for the storage or transport of other goods unless decontaminated below the level of 0.4 Bq/cm ² for beta and gamma emitters and low toxicity alpha emitters and 0.04 Bq/cm ² for all other alpha emitters.
505	X	No change			Delete 505 and add 505.1 to the definition of exclusive use.
506	X	No change	Model Regulations 7.1.2.1 are equivalent.		
507	4.1.9.1.5 1.1.2.5.1 2.0.3	4.1.9.1.5 1.5.5.1 2.0.3			
508	4.1.9.1.2	No change			
509	4.1.9.1.4	No change			

TS-R-1	UN	Move to	Comment	Proposed change to UN text	Proposed change to IAEA text
510	7.1.8. 5.1	No change			
511	7.1.8. 5.2	No change			
512	7.1.8 5.3	No change			
513	7.1.8. 5.4	No change			
514	7.1.8 5.5	No change			
515	2.7.9.1, 2.7.9.7	1.5.1.5.1 1.5.1.5.2	This is a difficult paragraph to transfer to UN – this needs work		IAEA should consider this.
516	2.7.9.2	2.7.2.4.1.2			
517	2.7.9.3	2.7.2.4.1.3			Consider moving to Section IV
518	2.7.9.4	2.7.2.4.1.4			Consider moving to Section IV
519	2.7.9.5	2.7.2.4.1.6			Consider moving to Section IV
520	2.7.9.6	2.7.2.4.1.5			Consider moving to Section IV
521	4.1.9.2.1	No change			
522	4.1.9.2.2	No change			
523	4.1.9.2.3	No change			
524	4.1.9.2.4	No change			
525	7.1.8.2	No change			
526	2.7.6.1.1	5.1.5.X			
527	2.7.6.1.2	5.1.5.X			
528	2.7.6.2.1	6.4.11.13			528 is directly related to 681 and 682, so IAEA should consider moving these together
529	2.7.6.2.2	5.1.5.X			
530	2.7.8.1	4.1.9.Y.1			

TS-R-1	UN	Move to	Comment	Proposed change to UN text	Proposed change to IAEA text
531	2.7.8.2	4.1.9.Y.2			
532	2.7.8.3	4.1.9.Y.3			
533	2.7.8.4	5.1.5.X			
534	2.7.8.5	2.7.2.4.6			
535	5.2.1.5.1	No change			
536	5.2.1.5.2	5.2.1.5.2 5.2.1.1	Model Regulations do not have TSR text re transport by post.	Delete first sentence of 5.2.1.5.2 already covered in 5.2.1.1 In the case of excepted packages marking the proper shipping name is not required.	For each <i>package</i> , other than <i>excepted packages</i> , the United Nations number (see Table VIII), preceded by the letters “UN”, and the proper shipping name (see Table VIII) shall be legibly and durably marked on the outside of the <i>packaging</i> . In the case of <i>excepted packages</i> marking the proper shipping name is not required. For <i>packages</i> accepted for international movement by post the requirement of para. 581 shall apply.
537	5.2.1.5.3	No change			
538	5.2.1.5.4	No change			IAEA should study marking issue with reference to the situation where the type of package changes
539	5.2.1.5.5	No change			
540	5.2.1.5.6	No change			

TS-R-1	UN	Move to	Comment	Proposed change to UN text	Proposed change to IAEA text
541	5.2.1.5.7	No change	UN labels are different to IAEA labels	Fig 7B,7C,7E should be made like IAEA (space in the transport index box for the number).	
542	5.2.2.1.12.1	No change			
543	5.2.2.1.12.1	No change		Except when enlarged labels are used in accordance with 5.3.1.1.5.1,	
544	5.2.2.1.12.2	No change		(d) <i>Transport index</i> : The number determined in accordance with paras 2.7.6.1.1 and 2.7.6.1.2. (No <i>transport index</i> entry is required for category I-WHITE.)	(d) <i>Transport index</i> : The number determined in accordance with paras 526 and 527. (No <i>transport index</i> entry is required for category I-WHITE.)
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			
548	5.3.2.1.1 (d) (e) 5.3.2.1.2	No change			

