

# IAEA Safety Standards

for protecting people and the environment

## Schedules of Provisions of the IAEA Regulations for the Safe Transport of Radioactive Material (2009 Edition)

Safety Guide

No. TS-G-1.6 (Rev. 1)



**IAEA**

International Atomic Energy Agency

# IAEA SAFETY STANDARDS AND RELATED PUBLICATIONS

## IAEA SAFETY STANDARDS

Under the terms of Article III of its Statute, the IAEA is authorized to establish or adopt standards of safety for protection of health and minimization of danger to life and property, and to provide for the application of these standards.

The publications by means of which the IAEA establishes standards are issued in the **IAEA Safety Standards Series**. This series covers nuclear safety, radiation safety, transport safety and waste safety. The publication categories in the series are **Safety Fundamentals**, **Safety Requirements** and **Safety Guides**.

Information on the IAEA's safety standards programme is available on the IAEA Internet site

<http://www-ns.iaea.org/standards/>

The site provides the texts in English of published and draft safety standards. The texts of safety standards issued in Arabic, Chinese, French, Russian and Spanish, the IAEA Safety Glossary and a status report for safety standards under development are also available. For further information, please contact the IAEA at: Vienna International Centre, PO Box 100, 1400 Vienna, Austria.

All users of IAEA safety standards are invited to inform the IAEA of experience in their use (e.g. as a basis for national regulations, for safety reviews and for training courses) for the purpose of ensuring that they continue to meet users' needs. Information may be provided via the IAEA Internet site or by post, as above, or by email to [Official.Mail@iaea.org](mailto:Official.Mail@iaea.org).

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The IAEA provides for the application of the standards and, under the terms of Articles III and VIII.C of its Statute, makes available and fosters the exchange of information relating to peaceful nuclear activities and serves as an intermediary among its Member States for this purpose.

Reports on safety in nuclear activities are issued as **Safety Reports**, which provide practical examples and detailed methods that can be used in support of the safety standards.

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Security related publications are issued in the **IAEA Nuclear Security Series**.

The **IAEA Nuclear Energy Series** comprises informational publications to encourage and assist research on, and the development and practical application of, nuclear energy for peaceful purposes. It includes reports and guides on the status of and advances in technology, and on experience, good practices and practical examples in the areas of nuclear power, the nuclear fuel cycle, radioactive waste management and decommissioning.

SCHEDULES OF PROVISIONS  
OF THE IAEA REGULATIONS  
FOR THE SAFE TRANSPORT  
OF RADIOACTIVE MATERIAL  
(2009 EDITION)

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The Agency's Statute was approved on 23 October 1956 by the Conference on the Statute of the IAEA held at United Nations Headquarters, New York; it entered into force on 29 July 1957. The Headquarters of the Agency are situated in Vienna. Its principal objective is "to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world".

IAEA SAFETY STANDARDS SERIES No. TS-G-1.6 (Rev. 1)

SCHEDULES OF PROVISIONS  
OF THE IAEA REGULATIONS  
FOR THE SAFE TRANSPORT  
OF RADIOACTIVE MATERIAL  
(2009 EDITION)

SAFETY GUIDE

This Safety Guide publication includes  
the Schedules of Provisions of the IAEA Regulations for  
the Safe Transport of Radioactive Material (2005 Edition).

INTERNATIONAL ATOMIC ENERGY AGENCY  
VIENNA, 2014

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# FOREWORD

**by Yukiya Amano**  
**Director General**

The IAEA's Statute authorizes the Agency to “establish or adopt... standards of safety for protection of health and minimization of danger to life and property” — standards that the IAEA must use in its own operations, and which States can apply by means of their regulatory provisions for nuclear and radiation safety. The IAEA does this in consultation with the competent organs of the United Nations and with the specialized agencies concerned. A comprehensive set of high quality standards under regular review is a key element of a stable and sustainable global safety regime, as is the IAEA's assistance in their application.

The IAEA commenced its safety standards programme in 1958. The emphasis placed on quality, fitness for purpose and continuous improvement has led to the widespread use of the IAEA standards throughout the world. The Safety Standards Series now includes unified Fundamental Safety Principles, which represent an international consensus on what must constitute a high level of protection and safety. With the strong support of the Commission on Safety Standards, the IAEA is working to promote the global acceptance and use of its standards.

Standards are only effective if they are properly applied in practice. The IAEA's safety services encompass design, siting and engineering safety, operational safety, radiation safety, safe transport of radioactive material and safe management of radioactive waste, as well as governmental organization, regulatory matters and safety culture in organizations. These safety services assist Member States in the application of the standards and enable valuable experience and insights to be shared.

Regulating safety is a national responsibility, and many States have decided to adopt the IAEA's standards for use in their national regulations. For parties to the various international safety conventions, IAEA standards provide a consistent, reliable means of ensuring the effective fulfilment of obligations under the conventions. The standards are also applied by regulatory bodies and operators around the world to enhance safety in nuclear power generation and in nuclear applications in medicine, industry, agriculture and research.

Safety is not an end in itself but a prerequisite for the purpose of the protection of people in all States and of the environment — now and in the future. The risks associated with ionizing radiation must be assessed and controlled without unduly limiting the contribution of nuclear energy to equitable and sustainable development. Governments, regulatory bodies and operators everywhere must ensure that nuclear material and radiation sources are used beneficially, safely and ethically. The IAEA safety standards are designed to facilitate this, and I encourage all Member States to make use of them.



# THE IAEA SAFETY STANDARDS

## BACKGROUND

Radioactivity is a natural phenomenon and natural sources of radiation are features of the environment. Radiation and radioactive substances have many beneficial applications, ranging from power generation to uses in medicine, industry and agriculture. The radiation risks to workers and the public and to the environment that may arise from these applications have to be assessed and, if necessary, controlled.

Activities such as the medical uses of radiation, the operation of nuclear installations, the production, transport and use of radioactive material, and the management of radioactive waste must therefore be subject to standards of safety.

Regulating safety is a national responsibility. However, radiation risks may transcend national borders, and international cooperation serves to promote and enhance safety globally by exchanging experience and by improving capabilities to control hazards, to prevent accidents, to respond to emergencies and to mitigate any harmful consequences.

States have an obligation of diligence and duty of care, and are expected to fulfil their national and international undertakings and obligations.

International safety standards provide support for States in meeting their obligations under general principles of international law, such as those relating to environmental protection. International safety standards also promote and assure confidence in safety and facilitate international commerce and trade.

A global nuclear safety regime is in place and is being continuously improved. IAEA safety standards, which support the implementation of binding international instruments and national safety infrastructures, are a cornerstone of this global regime. The IAEA safety standards constitute a useful tool for contracting parties to assess their performance under these international conventions.

## THE IAEA SAFETY STANDARDS

The status of the IAEA safety standards derives from the IAEA's Statute, which authorizes the IAEA to establish or adopt, in consultation and, where appropriate, in collaboration with the competent organs of the United Nations and with the specialized agencies concerned, standards of safety for protection of health and minimization of danger to life and property, and to provide for their application.

With a view to ensuring the protection of people and the environment from harmful effects of ionizing radiation, the IAEA safety standards establish fundamental safety principles, requirements and measures to control the radiation exposure of people and the release of radioactive material to the environment, to restrict the likelihood of events that might lead to a loss of control over a nuclear reactor core, nuclear chain reaction, radioactive source or any other source of radiation, and to mitigate the consequences of such events if they were to occur. The standards apply to facilities and activities that give rise to radiation risks, including nuclear installations, the use of radiation and radioactive sources, the transport of radioactive material and the management of radioactive waste.

Safety measures and security measures<sup>1</sup> have in common the aim of protecting human life and health and the environment. Safety measures and security measures must be designed and implemented in an integrated manner so that security measures do not compromise safety and safety measures do not compromise security.

The IAEA safety standards reflect an international consensus on what constitutes a high level of safety for protecting people and the environment from harmful effects of ionizing radiation. They are issued in the IAEA Safety Standards Series, which has three categories (see Fig. 1).

### **Safety Fundamentals**

Safety Fundamentals present the fundamental safety objective and principles of protection and safety, and provide the basis for the safety requirements.

### **Safety Requirements**

An integrated and consistent set of Safety Requirements establishes the requirements that must be met to ensure the protection of people and the environment, both now and in the future. The requirements are governed by the objective and principles of the Safety Fundamentals. If the requirements are not met, measures must be taken to reach or restore the required level of safety. The format and style of the requirements facilitate their use for the establishment, in a harmonized manner, of a national regulatory framework. Requirements, including numbered ‘overarching’ requirements, are expressed as ‘shall’ statements. Many requirements are not addressed to a specific party, the implication being that the appropriate parties are responsible for fulfilling them.

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<sup>1</sup> See also publications issued in the IAEA Nuclear Security Series.

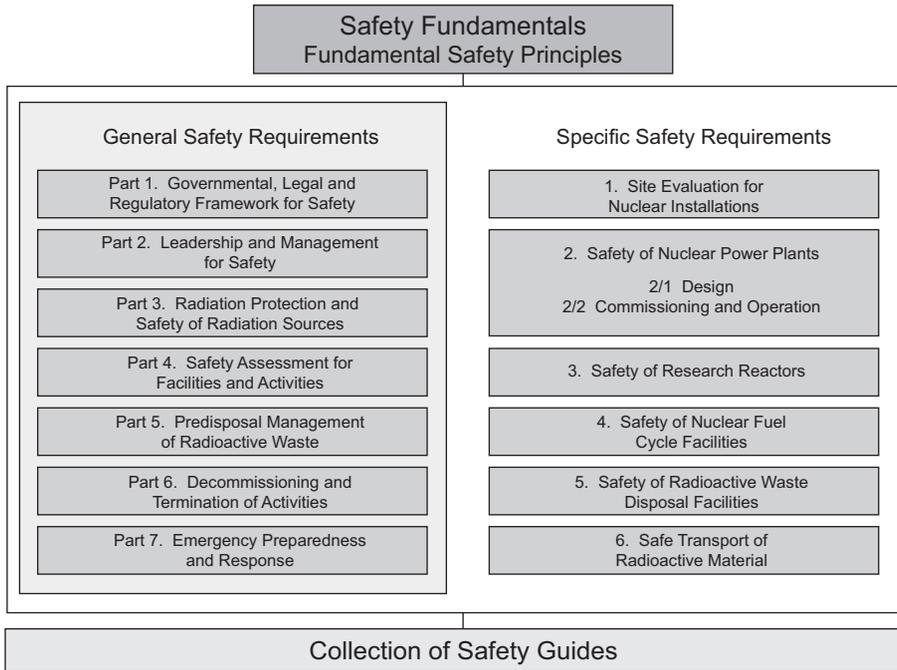


FIG. 1. The long term structure of the IAEA Safety Standards Series.