TS-R-1	UN	Move to	Comment	Proposed change to UN text	Proposed change to IAEA text
549	5.1.1.2	No change	Wording is slightly different between the texts; TS-R mentions "consignor's responsibility", Model Regulations says, "no person may offer".		Except as otherwise provided in these Regulations, no person may offer radioactive material for transport unless it is properly marked, labelled, placarded, described and certified on a transport document, and otherwise in a condition for transport as required by these Regulations.
550	5.4.1.5.7.1 5.4.1.3 5.4.1.4.1	No change	Information requirements and ordering differ.		Adopt UN sequence from 5.4.1.4.2 IAEA could consider reviewing the need for the information obligations
551	5.4.1.6.1	No change			Adopt UN declaration: "I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labelled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations."
552	X	No change	Not relevant to the Model Regulations.		IAEA to consider the continued validity of this paragraph
553	5.4.1.6	No change			

TS-R-1	UN	Move to	Comment	Proposed change to UN text	Proposed change to IAEA text
X	5.4.1.6.2	No change			IAEA should adopt UN paragraph as 553bis
X	5.4.2	No change			IAEA should adopt UN requirements as 553bis+1
554	5.4.1.6	No change			
555	2.7.9.6 d)	No change			Delete – already covered in 520(d)
556	5.4.1.5.7.2	No change			
557	5.4.1.5.7.4	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	Move second sentence to 4.1.9.1.8			
563	7.1.8 1.1	No change			
564	7.1.8.1.2	No change			
565	7.1.8.3.1	No change			
566	7.1.8.3.2	No change			

TS-R-1	UN	Move to	Comment	Proposed change to UN text	Proposed change to IAEA text
567	7.1.8.3.3	No change			
568	7.1.8.3.4	No change			
569	7.1.8.4.1	No change			
570	7.1.8.4.2	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	X	No change			
582	X	No change			
583	7.1.8. 6.1	No change			
601	2.7.2.3.1.3	No change			
602	2.7.4.1	2.7.2.3.3.1			

TS-R-1	UN	Move to	Comment	Proposed change to UN text	Proposed change to IAEA text
603	2.7.4.2	2.7.2.3.3.2			
604	2.7.4.1	2.7.2.3.3.1			
605	2.7.10.1	2.7.2.3.4.1 2.7.2.3.4.2			
606	6.4.2.1	No change			
607	6.4.2.2	No change			
608	6.4.2.3	No change			
609	6.4.2.4	No change			
610	6.4.2.5	No change			
611	6.2.4.6	No change			
612	6.2.4.7	No change			
613	6.4.2.8	No change			
614	6.4.2.9	No change			
615	6.4.2.10	No change			
616	6.4.2.11	No change			
617	6.4.3.1	No change			
618	6.4.3.2	No change			
619	6.4.3.3	No change			
620	6.4.4	No change			
621	6.4.5.1	No change			
622	6.4.5.2	No change			
623	6.4.5.3	No change			

TS-R-1	UN	Move to	Comment	Proposed change to UN text	Proposed change to IAEA text
624	6.4.5.4.1	No change	Remove other requirements equivalent to UN model regulations here and in following paragraphs	<p>Packages may be used as Type IP-2 package provided that:</p> <p>(a) They satisfy the requirements of 6.4.5.1;</p> <p>(b) They are designed to satisfy the requirements prescribed for UN Packing Group I or II in Chapter 6.1 of these Regulations; and</p> <p>(c) When subjected to the tests required for packing group I or II in Chapter 6.1, they would prevent:</p> <p>(i) loss or dispersal of the radioactive contents; and</p> <p>(ii) more than a 20% increase in the maximum radiation level at any external surface of the package.</p>	<p><i>Packages</i> may be used as <i>Type IP-2</i> provided that:</p> <p>(a) They satisfy the requirements for <i>Type IP-1</i> specified in para. 621;</p> <p>(b) They are designed to satisfy the requirements prescribed for UN Packing Group I or II in Chapter 6.1 of United Nations Recommendations on the Transport of Dangerous Goods [7]; and</p> <p>(c) When subjected to the tests required for UN Packing Group I or II, they would prevent:</p> <p>(i) loss or dispersal of the <i>radioactive contents</i>; and</p> <p>(ii) more than a 20% increase in the maximum radiation level at the external surface of the package.</p>