## Safety Guides

Safety Guides provide recommendations and guidance on how to comply with the safety requirements, indicating an international consensus that it is necessary to take the measures recommended (or equivalent alternative measures). The Safety Guides present international good practices, and increasingly they reflect best practices, to help users striving to achieve high levels of safety. The recommendations provided in Safety Guides are expressed as ‘should’ statements.

## APPLICATION OF THE IAEA SAFETY STANDARDS

The principal users of safety standards in IAEA Member States are regulatory bodies and other relevant national authorities. The IAEA safety standards are also used by co-sponsoring organizations and by many organizations that design, construct and operate nuclear facilities, as well as organizations involved in the use of radiation and radioactive sources.

The IAEA safety standards are applicable, as relevant, throughout the entire lifetime of all facilities and activities — existing and new — utilized for peaceful purposes and to protective actions to reduce existing radiation risks. They can be used by States as a reference for their national regulations in respect of facilities and activities.

The IAEA's Statute makes the safety standards binding on the IAEA in relation to its own operations and also on States in relation to IAEA assisted operations.

The IAEA safety standards also form the basis for the IAEA's safety review services, and they are used by the IAEA in support of competence building, including the development of educational curricula and training courses.

International conventions contain requirements similar to those in the IAEA safety standards and make them binding on contracting parties. The IAEA safety standards, supplemented by international conventions, industry standards and detailed national requirements, establish a consistent basis for protecting people and the environment. There will also be some special aspects of safety that need to be assessed at the national level. For example, many of the IAEA safety standards, in particular those addressing aspects of safety in planning or design, are intended to apply primarily to new facilities and activities. The requirements established in the IAEA safety standards might not be fully met at some existing facilities that were built to earlier standards. The way in which IAEA safety standards are to be applied to such facilities is a decision for individual States.

The scientific considerations underlying the IAEA safety standards provide an objective basis for decisions concerning safety; however, decision makers must also make informed judgements and must determine how best to balance the benefits of an action or an activity against the associated radiation risks and any other detrimental impacts to which it gives rise.

## DEVELOPMENT PROCESS FOR THE IAEA SAFETY STANDARDS

The preparation and review of the safety standards involves the IAEA Secretariat and four safety standards committees, for nuclear safety (NUSSC), radiation safety (RASSC), the safety of radioactive waste (WASSC) and the safe transport of radioactive material (TRANSSC), and a Commission on Safety Standards (CSS) which oversees the IAEA safety standards programme (see Fig. 2).

All IAEA Member States may nominate experts for the safety standards committees and may provide comments on draft standards. The membership of the Commission on Safety Standards is appointed by the Director General and

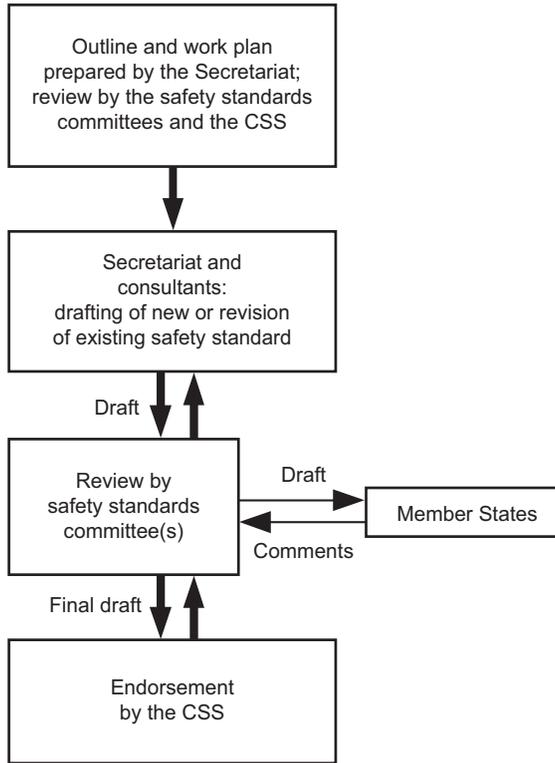


FIG. 2. The process for developing a new safety standard or revising an existing standard.

includes senior governmental officials having responsibility for establishing national standards.

A management system has been established for the processes of planning, developing, reviewing, revising and establishing the IAEA safety standards. It articulates the mandate of the IAEA, the vision for the future application of the safety standards, policies and strategies, and corresponding functions and responsibilities.

## INTERACTION WITH OTHER INTERNATIONAL ORGANIZATIONS

The findings of the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) and the recommendations of international expert bodies, notably the International Commission on Radiological Protection (ICRP), are taken into account in developing the IAEA safety standards. Some

safety standards are developed in cooperation with other bodies in the United Nations system or other specialized agencies, including the Food and Agriculture Organization of the United Nations, the United Nations Environment Programme, the International Labour Organization, the OECD Nuclear Energy Agency, the Pan American Health Organization and the World Health Organization.

## INTERPRETATION OF THE TEXT

Safety related terms are to be understood as defined in the IAEA Safety Glossary (see <http://www-ns.iaea.org/standards/safety-glossary.htm>). Otherwise, words are used with the spellings and meanings assigned to them in the latest edition of The Concise Oxford Dictionary. For Safety Guides, the English version of the text is the authoritative version.

The background and context of each standard in the IAEA Safety Standards Series and its objective, scope and structure are explained in Section 1, Introduction, of each publication.

Material for which there is no appropriate place in the body text (e.g. material that is subsidiary to or separate from the body text, is included in support of statements in the body text, or describes methods of calculation, procedures or limits and conditions) may be presented in appendices or annexes.

An appendix, if included, is considered to form an integral part of the safety standard. Material in an appendix has the same status as the body text, and the IAEA assumes authorship of it. Annexes and footnotes to the main text, if included, are used to provide practical examples or additional information or explanation. Annexes and footnotes are not integral parts of the main text. Annex material published by the IAEA is not necessarily issued under its authorship; material under other authorship may be presented in annexes to the safety standards. Extraneous material presented in annexes is excerpted and adapted as necessary to be generally useful.

## USE OF THIS PUBLICATION

There are two parts to this publication. The first part is the Schedules of Provisions of the IAEA Regulations for the Safe Transport of Radioactive Material (2009 Edition). The second part is the Schedules of Provisions of the IAEA Regulations for the Safe Transport of Radioactive Material (2005 Edition).

The first part of this publication represents a limited scope revision of the second part. Each schedule applies for a unique UN number and lists the applicable paragraphs of the 2009 Edition of the Regulations for the Safe Transport of Radioactive Material (the Transport Regulations). This part of the publication is organized according to the structure of the Transport Regulations, which has eight sections: (I) Introduction; (II) Definitions; (III) General Provisions; (IV) Activity Limits and Classification; (V) Requirements and Controls for Transport; (VI) Requirements for Radioactive Materials and for Packagings and Packages; (VII) Test Procedures; and (VIII) Approval and Administrative Requirements. No paragraph numbers for Sections II and VII of the Transport Regulations have been included, owing to the lack of significance of the changes in determining the correct package type and the appropriate operational and administrative requirements to be applied. The Schedules of Provisions of the IAEA Regulations for the Safe Transport of Radioactive Material (2009 Edition) includes three appendices which are intended to facilitate use of this publication: Appendix I on the correspondence of paragraph numbers in the 2005 Edition and the 2009 Edition of the Transport Regulations; Appendix II on the correspondence of paragraph numbers of the 2009 Edition and the 2005 Edition of the Transport Regulations; and Appendix III, providing a table of paragraph numbers versus applicable UN numbers.

The second part of this publication, the Schedules of Provisions of the IAEA Regulations for the Safe Transport of Radioactive Material (2005 Edition), has been included to facilitate the use of the first part. This part is organized according to the usual eight sections of schedules, namely: (i) general provisions; (ii) contents limits for packages; (iii) contamination; (iv) maximum radiation levels; (v) categories of packages and overpacks; (vi) marking and labelling; (vii) requirements before shipment; and (viii) provisions concerning transport operations. Users more familiar with this structure may consult the second part first, and then use the first part to confirm the paragraphs to be applied.



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# 1. INTRODUCTION

## BACKGROUND

1.1. The Regulations for the Safe Transport of Radioactive Material (IAEA Safety Standards Series No. TS-R-1, 2009 Edition [1]), hereinafter referred to as ‘the 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. Protection from harmful effects of radiation during the transport of radioactive material is achieved by means of a combination of limitations on the contents of a package according to the quantity and type of radioactivity, the package design, and certain simple handling, storage and stowage precautions that are to be followed during transport.

1.2. While some provisions of the Regulations concern administrative controls (e.g. the requirement for the carrier to apply segregation to limit the radiation level in occupied areas), reliance is placed in the main on provisions relating to the package, the responsibility for which rests primarily with the consignor of the package.

1.3. The Regulations are structured topically in terms of definitions, general provisions, activity limits and material restrictions, requirements and controls for transport, requirements for radioactive materials and for packagings and packages, test procedures, and approval and administrative requirements.

1.4. The Regulations are supplemented by Safety Guides [2–6] that provide recommendations on meeting the requirements of the Regulations.

1.5. The present Safety Guide is prepared on the basis of the Regulations. It lists the paragraph numbers of the Regulations relevant for specified types of consignment, classified according to their associated UN numbers, but does not contain any additional requirements. Details, in particular of design, construction and testing of packagings, are omitted.

1.6. Although much of the information may not apply, a user desiring to transport a particular type of consignment of radioactive material would need to study and assimilate requirements from all sections of the Regulations. This Safety Guide aims to aid such users by providing a listing of relevant requirements of the Regulations for each type of radioactive material, package or

shipment. Once a consignor has properly classified the radioactive material to be shipped (following the recommendations provided in Section 2 and Fig. 1 of this Safety Guide), the appropriate UN number can be assigned and the paragraph numbers of specific requirements for shipment can be found in the corresponding schedule.

1.7. In the event of an anomaly or a conflict between the provisions of the Regulations and this Safety Guide, the requirements in the Regulations apply. For regulatory purposes, reference should be made to the detailed provisions of the Regulations.

## OBJECTIVE

1.8. The objective of this Safety Guide is to provide information to aid users in determining the correct package type and the appropriate operational and administrative requirements to be applied.

## SCOPE

1.9. This Safety Guide can be used for all transport of radioactive material. It contains 25 schedules corresponding to the UN numbers and associated proper shipping names for the radioactive material to be shipped.

1.10. The user's attention is drawn to the fact that there may be deviations from the Regulations (exceptions, additions, etc.) necessitated by national and modal regulations and carrier restrictions, which are not reflected in this Safety Guide.

## STRUCTURE

1.11. Section 2 describes how the material is to be classified and assigned under the appropriate UN number with the associated proper shipping name. The Safety Guide contains 25 schedules corresponding to the UN number and associated proper shipping name for the radioactive material to be shipped. Each of the 25 schedules lists the relevant paragraph numbers of the 2009 Edition of the Regulations.

1.12. The changes between the 2005 Edition and the 2009 Edition of the Regulations relate mainly to formatting and structure, with some changes within existing paragraphs (i.e. the changes do not constitute a major redrafting of the text). To assist the reader, Appendices I and II set out the correspondence between paragraph numbers of the 2005 Edition and the 2009 Edition of the Regulations, and Appendix III indicates the UN numbers to which each paragraph of the 2009 Edition of the Regulations applies.

## **2. CLASSIFICATION**

2.1. This section describes how radioactive material should be classified and assigned under the appropriate UN number and associated proper shipping name.

2.2. Radioactive material is required to be assigned under one of the UN numbers specified in Table 1. The UN number assigned depends on the activity level of the radionuclides contained in the package, the fissile or non-fissile properties of these radionuclides, the type of package, and the nature or form of the radioactive contents of the package, or on whether there are special arrangements governing the transport operation.

2.3. In all cases of international transport of packages requiring approval of design or shipment by the competent authority for which different approval types apply in the different countries concerned in the shipment, the UN number, proper shipping name, categorization, labelling and marking are required to be in accordance with the certificate of the country of origin of the design.

2.4. A flow diagram for classification of radioactive material under the appropriate UN number is provided in Fig. 1 on pp. 8 and 9 to aid in the assignment process. The objective of the flow diagram is not to indicate all possible options allowed by the regulations, nor to incorporate all of the detailed requirements and limits. Rather, the diagram is to be seen as a tool to indicate the most suitable or optimized option for classification.

2.5. It is clear that it has to be verified that all of the requirements, limitations and prescriptions related to the UN number assigned can be complied with. If not, an alternative UN number will need to be assigned.

TABLE 1. UN NUMBERS AND RELATED PARAGRAPH NUMBERS OF THE REGULATIONS (2009 EDITION) [1]

UN No.	Proper shipping name	Paragraph number(s) of the Regulations [1] in which content limits and basic requirements are established
EXCEPTED PACKAGES		
2908	RADIOACTIVE MATERIAL, EXCEPTED PACKAGE — EMPTY PACKAGING	425, 515
2909	RADIOACTIVE MATERIAL, EXCEPTED PACKAGE — ARTICLES MANUFACTURED FROM NATURAL URANIUM or DEPLETED URANIUM or NATURAL THORIUM	426, 515
2910	RADIOACTIVE MATERIAL, EXCEPTED PACKAGE — LIMITED QUANTITY OF MATERIAL	424, 515
2911	RADIOACTIVE MATERIAL, EXCEPTED PACKAGE — INSTRUMENTS or ARTICLES	423(b), 515
LOW SPECIFIC ACTIVITY (LSA) MATERIAL		
2912	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-I), non-fissile or fissile-excepted	410, 411, 518(a), 518(b), 519, 520
3321	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-II), non-fissile or fissile-excepted	411, 519, 520
3322	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-III), non-fissile or fissile-excepted	410, 411, 519, 520
3324	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-II), FISSILE	410, 411, 418, 517, 519, 520
3325	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-III), FISSILE	410, 411, 418, 517, 519, 520
SURFACE CONTAMINATED OBJECTS (SCOs)		
2913	RADIOACTIVE MATERIAL, SURFACE CONTAMINATED OBJECTS (SCO-I or SCO-II), non-fissile or fissile-excepted	414, 518, 519, 520
3326	RADIOACTIVE MATERIAL, SURFACE CONTAMINATED OBJECTS (SCO-I or SCO-II), FISSILE	414, 418, 517, 519, 520

TABLE 1. UN NUMBERS AND RELATED PARAGRAPH NUMBERS OF THE REGULATIONS (2009 EDITION) [1] (cont.)

UN No.	Proper shipping name	Paragraph number(s) of the Regulations [1] in which content limits and basic requirements are established
TYPE A PACKAGES		
2915	RADIOACTIVE MATERIAL, TYPE A PACKAGE, non-special form, non-fissile or fissile-excepted	428(b), 429
3327	RADIOACTIVE MATERIAL, TYPE A PACKAGE, FISSILE, non-special form	418, 428(b), 429
3332	RADIOACTIVE MATERIAL, TYPE A PACKAGE, SPECIAL FORM, non-fissile or fissile-excepted	428(a), 429, 803, 806
3333	RADIOACTIVE MATERIAL, TYPE A PACKAGE, SPECIAL FORM, FISSILE	418, 428(a), 429, 803, 804, 812–814
TYPE B(U) PACKAGES		
2916	RADIOACTIVE MATERIAL, TYPE B(U) PACKAGE, non-fissile or fissile-excepted	431, 433, 806–808
3328	RADIOACTIVE MATERIAL, TYPE B(U) PACKAGE, FISSILE	418, 431, 433, 806(a), 807, 808
TYPE B(M) PACKAGES		
2917	RADIOACTIVE MATERIAL, TYPE B(M) PACKAGE, non-fissile or fissile-excepted	432, 433, 809–811
3329	RADIOACTIVE MATERIAL, TYPE B(M) PACKAGE, FISSILE	418, 432, 433, 809–811
TYPE C PACKAGES		
3323	RADIOACTIVE MATERIAL, TYPE C PACKAGE, non-fissile or fissile-excepted	434, 806–808
3330	RADIOACTIVE MATERIAL, TYPE C PACKAGE, FISSILE	418, 434, 806–808

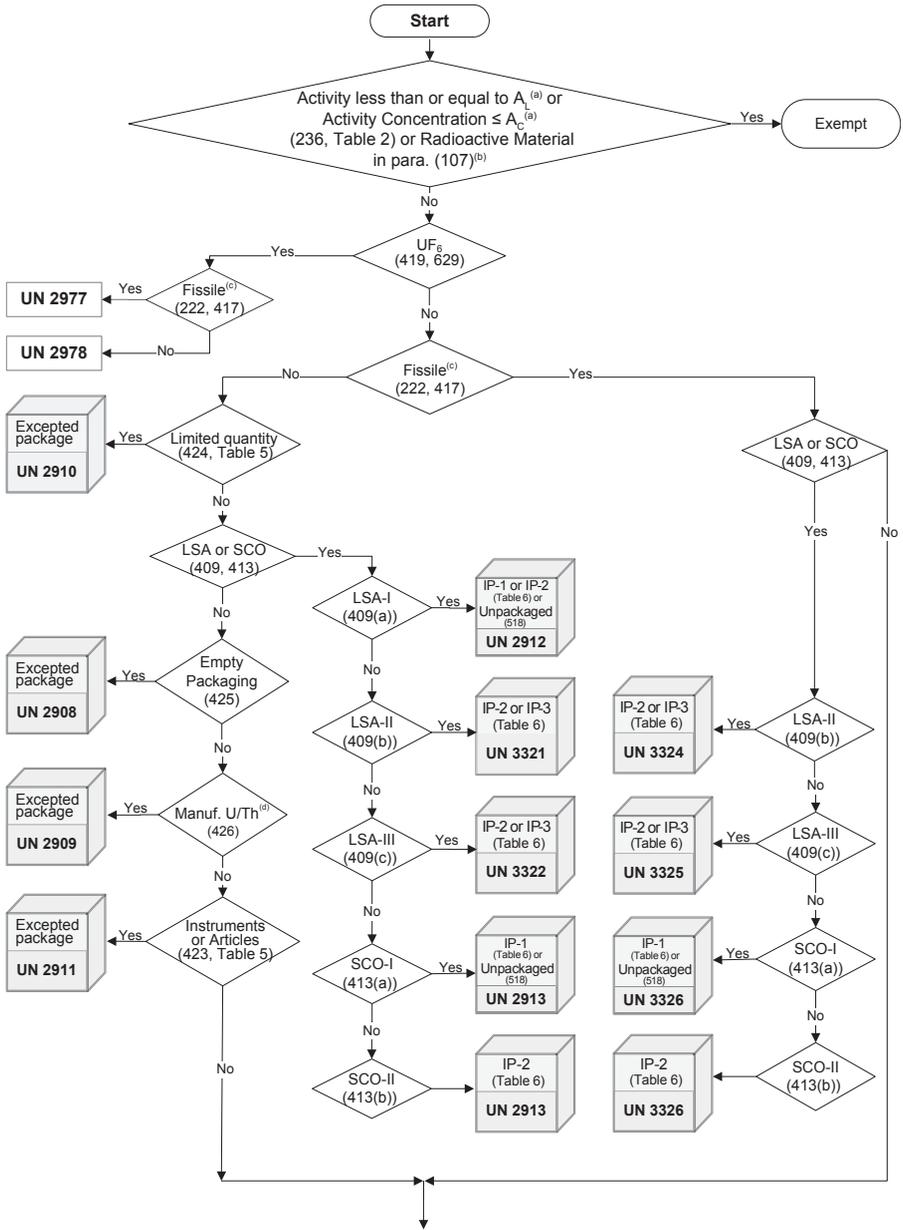
TABLE 1. UN NUMBERS AND RELATED PARAGRAPH NUMBERS OF THE REGULATIONS (2009 EDITION) [1] (cont.)