TS-R-1	UN	Move to	Comment	Proposed change to UN text	Proposed change to IAEA text
625	6.4.5.4.2	No change	<p>TS-R refers to “ tank container”, Model Regulations to “portable tank”</p> <p>IAEA should incorporate “portable tank” definition from UN.</p>	<p>Portable tanks may also be used as <i>Type IP-2</i> or <i>Type IP-3</i>, provided that:</p> <p>(a) They satisfy the requirements of 6.4.5.1;</p> <p>(b) They are designed to satisfy the requirements prescribed in Chapter 6.7 of these Regulations and are capable of withstanding a test pressure of 265 kPa; and</p> <p>(c) They are designed so that any additional shielding which is provided shall be capable of withstanding the static and dynamic stresses resulting from handling and routine conditions of transport and of preventing an increase of more than 20% in the maximum radiation level at any external surface of the portable tanks.</p>	<p>Portable tanks may also be used as <i>Type IP-2</i> or <i>Type IP-3</i>, provided that:</p> <p>(a) They satisfy the requirements for <i>Type IP-1</i> specified in para. 621;</p> <p>(b) They are designed to satisfy the requirements prescribed in chapter 6.7 of the United Nations Recommendations on the Transport of Dangerous Goods [7] and are capable of withstanding a test pressure of 265 kPa; and</p> <p>(c) They are designed so that any additional shielding which is provided shall be capable of withstanding the static and dynamic stresses resulting from handling and routine conditions of transport and of preventing an increase of more than 20% in the maximum radiation level at any external surface of the portable tanks.</p>

TS-R-1	UN	Move to	Comment	Proposed change to UN text	Proposed change to IAEA text
626	6.4.5.4.3	No change	Reformatted as 625 and clearer specification of the standards to be applied.	<p>Tanks, other than portable tanks, may also be used as Type IP-2 or Type IP-3 for transporting LSA-I and LSA-II liquids and gases as prescribed in Table 4.1.9.2.4, provided that:</p> <p>(a) They satisfy the requirements of 6.4.5.1;</p> <p>(b) They are designed to satisfy the requirements prescribed in regional or national regulations for the transport of dangerous goods and are capable of withstanding a test pressure of 265 kPa; and</p> <p>(c) They are designed so that any additional shielding which is provided shall be capable of withstanding the static and dynamic stresses resulting from handling and routine conditions of transport and of preventing an increase of more than 20% in the maximum radiation level at any external surface of the tanks.</p>	<p>Tanks, other than portable tanks, may also be used as <i>Type IP-2</i> or <i>Type IP-3</i> for transporting <i>LSA-I</i> and <i>LSA-II</i> liquids and gases as prescribed in Table IV, provided that:</p> <p>(a) They satisfy the requirements for <i>Type IP-1</i> specified in para. 621;</p> <p>(b) They are designed to satisfy the requirements prescribed in regional or national regulations for the transport of dangerous goods and are capable of withstanding a test pressure of 265 kPa; and</p> <p>(c) They are designed so that any additional shielding which is provided shall be capable of withstanding the static and dynamic stresses resulting from handling and routine conditions of transport and of preventing an increase of more than 20% in the maximum radiation level at any external surface of the tanks.</p>

TS-R-1	UN	Move to	Comment	Proposed change to UN text	Proposed change to IAEA text
627	6.4.5.4.4	No change	“Permanent enclosed character” added	<p>Freight containers of a permanent enclosed character may also be used as Type IP-2 or IP-3 package, provided that:</p> <p>(a) The radioactive contents are restricted to solid materials;</p> <p>(b) They satisfy the requirements of 6.4.5.1; and</p> <p>(c) They are designed to conform to ISO 1496-1:1990: “Series 1 Freight Containers - Specifications and Testing - Part 1: General Cargo Containers” excluding dimensions and ratings. They shall be designed such that if subjected to the tests prescribed in that document and the accelerations occurring during routine conditions of transport they would prevent:</p> <p>(i) loss or dispersal of the radioactive contents; and</p> <p>(ii) any increase of more than 20% in the maximum radiation level at any external surface of the freight containers.</p>	<p>Freight containers of a permanent enclosed character may also be used as <i>Type IP-2</i> or <i>Type IP-3</i>, provided that:</p> <p>(a) The <i>radioactive contents</i> are restricted to solid materials;</p> <p>(b) They satisfy the requirements for <i>Type IP-1</i> specified in para. 621; and</p> <p>(c) They are designed to conform the International Organization for Standardization document ISO 1496/1: “Series 1 Freight Containers — Specifications and Testing — Part 1: General Cargo Containers” [9] excluding dimensions and ratings. They shall be designed such that if - subjected to the tests prescribed in that document and the accelerations occurring during routine conditions of transport they would prevent:</p> <p>(i) loss or dispersal of the <i>radioactive contents</i>; and</p> <p>(ii) more than a 20% increase in the maximum <i>radiation level</i> at the external surface of the <i>freight containers</i>.</p>