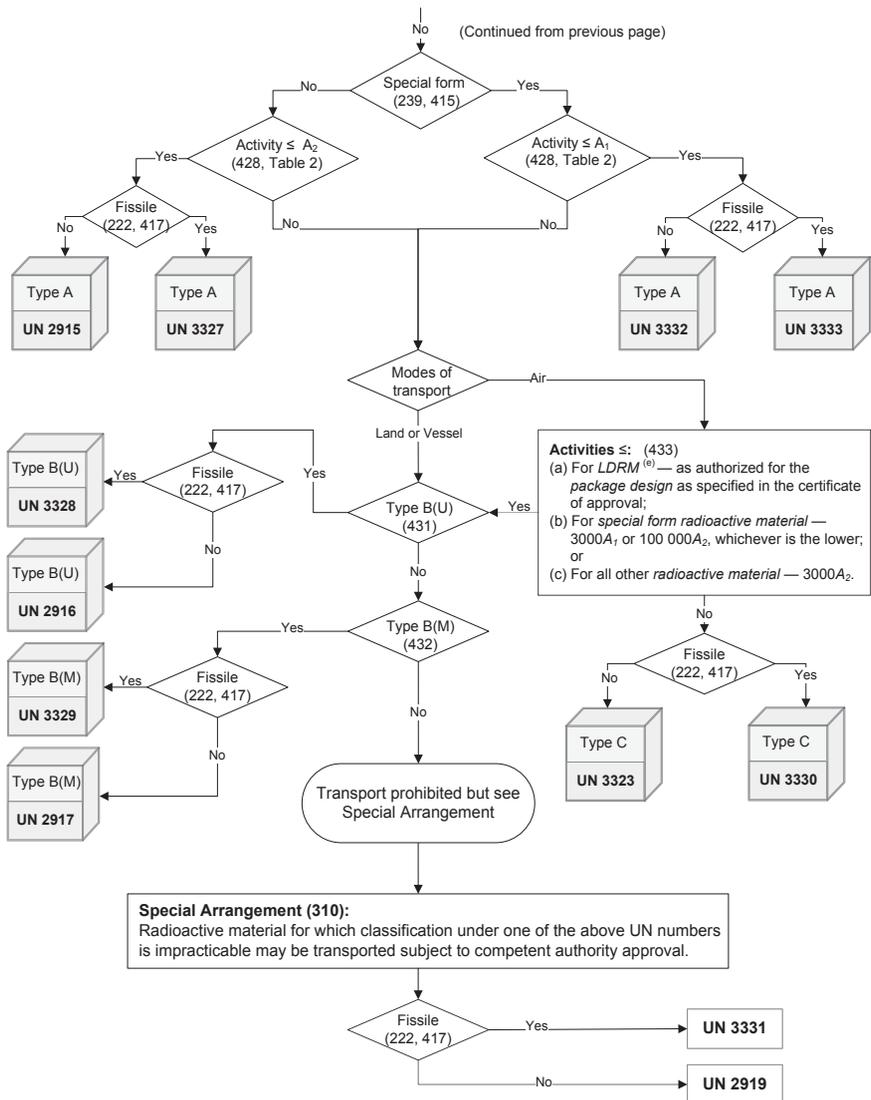
UN No.	Proper shipping name	Paragraph number(s) of the Regulations [1] in which content limits and basic requirements are established
SPECIAL ARRANGEMENT		
2919	RADIOACTIVE MATERIAL, TRANSPORTED UNDER SPECIAL ARRANGEMENT, non-fissile or fissile-excepted	310, 824–826
3331	RADIOACTIVE MATERIAL, TRANSPORTED UNDER SPECIAL ARRANGEMENT, FISSILE	310, 824–826
URANIUM HEXAFLUORIDE		
2977	RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE, FISSILE	418–420, 805
2978	RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE, non-fissile or fissile-excepted	419, 420, 805

2.6. It is possible that for specific cases more than one UN number may be appropriate. In such cases, the choice of UN number is left to the operator or consignor. Two examples of such situations are set out in the following:

- (1) Some radioactive material may meet the criteria for both ‘limited quantity’ and ‘LSA (low specific activity) or SCO (surface contaminated object)’. If the radioactive material is not fissile, following the route of the diagram, the first decision box encountered is ‘limited quantity’. If this option is selected, the material could be classified as UN 2910 (limited quantity of material in excepted package). This option has minimal administrative burden and requirements for the package, but the activity of such an excepted package is required to be very low. However, this is not the only option for the package. Rather, the choice may be made to proceed to the decision box ‘LSA or SCO’. The material will now be classified as LSA or SCO (depending on the case) and can be shipped unpackaged in a larger amount as LSA-I or SCO-I without the restriction on the activity limit that is a requirement for excepted packages. However, the option ‘LSA or SCO’ may incur a higher administrative burden that will need to be considered.

- (2) If the amount of LSA material is such that the radiation level at 3 m from the unshielded material is not lower than 10 mSv/h, then the consignor has the choice of limiting the amount of LSA material per package accordingly and classifying the package as an industrial package (IP), or using a Type B package and assigning it under the appropriate UN number according to the choice made.





<sup>(a)</sup>  $A_1$ : Activity limit for an exempt consignment in table 2 of the Regulations;  
 $A_2$ : Activity concentration for exempt material in table 2 of the Regulations.

<sup>(b)</sup> The number in ( ): The paragraph number or table of the Regulations.

<sup>(c)</sup> Fissile excepted by para. 417 should be treated as "No".

<sup>(d)</sup> Manuf. U/Th: Articles manufactured from natural uranium or depleted uranium or natural thorium.

<sup>(e)</sup> LDRM: Low dispersible radioactive material.

FIG. 1. Flow diagram for classification of radioactive material under the appropriate UN number; in accordance with the 2009 Edition of the Regulations [1].

SCHEDULE FOR UN 2908

RADIOACTIVE MATERIAL, EXCEPTED PACKAGE —  
EMPTY PACKAGING

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Section	Paragraph number(s) of the 2009 Edition of the Regulations [1]
Section I INTRODUCTION	109, 110
Section III GENERAL PROVISIONS	301–309, 311–315
Section IV ACTIVITY LIMITS AND CLASSIFICATION	No relevant requirements
Section V REQUIREMENTS AND CONTROLS FOR TRANSPORT	506, 507, 510, 515, 528–531, 544(a), 576, 577 Table 10
Section VI REQUIREMENTS FOR RADIOACTIVE MATERIALS AND FOR PACKAGINGS AND PACKAGES	606–619, 634
Section VIII APPROVAL AND ADMINISTRATIVE REQUIREMENTS	801, 815

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## SCHEDULE FOR UN 2909

### RADIOACTIVE MATERIAL, EXCEPTED PACKAGE — ARTICLES MANUFACTURED FROM NATURAL URANIUM OR DEPLETED URANIUM OR NATURAL THORIUM

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Section	Paragraph number(s) of the 2009 Edition of the Regulations [1]
Section I INTRODUCTION	109, 110
Section III GENERAL PROVISIONS	301–309, 311–315
Section IV ACTIVITY LIMITS AND CLASSIFICATION	No relevant requirements
Section V REQUIREMENTS AND CONTROLS FOR TRANSPORT	506, 507, 510, 515, 528–531, 544(a), 576, 577 Table 10
Section VI REQUIREMENTS FOR RADIOACTIVE MATERIALS AND FOR PACKAGINGS AND PACKAGES	606–619
Section VIII APPROVAL AND ADMINISTRATIVE REQUIREMENTS	801, 815

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## SCHEDULE FOR UN 2910

### RADIOACTIVE MATERIAL, EXCEPTED PACKAGE — LIMITED QUANTITY OF MATERIAL

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Section	Paragraph number(s) of the 2009 Edition of the Regulations [1]
Section I INTRODUCTION	109, 110
Section III GENERAL PROVISIONS	301–309, 311–315
Section IV ACTIVITY LIMITS AND CLASSIFICATION	No relevant requirements
Section V REQUIREMENTS AND CONTROLS FOR TRANSPORT	506, 507, 510, 515, 528–531, 544(a), 576, 577 Table 10
Section VI REQUIREMENTS FOR RADIOACTIVE MATERIALS AND FOR PACKAGINGS AND PACKAGES	606–619, 634
Section VIII APPROVAL AND ADMINISTRATIVE REQUIREMENTS	801, 802(e), 815

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## SCHEDULE FOR UN 2911

### RADIOACTIVE MATERIAL, EXCEPTED PACKAGE — INSTRUMENTS OR ARTICLES

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Section	Paragraph number(s) of the 2009 Edition of the Regulations [1]
Section I INTRODUCTION	109, 110
Section III GENERAL PROVISIONS	301–309, 311–315
Section IV ACTIVITY LIMITS AND CLASSIFICATION	No relevant requirements
Section V REQUIREMENTS AND CONTROLS FOR TRANSPORT	506, 507, 510, 515, 528–531, 544(a), 576, 577 Table 10
Section VI REQUIREMENTS FOR RADIOACTIVE MATERIALS AND FOR PACKAGINGS AND PACKAGES	606–619, 634
Section VIII APPROVAL AND ADMINISTRATIVE REQUIREMENTS	801, 802(e), 815

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## SCHEDULE FOR UN 2912

### RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-I), non-fissile or fissile-excepted

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Section	Paragraph number(s) of the 2009 Edition of the Regulations [1]
Section I INTRODUCTION	109, 110
Section III GENERAL PROVISIONS	301–309, 311–315
Section IV ACTIVITY LIMITS AND CLASSIFICATION	411
Section V REQUIREMENTS AND CONTROLS FOR TRANSPORT	501(a), 502(a), 502(b), 503–513, 516, 518(a), 518(b), 519–522, 524–526, 527(a)–527(c), 528–531, 532(a)–532(c), 535–538, 541–543, 544(a)–544(h), 544(k), 544(l), 545–552, 559–562, 563(b), 564, 567–575, 578, 579 Tables 7–11 Figs 2–4, Fig. 6, Fig. 7
Section VI REQUIREMENTS FOR RADIOACTIVE MATERIALS AND FOR PACKAGINGS AND PACKAGES	606–619, 624–628, 634
Section VIII APPROVAL AND ADMINISTRATIVE REQUIREMENTS	801, 802(d), 802(e), 815, 820(d)

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## SCHEDULE FOR UN 2913

### RADIOACTIVE MATERIAL, SURFACE CONTAMINATED OBJECTS (SCO-I OR SCO-II), non-fissile or fissile-excepted

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Section	Paragraph number(s) of the 2009 Edition of the Regulations [1]
Section I INTRODUCTION	109, 110
Section III GENERAL PROVISIONS	301–309, 311–315
Section IV ACTIVITY LIMITS AND CLASSIFICATION	414
Section V REQUIREMENTS AND CONTROLS FOR TRANSPORT	501(a), 502(a), 502(b), 503–513, 516, 518–522, 524–526, 527(a)–527(c), 528–531, 532(a)–532(c), 535–538, 541–543, 544(a)–544(h), 544(k)–544(m), 545–552, 559–562, 563(a), 563(b), 564, 567–575, 578, 579 Tables 7–11 Figs 2–4, Fig. 6, Fig. 7
Section VI REQUIREMENTS FOR RADIOACTIVE MATERIALS AND FOR PACKAGINGS AND PACKAGES	606–619, 622, 624–628, 634
Section VIII APPROVAL AND ADMINISTRATIVE REQUIREMENTS	801, 802(d), 815, 820(d)

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## SCHEDULE FOR UN 2915

### RADIOACTIVE MATERIAL, TYPE A PACKAGE, non-special form, non-fissile or fissile-excepted

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Section	Paragraph number(s) of the 2009 Edition of the Regulations [1]
Section I INTRODUCTION	109, 110
Section III GENERAL PROVISIONS	301–309, 311–315
Section IV ACTIVITY LIMITS AND CLASSIFICATION	428(b), 429
Section V REQUIREMENTS AND CONTROLS FOR TRANSPORT	501(a), 502(a), 502(b), 503–512, 521, 522, 524–526, 527(a)–527(c), 528–531, 532(b), 532(c), 536–538, 541–543, 544(a)–544(h), 544(k), 544(l), 545–552, 559–562, 563(a), 563(b), 564, 567–575, 578, 579 Tables 8–11 Figs 2–4, Fig. 6, Fig. 7
Section VI REQUIREMENTS FOR RADIOACTIVE MATERIALS AND FOR PACKAGINGS AND PACKAGES	606–619, 634–639, 641–645, 646(a), 646(b), 647–649
Section VIII APPROVAL AND ADMINISTRATIVE REQUIREMENTS	801, 802(d), 802(e), 815, 820(d)

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## SCHEDULE FOR UN 2916

### RADIOACTIVE MATERIAL, TYPE B(U) PACKAGE, non-fissile or fissile-excepted

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Section	Paragraph number(s) of the 2009 Edition of the Regulations [1]
Section I INTRODUCTION	109, 110
Section III GENERAL PROVISIONS	301–309, 311–315
Section IV ACTIVITY LIMITS AND CLASSIFICATION	No relevant requirements
Section V REQUIREMENTS AND CONTROLS FOR TRANSPORT	501(a), 501(b), 502(a)–502(f), 502(h), 503–512, 521, 522, 524–526, 527(a), 527(c), 528–531, 533(a)–533(c), 534, 536–538, 541–543, 544(a)–544(h), 544(j)–544(l), 545–554, 555(b), 556–562, 563(a), 563(b), 564, 567–575, 578, 579 Tables 8–11 Figs 1–4, Fig. 6, Fig. 7
Section VI REQUIREMENTS FOR RADIOACTIVE MATERIALS AND FOR PACKAGINGS AND PACKAGES	602–619, 634–645, 646(b), 647, 651–664 Table 13
Section VIII APPROVAL AND ADMINISTRATIVE REQUIREMENTS	802(a)(i), 802(a)(ii), 802(a)(v), 802(d), 802(e), 803, 804, 806(b), 807, 808, 816–819, 820(d), 821, 827–830, 833

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## SCHEDULE FOR UN 2917

### RADIOACTIVE MATERIAL, TYPE B(M) PACKAGE, non-fissile or fissile-excepted

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Section	Paragraph number(s) of the 2009 Edition of the Regulations [1]
Section I INTRODUCTION	109, 110
Section III GENERAL PROVISIONS	301–309, 311–315
Section IV ACTIVITY LIMITS AND CLASSIFICATION	432, 433
Section V REQUIREMENTS AND CONTROLS FOR TRANSPORT	501(a), 501(b), 502(a)–502(f), 502(h), 503–512, 521, 522, 524–526, 527(a), 527(c), 528–531, 533(a)–533(c), 534, 536–538, 541–543, 544(a)–544(h), 544(j)–544(l), 545–554, 555(c), 556–562, 563(a), 563(b), 564, 567–575, 578, 579 Tables 8–11 Figs 1–4, Fig. 6, Fig. 7
Section VI REQUIREMENTS FOR RADIOACTIVE MATERIALS AND FOR PACKAGINGS AND PACKAGES	602–619, 634–645, 646(b), 647, 651–666 Table 13
Section VIII APPROVAL AND ADMINISTRATIVE REQUIREMENTS	802(a)(i), 802(a)(ii), 802(a)(v), 802 (c)–802(e), 803, 804, 807, 809–811, 816–819, 820(a), 820(b), 820(d), 821–823, 827–830, 832–834

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## SCHEDULE FOR UN 2919

### RADIOACTIVE MATERIAL, TRANSPORTED UNDER SPECIAL ARRANGEMENT, non-fissile or fissile-excepted

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Section	Paragraph number(s) of the 2009 Edition of the Regulations [1]
Section I INTRODUCTION	109, 110
Section III GENERAL PROVISIONS	301–315
Section IV ACTIVITY LIMITS AND CLASSIFICATION	No relevant requirements
Section V REQUIREMENTS AND CONTROLS FOR TRANSPORT	501(a), 502(b), 503–512, 521, 522, 524–526, 527(d), 527(e), 528–531, 536–538, 541–543, 544(a)–544(h), 544(j)–544(l), 545–553, 555(d), 556–562, 563(a), 563(b), 564, 567–575, 578, 579 Fig. 4, Fig. 6, Fig. 7 Tables 8–11
Section VI REQUIREMENTS FOR RADIOACTIVE MATERIALS AND FOR PACKAGINGS AND PACKAGES	602–619, 629–632, 634–645, 646(a), 646(b), 647–649, 651–656, 657(a), 657(b)(i), 657(b)(ii), 658–666, 668–670 Table 13
Section VIII APPROVAL AND ADMINISTRATIVE REQUIREMENTS	802(b), 802(d), 802(e), 824–831, 834

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## SCHEDULE FOR UN 2977

### RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE, FISSILE

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Section	Paragraph number(s) of the 2009 Edition of the Regulations [1]
Section I INTRODUCTION	109, 110
Section III GENERAL PROVISIONS	301–309, 311–315
Section IV ACTIVITY LIMITS AND CLASSIFICATION	418, 420
Section V REQUIREMENTS AND CONTROLS FOR TRANSPORT	501, 502(a)–502(e), 502(g), 503–512, 521–526, 527(a), 527(c), 528–533, 536–554, 558–575, 578, 579 Figs 2–7 Tables 8–12
Section VI REQUIREMENTS FOR RADIOACTIVE MATERIALS AND FOR PACKAGINGS AND PACKAGES	606–619, 622, 624–632, 634–639, 641–645, 646(a), 646(b), 647, 651–656, 657(a), 657(b)(i), 657(b)(ii), 658–666, 668–676, 677(a), 677(b), 678–683 Table 13
Section VIII APPROVAL AND ADMINISTRATIVE REQUIREMENTS	802(a)(iii), 802(a)(iv), 802(c), 802(d), 805, 806(a), 806(b), 807–817, 819, 820(c), 820(d), 821–823, 828, 829, 832–834

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## SCHEDULE FOR UN 2978

### RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE, non-fissile or fissile-excepted

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Section	Paragraph number(s) of the 2009 Edition of the Regulations [1]
Section I INTRODUCTION	109, 110
Section III GENERAL PROVISIONS	301–309, 311–315
Section IV ACTIVITY LIMITS AND CLASSIFICATION	420
Section V REQUIREMENTS AND CONTROLS FOR TRANSPORT	501(a), 501(b), 502(a)–502(c), 503–512, 521, 522, 524–526, 527(a), 527(c), 528–531, 532, 533, 536–538, 541–543, 544(a)–544(h), 544(j)–544(m), 545–554, 558–562, 563(a), 563(b), 564, 567–575, 578, 579 Figs 2–4, Fig. 6, Fig. 7 Tables 8–11
Section VI REQUIREMENTS FOR RADIOACTIVE MATERIALS AND FOR PACKAGINGS AND PACKAGES	606–619, 622, 624–632, 634, 635–639, 641–645, 646(a), 646(b), 647, 651–656, 657(a), 657(b)(i), 657(b)(ii), 658–666, 668–670 Table 13
Section VIII APPROVAL AND ADMINISTRATIVE REQUIREMENTS	801, 802(a)(iii), 802(d), 805, 806(a), 806(b), 807–811, 815–817, 819, 820(d), 827–829, 833, 834