TS-R-1	UN	Move to	Comment	Proposed change to UN text	Proposed change to IAEA text
628	6.4.5.4.5	No change	IAEA could discuss whether they really wish to have the most damaging orientation for tests. Can formatting reflect 624?	<p>Metal intermediate bulk containers may also be used as Type IP-2 or IP-3 package provided that:</p> <p>(a) They satisfy the requirements of 6.4.5.1; and</p> <p>(b) They are designed to satisfy the requirements prescribed in Chapter 6.5 of these Regulations for packing group I or II, but with the drop test conducted in the most damaging orientation, they would prevent:</p> <p>(i) loss or dispersal of the radioactive contents; and</p> <p>(ii) any increase of more than 20% in the maximum radiation level at any external surface of the intermediate bulk container.</p>	<p>Metal <i>intermediate bulk containers</i> may also be used as <i>Type IP-2</i> or <i>Type IP-3</i>, provided that:</p> <p>(a) They satisfy the requirements for <i>Type IP-1</i> specified in para. 621; and</p> <p>(b) They are designed to satisfy the requirements prescribed in Chapter 6.5 of the Recommendations on Intermediate Bulk Containers (IBC's) of the United Nations Recommendations on the Transport of Dangerous Goods [7], for Packing Group I or II, and if they were subjected to the tests prescribed in that document, but with the drop test conducted in the most damaging orientation, they would prevent:</p> <p>(i) loss or dispersal of the <i>radioactive contents</i>; and</p> <p>(ii) more than a 20% increase in the maximum <i>radiation level</i> at the external surface of the <i>intermediate bulk container</i>.</p>
629	6.4.6.1	No change			
630	6.4.6.2	No change			IAEA should re-examine the equivalence of tests

TS-R-1	UN	Move to	Comment	Proposed change to UN text	Proposed change to IAEA text
631	6.4.6.3	No change			
632	6.4.6.4	No change			
633	6.4.7.1	No change			
634	6.4.7.2	No change			
635	6.4.7.3	No change			
636	6.4.7.4	No change			
637	6.4.7.5	No change			
638	6.4.7.6	No change			
639	6.4.7.7	No change			
640	6.4.7.8	No change			
641	6.4.7.9	No change			
642	6.4.7.10	No change			
643	6.4.7.11	No change			
644	6.4.7.12	No change			
645	6.4.7.13	No change			
646	6.4.7.14	No change			
647	6.4.7.15	No change			
648	6.4.7.16	No change			
649	6.4.7.17	No change			
650	6.4.8.1	No change			
651	6.4.8.2	No change			
652	6.4.8.3	No change			
653	6.4.8.4	No change			

TS-R-1	UN	Move to	Comment	Proposed change to UN text	Proposed change to IAEA text
654	6.4.8.5	No change			
655	6.4.8.6	No change			
656	6.4.8.7	No change			
657	6.1.8.8	No change			
658	6.4.8.9	No change			
659	6.4.8.10	No change			
660	6.4.8.11	No change			
661	6.4.8.12	No change			
662	6.4.8.13	No change			
663	6.4.8.14	No change			
664	6.4.8.15	No change			
665	6.4.9.1	No change			
666	6.4.9.2	No change			
667	6.4.10.1	No change			
668	6.4.10.2	No change			
669	6.4.10.3	No change			
670	6.4.10.4	No change			
671	6.4.11.1	No change			
672	6.4.11.2	2.7.2.3.5 6.4.11.2			
673	6.4.11.3	No change			
674	6.4.11.4	No change			
675	6.4.11.5	No change			

TS-R-1	UN	Move to	Comment	Proposed change to UN text	Proposed change to IAEA text
676	6.4.11.6	No change			
677	6.4.11.7	No change			
678	6.4.11.8	No change			
679	6.4.11.9	No change			
680	6.4.11.10	No change			
681	6.4.11.11	No change			
682	6.4.11.12	No change			
701	2.7.2.3.1.5	2.7.2.3.3.3 2.7.2.3.3.7			
702	6.4.12.2	No change			
703	2.7.2.3.1.4	No change			
704	2.7.4.4	2.7.2.3.3.4			
705	2.7.4.5 a)	2.7.2.3.3.5			
706	2.7.4.5 b)	2.7.2.3.3.5			
707	2.7.4.5 c)	No change			
708	2.7.4.5 d)	No change			
709	2.7.4.6	2.7.2.3.3.6			
710	2.7.4.7	No change			
711	2.7.4.8	2.7.2.3.3.8			
712	2.7.10.2	No change			
713	6.4.12.3	No change			
714	6.4.12.3	No change			
715	6.4.12.3	No change			

TS-R-1	UN	Move to	Comment	Proposed change to UN text	Proposed change to IAEA text
716	6.4.13	No change			
717	6.4.14	No change			
718	6.4.21	No change		UN to adopt 1.38 and 2.76 as pressures.	
719	6.4.15.1	No change			
720	6.4.15.2	No change			
721	6.4.15.3	No change			
722	6.4.15.4	No change			
723	6.4.15.5	No change			
724	6.4.15.6	No change			
725	6.4.16	No change			
726	6.4.17.1	No change			
727	6.4.17.2	No change			
728	6.4.17.3	No change			
729	6.4.17.4	No change			
730	6.4.18	No change			
731	6.4.19.1	No change			
732	6.4.19.2	No change			
733	6.4.19.3	No change			
734	6.4.20.1	No change			
735	6.4.20.2	No change			
736	6.4.20.3	No change			
737	6.4.20.4	No change			
801	5.1.5.3.3	No Change			

TS-R-1	UN	Move to	Comment	Proposed change to UN text	Proposed change to IAEA text
802abc	5.1.5.3.1	No change			
802d	7.2.3.2.2	No change			
802e	2.7.7.2.2	No change			
803	6.4.22.5 6.4.23.8	No change			
804	5.1.5.3.1	No change			
805a	6.4.22.1	No change			
805b	6.4.23.6	No change			
805c	6.4.23.7 5.1.5.3.1	No change	*Indirect reference.		
805d	5.1.5.3.1	No change			
806	6.4.22.2	No change			
807	6.4.23.4	No change			
808	5.1.5.3.1	No change			
809	6.4.22.3	No change			
810	6.4.23.5	No change			
811	5.1.5.3.1	No change			
812	6.4.22.4	No change			
813	6.4.23.7	No change			
814	5.1.5.3.1	No change			
815	6.4.24.1	No change			
816	6.4.24.2	No change			
817	6.4.24.3	No change			
818	6.4.24.4	No change			

TS-R-1	UN	Move to	Comment	Proposed change to UN text	Proposed change to IAEA text
819	6.4.23.15	No change		ADD “under paras 6.4.22.2, 6.4.22.3, 6.4.22.4, 6.4.24.2 and 6.4.24.3”	
820	5.1.5.2.2	No change			
821	5.1.5.2.2	No change			
822	6.4.23.2	No change			
823	5.1.5.3.1	No change			
824	5.1.5.2.3 1.1.2.4.2	No change			
825	6.4.23.3	No change			
826	5.1.5.3.1	No change			
827	5.1.5.3.1	No change			
828	6.4.23.9	No change			
829	6.4.23.10	No change			
830	6.4.23.11	No change			
831	6.4.23.12	No change			
832	6.4.23.13	No change			
833	6.4.23.14	No change		UN text should add reference 6.4.8.4 in (o)	
834	6.4.23.16	No change			

Annex 4 (ENGLISH ONLY)

Areas which in the opinion of the United Kingdom need further work

The United Kingdom has reviewed Annex 1 submitted as a consequence of the IAEA working group and as a result wishes to propose a number of editorial amendments.

1. In Chapter 1.5 there appears to be a heading missing to 1.5.1.5 which should read
“Requirements and controls for transport of excepted packages”
2. Chapter 2.7.2

Table 2.7.2.1.1

Under the headings in the left hand column it is suggested that a cross reference is made to the relevant section of the regulations. Although in most cases the information follows on from 2.7.2, in the case of excepted quantities the provisions have been put in the new Chapter 1.5. Readers may not realise this as most of Part 1 deals with general provisions and does not deal with consignment procedures such as packaging, marking and labelling. Therefore under each heading add the following:

Excepted packages

(1.5.1.5)

Low specific activity radioactive material

(2.7.2.3.1)

Surface contaminated objects

(2.7.2.3.2)

Type A

(2.7.2.4.4)

Type B(U) package

(2.7.2.4.6)

Type B(M) package

(2.7.2.4.6)

Type C package

(2.7.2.4.6)

Special arrangement

(2.7.2.5)

Uranium hexafluoride

(2.7.2.4.5)

3. In paragraph 2.7.2.3.5. Replace “unless the following conditions are met” with
“ Excepted from this requirements” and then move into sub paragraphs.
4. 4.1.9.Y should read 4.1.9.1.9 and 4.1.9.Z.1 should read 4.1.9.1.10.