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## SCHEDULE FOR UN 3321

### RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-II), non-fissile or fissile-excepted

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Section	Paragraph number(s) of the 2009 Edition of the Regulations [1]
Section I INTRODUCTION	109, 110
Section III GENERAL PROVISIONS	301–309, 311–315
Section IV ACTIVITY LIMITS AND CLASSIFICATION	410
Section V REQUIREMENTS AND CONTROLS FOR TRANSPORT	501(a), 502(a), 502(b), 503–512, 516, 520–522, 524–526, 527(a)–527(c), 528–531, 532(a)–532(c), 536–538, 541–543, 544(a)–544(h), 544 (k)–544(m), 545–552, 559–562, 563(a), 563(b), 564, 567–575, 578, 579 Tables 7–11 Figs 2–4, Fig. 6, Fig. 7
Section VI REQUIREMENTS FOR RADIOACTIVE MATERIALS AND FOR PACKAGINGS AND PACKAGES	606–619, 622, 624–628, 634–639, 641–645, 646(a), 646(b), 647
Section VIII APPROVAL AND ADMINISTRATIVE REQUIREMENTS	801, 802(d), 802(e), 815, 820(d)

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## SCHEDULE FOR UN 3322

### RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-III), non-fissile or fissile-excepted

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Section	Paragraph number(s) of the 2009 Edition of the Regulations [1]
Section I INTRODUCTION	109, 110
Section III GENERAL PROVISIONS	301–309, 311–315
Section IV ACTIVITY LIMITS AND CLASSIFICATION	410
Section V REQUIREMENTS AND CONTROLS FOR TRANSPORT	501(a), 502(a), 502(b), 503–512, 516, 520, 521(a)–521(c), 522, 524–526, 527(a)–527(c), 528–531, 532(a)–532(c), 536–538, 541–543, 544(a)–544(h), 544(k)–544(m), 545–552, 559–562, 563(a), 563(b), 564, 567–575, 578, 579 Tables 7–11, Footnote (a) of Table 11 Figs 2–4, Fig. 6, Fig. 7
Section VI REQUIREMENTS FOR RADIOACTIVE MATERIALS AND FOR PACKAGINGS AND PACKAGES	601, 606–619, 622, 624–628, 634–639, 641–645, 646(a), 646(b), 647
Section VIII APPROVAL AND ADMINISTRATIVE REQUIREMENTS	801, 802(d), 802(e), 815, 820(d)

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## SCHEDULE FOR UN 3323

### RADIOACTIVE MATERIAL, TYPE C PACKAGE, non-fissile or fissile-excepted

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Section	Paragraph number(s) of the 2009 Edition of the Regulations [1]
Section I INTRODUCTION	109, 110
Section III GENERAL PROVISIONS	301–309, 311–315
Section IV ACTIVITY LIMITS AND CLASSIFICATION	434
Section V REQUIREMENTS AND CONTROLS FOR TRANSPORT	501(a), 501(b), 502(a)–502(f), 502(h), 503–512, 521, 522, 524–526, 527(a), 527(c), 528–531, 533(d), 534, 536–538, 541–543, 544(a)–544(h), 544(j)–544(l), 545–554, 555(a), 556–562, 563(a), 563(b), 564, 567–575, 578, 579 Tables 8–11 Figs 1–4, Fig. 6, Fig. 7
Section VI REQUIREMENTS FOR RADIOACTIVE MATERIALS AND FOR PACKAGINGS AND PACKAGES	602–619, 634–645, 646(b), 647, 651–655, 657(b), 659–664, 668–670 Table 13
Section VIII APPROVAL AND ADMINISTRATIVE REQUIREMENTS	802(a)(i), 802(a)(ii), 802(a)(vi), 802(d), 802(e), 803, 804, 807, 808, 816–819, 820(d), 821, 827–829, 830, 833

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SCHEDULE FOR UN 3324

RADIOACTIVE MATERIAL,  
LOW SPECIFIC ACTIVITY (LSA-II), FISSILE

Section	Paragraph number(s) of the 2009 Edition of the Regulations [1]
Section I INTRODUCTION	109, 110
Section III GENERAL PROVISIONS	301–309, 311–315
Section IV ACTIVITY LIMITS AND CLASSIFICATION	410, 418
Section V REQUIREMENTS AND CONTROLS FOR TRANSPORT	501, 502(a)–502(c), 502(g), 503–512, 516, 520, 521, 522–526, 527(a)–527(c), 528–531, 532(a), 532(c), 533, 536–543, 544–554, 558–562, 563–575, 578, 579 Tables 7–12 Figs 2–7
Section VI REQUIREMENTS FOR RADIOACTIVE MATERIALS AND FOR PACKAGINGS AND PACKAGES	606–619, 622, 624–628, 634–639, 641, 642–645, 646(a), 646(b), 647, 671–675, 676, 677(a), 678–683
Section VIII APPROVAL AND ADMINISTRATIVE REQUIREMENTS	802(a)(iv), 802(c)–802(e), 812–814, 816, 817, 819, 820(c), 820(d), 821–823, 827–829, 832, 833(a)–833(n), 833(q)–833(w), 834

SCHEDULE FOR UN 3325

RADIOACTIVE MATERIAL,  
LOW SPECIFIC ACTIVITY (LSA-III), FISSILE

Section	Paragraph number(s) of the 2009 Edition of the Regulations [1]
Section I INTRODUCTION	109, 110
Section III GENERAL PROVISIONS	301–309, 311–315
Section IV ACTIVITY LIMITS AND CLASSIFICATION	410, 418
Section V REQUIREMENTS AND CONTROLS FOR TRANSPORT	501, 502(a)–502(c), 502(g), 503–512, 516, 520, 521–526, 527(a)–527(c), 528–531, 532(a), 532(c), 533, 536–554, 558–575, 578, 579 Tables 7–12 Figs 2–7
Section VI REQUIREMENTS FOR RADIOACTIVE MATERIALS AND FOR PACKAGINGS AND PACKAGES	601, 606–619, 622, 624–628, 634–639, 641–645, 646(a), 646(b), 647, 671–676, 677(a), 678–683
Section VIII APPROVAL AND ADMINISTRATIVE REQUIREMENTS	802(a)(iv), 802(c)–802(e), 812–814, 816, 817, 819, 820(c), 820(d), 821–823, 827–829, 832, 833(a)–833(n), 833(q)–833(w), 834

## SCHEDULE FOR UN 3326

### RADIOACTIVE MATERIAL, SURFACE CONTAMINATED OBJECTS (SCO-I OR SCO-II), FISSILE

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Section	Paragraph number(s) of the 2009 Edition of the Regulations [1]
Section I INTRODUCTION	109, 110
Section III GENERAL PROVISIONS	301–309, 311–315
Section IV ACTIVITY LIMITS AND CLASSIFICATION	418
Section V REQUIREMENTS AND CONTROLS FOR TRANSPORT	501, 502(a)–502(c), 502(g), 503–513, 516, 518, 520, 521(a)–521(c), 522–526, 527(a)–527(c), 528–531, 532(a)–532(c), 533, 535–554, 558–575, 578, 579 Tables 7–12 Figs 2–7
Section VI REQUIREMENTS FOR RADIOACTIVE MATERIALS AND FOR PACKAGINGS AND PACKAGES	606–619, 622, 624–628, 634, 635, 671–676, 677(a), 678–683
Section VIII APPROVAL AND ADMINISTRATIVE REQUIREMENTS	802(a)(iv), 802(c), 802(d), 812–814, 816, 817, 819, 820(c), 820(d), 821–823, 827–829, 832, 833(a)–833(n), 833(q)–833(w), 834

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## SCHEDULE FOR UN 3327

### RADIOACTIVE MATERIAL, TYPE A PACKAGE, FISSILE, non-special form

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Section	Paragraph number(s) of the 2009 Edition of the Regulations [1]
Section I INTRODUCTION	109, 110
Section III GENERAL PROVISIONS	301–309, 311–315
Section IV ACTIVITY LIMITS AND CLASSIFICATION	418, 429
Section V REQUIREMENTS AND CONTROLS FOR TRANSPORT	501, 502(a)–502(c), 502(g), 503–512, 521–526, 527(a), 527(c), 528–531, 532(b), 532(c), 533, 536–543, 544(a)–544(l), 545–554, 558–575, 578, 579 Tables 8–12 Figs 2–7
Section VI REQUIREMENTS FOR RADIOACTIVE MATERIALS AND FOR PACKAGINGS AND PACKAGES	606–619, 634–639, 641–645, 646(a), 646(b), 647–649, 671–676, 677(a), 678–683
Section VIII APPROVAL AND ADMINISTRATIVE REQUIREMENTS	802(a)(iv), 802(c)–802(e), 812–814, 816, 817, 819, 820(c), 820(d), 821–823, 827–829, 832, 833(a)–833(n), 833(q)–833(w), 834

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## SCHEDULE FOR UN 3328

### RADIOACTIVE MATERIAL, TYPE B(U) PACKAGE, FISSILE

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Section	Paragraph number(s) of the 2009 Edition of the Regulations [1]
Section I INTRODUCTION	109, 110
Section III GENERAL PROVISIONS	301–309, 311–315
Section IV ACTIVITY LIMITS AND CLASSIFICATION	418
Section V REQUIREMENTS AND CONTROLS FOR TRANSPORT	501–512, 521–526, 527(a), 527(c), 528–531, 533(c), 534, 536–543, 544(a)–544(l), 545–554, 555(b), 556–575, 578, 579 Tables 8–12 Figs 1–7
Section VI REQUIREMENTS FOR RADIOACTIVE MATERIALS AND FOR PACKAGINGS AND PACKAGES	602–619, 634–645, 646(b), 647, 651–656, 657(a), 657(b)(i), 657(b)(ii), 658–664, 671–676, 677(a), 678–683 Table 13
Section VIII APPROVAL AND ADMINISTRATIVE REQUIREMENTS	802(a)(i), 802(a)(ii), 802(a)(iv), 802(a)(v), 802(c)–802(e), 803, 804, 806(a), 806(b), 807, 808, 812–814, 816–819, 820(c), 820(d), 821–823, 827–830, 832, 833(a)–833(n), 833(q)–833(w), 834

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## SCHEDULE FOR UN 3329

### RADIOACTIVE MATERIAL, TYPE B(M) PACKAGE, FISSILE

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Section	Paragraph number(s) of the 2009 Edition of the Regulations [1]
Section I INTRODUCTION	109, 110
Section III GENERAL PROVISIONS	301–309, 311–315
Section IV ACTIVITY LIMITS AND CLASSIFICATION	418
Section V REQUIREMENTS AND CONTROLS FOR TRANSPORT	501–512, 521(a), 521(b), 521–526, 527(a), 527(c), 528–531, 533(c), 534, 536–543, 544(a)–544(l), 545–554, 555(c), 556–575, 578, 579 Tables 8–12 Figs 1–7
Section VI REQUIREMENTS FOR RADIOACTIVE MATERIALS AND FOR PACKAGINGS AND PACKAGES	602–619, 634–645, 646(b), 647, 651–656, 657(a), 657(b)(i), 657(b)(ii), 658–666, 671–676, 677(a), 678–683 Table 13
Section VIII APPROVAL AND ADMINISTRATIVE REQUIREMENTS	802(a)(i), 802(a)(ii), 802(a)(iv), 802(a)(v), 802(c)–802(e), 803, 804, 807, 809–814, 816–823, 827–830, 832, 834

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## SCHEDULE FOR UN 3330

### RADIOACTIVE MATERIAL, TYPE C PACKAGE, FISSILE

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Section	Paragraph number(s) of the 2009 Edition of the Regulations [1]
Section I INTRODUCTION	109, 110
Section III GENERAL PROVISIONS	301–309, 311–315
Section IV ACTIVITY LIMITS AND CLASSIFICATION	418, 434
Section V REQUIREMENTS AND CONTROLS FOR TRANSPORT	501–512, 521–526, 527(a), 527(c), 528–531, 533(d), 534, 536–543, 544(a)–544(l), 545–554, 555(a), 556–575, 578, 579 Tables 8–12 Figs 1–7
Section VI REQUIREMENTS FOR RADIOACTIVE MATERIALS AND FOR PACKAGINGS AND PACKAGES	602–619, 634–645, 646(b), 647, 651–655, 657(b), 659–664, 668–676, 677(a), 678–683 Table 13
Section VIII APPROVAL AND ADMINISTRATIVE REQUIREMENTS	802(a)(i), 802(a)(ii), 802(a)(iv), 802(a)(vi), 802(c)–802(e), 803, 804, 806(a), 807, 808, 812–814, 816–819, 820(c), 820(d), 821–823, 827–830, 832, 833(a)–833(n), 833(q)–833(w), 834

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## SCHEDULE FOR UN 3331

### RADIOACTIVE MATERIAL, TRANSPORTED UNDER SPECIAL ARRANGEMENT, FISSILE

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Section	Paragraph number(s) of the 2009 Edition of the Regulations [1]
Section I INTRODUCTION	109, 110
Section III GENERAL PROVISIONS	301–315
Section IV ACTIVITY LIMITS AND CLASSIFICATION	418
Section V REQUIREMENTS AND CONTROLS FOR TRANSPORT	501(a), 501(c), 502(b), 502(g), 503–512, 521–526, 527(d), 527(e), 528–531, 536–543, 544(a)–544(l), 545–553, 555(d), 556–575, 578, 579 Figs 4–7 Tables 8–12
Section VI REQUIREMENTS FOR RADIOACTIVE MATERIALS AND FOR PACKAGINGS AND PACKAGES	602–619, 629–632, 634–645, 646(a), 646(b), 647–649, 651–666, 668–676, 677(a), 677(b), 678–683 Table 13
Section VIII APPROVAL AND ADMINISTRATIVE REQUIREMENTS	802(b), 802(d), 802(e), 812–814, 820(c), 824–829, 831, 833, 834

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## SCHEDULE FOR UN 3332

### RADIOACTIVE MATERIAL, TYPE A PACKAGE, SPECIAL FORM, non-fissile or fissile-excepted

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Section	Paragraph number(s) of the 2009 Edition of the Regulations [1]
Section I INTRODUCTION	109, 110
Section III GENERAL PROVISIONS	301–309, 311–315
Section IV ACTIVITY LIMITS AND CLASSIFICATION	429
Section V REQUIREMENTS AND CONTROLS FOR TRANSPORT	501(a), 502(a), 502(b), 502(f), 503–512, 521, 522, 524–526, 527(a), 527(c), 528–531, 532(b), 532(c), 536–538, 541–543, 544(a)–544(h), 544(j)–544(l), 545–553, 558–562, 563(a), 563(b), 564, 567–575, 578, 579 Tables 8–11 Figs 2–4, Figs 6–7
Section VI REQUIREMENTS FOR RADIOACTIVE MATERIALS AND FOR PACKAGINGS AND PACKAGES	602–604, 606–619, 634–645, 646(a), 646(b), 647–649
Section VIII APPROVAL AND ADMINISTRATIVE REQUIREMENTS	801, 802(a)(i), 802(d), 802(e), 803, 804, 815, 818, 820(d), 827–830

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## SCHEDULE FOR UN 3333

### RADIOACTIVE MATERIAL, TYPE A PACKAGE, SPECIAL FORM, FISSILE

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Section	Paragraph number(s) of the 2009 Edition of the Regulations [1]
Section I INTRODUCTION	109, 110
Section III GENERAL PROVISIONS	301–309, 311–315
Section IV ACTIVITY LIMITS AND CLASSIFICATION	418, 429
Section V REQUIREMENTS AND CONTROLS FOR TRANSPORT	501, 502(a)–502(c), 502(f), 502(g), 503–512, 521–526, 527(a)–527(c), 528–531, 532(b), 532(c), 533, 536–543, 544(a)–544(l), 545–554, 558–575, 578, 579 Tables 8–12 Figs 2–7
Section VI REQUIREMENTS FOR RADIOACTIVE MATERIALS AND FOR PACKAGINGS AND PACKAGES	602–604, 606–619, 634–645, 646(a), 646(b), 647–649, 671–676, 677(a), 678–683
Section VIII APPROVAL AND ADMINISTRATIVE REQUIREMENTS	802(a)(i), 802(a)(iv), 802(c)–802(e), 803, 804, 812–814, 816–819, 820(c), 820(d), 821–823, 827–830, 832, 833(a)–833(n), 833(q)–833(w), 834

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## Appendix I

### CORRESPONDENCE OF PARAGRAPH NUMBERS IN THE 2005 EDITION<sup>a</sup> ('OLD') AND THE 2009 EDITION ('NEW') OF THE REGULATIONS [1]

Para. No. in 2005	Para. No. in 2009	Remarks	Para. No. in 2005	Para. No. in 2009	Remarks
101	101	Editorial	209	209	
102	102	Editorial	210	210	Substantive
103	103		211	211	
104	104	Substantive	212	212	
105	105	Substantive	213	213	
106	106	Editorial	214	214	
107	107	Editorial	215	215	
108	108		216	216	
109	110	Substantive	217	217	
110	111	Editorial	218	218	
201	201		219	219	
202	202		220	220	
203	203	Substantive	221	221	
204	204	Substantive	222	222	Substantive
205	205		223	223	Editorial
206	206	Editorial	224	224	Substantive
207	207	Substantive	225	225	
208	208				

*For footnote, see end of table.*

Para. No. in 2005	Para. No. in 2009	Remarks
226	226	Partly shifted to Substantive new 409
227	227	
228	228	
229	229	Substantive
230	230	Substantive
231	231	Substantive
232	232	Substantive
233	233	
234	234	
235	235	
236	236	
237	237	
238	238	
239	239	
240	240	
241	241	Partly shifted to Substantive new 413
242	242	Substantive
	243	New
243	244	

Para. No. in 2005	Para. No. in 2009	Remarks
244	245	
245	246	
246	247	
247	248	
248	249	
301	301	
302	302	Editorial
303	303	
304	304	
305	305	
306	306	
307	307	
308	308	
309	309	
310	310	
311	311	
312	312	
313	313	
	314	New
314	315	
	401	New

Para. No. in 2005	Para. No. in 2009	Remarks
401	402	
402	403	
403	404	
404	405	
405	406	
406	407	
	408	New
226	409	Partly
407	421	Substantive
408	422	Substantive
409	426	Old 426 and 519, Substantive
410	423(e) and 424(c)	Substantive
411	411	Substantive
	412	New
	413	Partly old 241
	414	Partly old 411
	415	New
	416	New
	417	Partly old 672

Para. No. in 2005	Para. No. in 2009	Remarks
	419	New
412	410	
413	428	
414	429	
415	431	Substantive
416	433	Substantive
417	434	Editorial
418	418	Substantive
419	420	Editorial
	423	Old 410 and 517
	424	Old 410 and 518
	425	Old 520
	427	New
	430	New
	432	New
	435	New
501	501	
502	502	
503	503	
504	504	Substantive

*For footnote, see end of table.*

Para. No. in 2005	Para. No. in 2009	Remarks
505	NIL	Deleted
506	505	
507	506	
508	507	
509	508	Editorial
510	509	
511	510	
512	511	
513	512	
514	513	
515	514	Substantive
516	515	
517	423	Substantive old 517 and 410
518	424	Old 518 and 410
519	426	Modified
520	425	Substantive
521	516	Substantive
522	517	Editorial
523	518	Editorial
524	519	

Para. No. in 2005	Para. No. in 2009	Remarks
525	520	Editorial
526	521	Editorial
527	522	Editorial
528	683	Editorial
529	523	Editorial
530	524	
531	525	Editorial
532	526	
533	527	Editorial
534	528	
535	529	
536	530	Substantive
537	531	
538	532	Editorial
539	533	
540	534	
541	535	Editorial
542	536	
543	537	
544	538	Substantive
545	539	

Para. No. in 2005	Para. No. in 2009	Remarks
546	540	
547	541	
548	542	Substantive
549	NIL	Deleted
550	544	Substantive
551	545	Substantive
552	546	
553	547	
	548	New
	549	New
	550	New
554	551	Editorial
555	425(d)	Modified
556	552	
557	553	
558	554	Substantive
559	555	Substantive
560	556	Substantive
561	557	
562	558	
563	559	

Para. No. in 2005	Para. No. in 2009	Remarks
564	560	
565	561	
566	562	
567	563	
568	564	
569	565	
570	566	
571	567	
572	568	Substantive
573	569	
574	570	
575	571	
576	572	
577	573	
578	574	
579	575	
580	576	
581	577	
582	578	
583	579	
601	601	

*For footnote, see end of table.*

Para. No. in 2005	Para. No. in 2009	Remarks
602	602	
603	603	Editorial
604	604	
605	605	
606	606	
607	607	
608	608	
609	609	
610	610	
611	611	
612	612	
613	613	
614	614	Substantive
615	615	
616	616	
617	617	
618	618	
619	619	
620	620	
621	621	
622	622	Editorial

Para. No. in 2005	Para. No. in 2009	Remarks
623	623	
624	624	Substantive
625	625	Substantive
626	626	Substantive
627	627	Substantive
628	628	Substantive
629	629	
630	630	
631	631	
632	632	
633	633	
634	634	
635	635	
636	636	
637	637	
638	638	
639	639	
640	640	
641	641	
642	642	
643	643	

Para. No. in 2005	Para. No. in 2009	Remarks
644	644	
645	645	
646	646	
647	647	
648	648	Substantive
649	649	
650	650	
651	651	
652	652	
653	653	
654	654	
655	655	
656	656	
657	657	Editorial
658	658	
659	659	
660	660	
661	661	
662	662	
663	663	
664	664	

Para. No. in 2005	Para. No. in 2009	Remarks
665	665	
666	666	
667	667	
668	668	
669	669	Editorial
670	670	
671	671	Editorial
672	672	Partly shifted to Substantive new 417
673	673	
674	674	
675	675	Substantive
676	676	
677	677	Substantive
678	678	
679	679	
680	680	
681	681	
682	682	
701	701	
702	702	

*For footnote, see end of table.*

Para. No. in 2005	Para. No. in 2009	Remarks
703	703	
704	704	Editorial
705	705	
706	706	
707	707	
708	708	
709	709	Editorial
710	710	
711	711	Editorial
712	712	
713	713	
714	714	
715	715	
716	716	Editorial
717	717	
718	718	
719	719	
720	720	
721	721	
722	722	
723	723	Substantive

Para. No. in 2005	Para. No. in 2009	Remarks
724	724	
725	725	
726	726	
727	727	
728	728	
729	729	
730	730	
731	731	
732	732	
733	733	
734	734	
735	735	
736	736	
737	737	
801	801	
802	802	
803	803	
804	804	
805	805	
806	806	
807	807	

Para. No. in 2005	Para. No. in 2009	Remarks
808	808	
809	809	
810	810	
811	811	
812	812	
813	813	
814	814	
815	815	Editorial
816	816	Editorial
817	817	Editorial
818	818	Editorial
819	819	
820	820	
821	821	

Para. No. in 2005	Para. No. in 2009	Remarks
822	822	
823	823	
824	824	
825	825	
826	826	
827	827	
828	828	Editorial
829	829	
830	830	
831	831	Substantive
832	832	Substantive
833	833	Substantive
834	834	

<sup>a</sup> The electronic version of the 2005 Edition of the Regulations, available on [www.iaea.org](http://www.iaea.org), should be used when referring to paras 405–419; in the printed version of the 2005 Edition of the Regulations, paras 405–419 are incorrectly numbered as paras 406–420.

## Appendix II

### CORRESPONDENCE OF PARAGRAPH NUMBERS IN THE 2009 EDITION ('NEW') [1] AND 2005 EDITION<sup>a</sup> ('OLD') OF THE REGULATIONS [1]

Para. No. in 2009	Para. No. in 2005	Remarks	Para. No. in 2009	Para. No. in 2005	Remarks
101	101	Editorial	209	209	
102	102	Editorial	210	210	Substantive
103	103		211	211	
104	104	Substantive	212	212	
105	105	Substantive	213	213	
106	106	Editorial	214	214	
107	107	Editorial	215	215	
108	108		216	216	
110	109	Substantive	217	217	
111	110	Editorial	218	218	
201	201		219	219	
202	202		220	220	
203	203	Substantive	221	221	
204	204	Substantive	222	222	Substantive
205	205		223	223	Editorial
206	206	Editorial	224	224	Substantive
207	207	Substantive	225	225	
208	208				

Para. No. in 2009	Para. No. in 2005	Remarks
226	226	Partly shifted to Substantive new 409
227	227	
228	228	
229	229	Substantive
230	230	Substantive
231	231	Substantive
232	232	Substantive
233	233	
234	234	
235	235	
236	236	
237	237	
238	238	
239	239	
240	240	
241	241	Partly shifted to Substantive new 413
242	242	Substantive
243		New
244	243	

Para. No. in 2009	Para. No. in 2005	Remarks
245	244	
246	245	
247	246	
248	247	
249	248	
301	301	
302	302	Editorial
303	303	
304	304	
305	305	
306	306	
307	307	
308	308	
309	309	
310	310	
311	311	
312	312	
313	313	
314		New
315	314	
401		New

*For footnote, see end of table.*

Para. No. in 2009	Para. No. in 2005	Remarks
402	401	
403	402	
404	403	
405	404	
406	405	
407	406	
408		New
409	226	Partly
410	412	
411	411	Substantive
412		New
413		Partly old 241
414		Partly old 411
415		New
416		New
417		Partly old 672
418	418	Substantive
419		New
420	419	Editorial
421	407	Substantive

Para. No. in 2009	Para. No. in 2005	Remarks
422	408	Substantive
423	410 and 517	Substantive
424	410 and 518	Substantive
425	520	Substantive
425(d)	555	Modified
426	409 and 519	Substantive
427		New
428	413	
429	414	
430		New
431	415	Substantive
432		New
433	416	Substantive
434	417	Editorial
435		New
501	501	
502	502	
503	503	
504	504	Substantive

Para. No. in 2009	Para. No. in 2005	Remarks
NIL	505	Deleted
505	506	
506	507	
507	508	
508	509	Editorial
509	510	
510	511	
511	512	
512	513	
513	514	
514	515	Substantive
515	516	
516	521	Substantive
517	522	Editorial
518	523	Editorial
519	524	
520	525	Editorial
521	526	Editorial
522	527	Editorial
523	529	Editorial
524	530	

Para. No. in 2009	Para. No. in 2005	Remarks
525	531	Editorial
526	532	
527	533	Editorial
528	534	
529	535	
530	536	Substantive
531	537	
532	538	Editorial
533	539	
534	540	
535	541	Editorial
536	542	
537	543	
538	544	Substantive
539	545	
540	546	
541	547	
542	548	Substantive
NIL	549	Deleted
543		New
544	550	Substantive

*For footnote, see end of table.*

Para. No. in 2009	Para. No. in 2005	Remarks
545	551	Substantive
546	552	
547	553	
548		New
549		New
550		New
551	554	Editorial
552	556	
553	557	
554	558	Substantive
555	559	Substantive
556	560	Substantive
557	561	
558	562	
559	563	
560	564	
561	565	
562	566	
563	567	
564	568	
565	569	

Para. No. in 2009	Para. No. in 2005	Remarks
566	570	
567	571	
568	572	Substantive
569	573	
570	574	
571	575	
572	576	
573	577	
574	578	
575	579	
576	580	
577	581	
578	582	
579	583	
601	601	
602	602	
603	603	Editorial
604	604	
605	605	
606	606	
607	607	

Para. No. in 2009	Para. No. in 2005	Remarks
608	608	
609	609	
610	610	
611	611	
612	612	
613	613	
614	614	Substantive
615	615	
616	616	
617	617	
618	618	
619	619	
620	620	
621	621	
622	622	Editorial
623	623	
624	624	Substantive
625	625	Substantive
626	626	Substantive
627	627	Substantive
628	628	Substantive

Para. No. in 2009	Para. No. in 2005	Remarks
629	629	
630	630	
631	631	
632	632	
633	633	
634	634	
635	635	
636	636	
637	637	
638	638	
639	639	
640	640	
641	641	
642	642	
643	643	
644	644	
645	645	
646	646	
647	647	
648	648	Substantive
649	649	

*For footnote, see end of table.*

Para. No. in 2009	Para. No. in 2005	Remarks
650	650	
651	651	
652	652	
653	653	
654	654	
655	655	
656	656	
657	657	Editorial
658	658	
659	659	
660	660	
661	661	
662	662	
663	663	
664	664	
665	665	
666	666	
667	667	
668	668	
669	669	Editorial
670	670	

Para. No. in 2009	Para. No. in 2005	Remarks
671	671	Editorial
672	672	Substantive, partly shifted to new 417
673	673	
674	674	
675	675	Substantive
676	676	
677	677	Substantive
678	678	
679	679	
680	680	
681	681	
682	682	
683	528	Editorial
701	701	
702	702	
703	703	
704	704	Editorial
705	705	
706	706	
707	707	

Para. No. in 2009	Para. No. in 2005	Remarks
708	708	
709	709	Editorial
710	710	
711	711	Editorial
712	712	
713	713	
714	714	
715	715	
716	716	Editorial
717	717	
718	718	
719	719	
720	720	
721	721	
722	722	
723	723	Substantive
724	724	
725	725	
726	726	
727	727	
728	728	

Para. No. in 2009	Para. No. in 2005	Remarks
729	729	
730	730	
731	731	
732	732	
733	733	
734	734	
735	735	
736	736	
737	737	
801	801	
802	802	
803	803	
804	804	
805	805	
806	806	
807	807	
808	808	
809	809	
810	810	
811	811	
812	812	

*For footnote, see end of table.*

Para. No. in 2009	Para. No. in 2005	Remarks
813	813	
814	814	
815	815	Editorial
816	816	Editorial
817	817	Editorial
818	818	Editorial
819	819	
820	820	
821	821	
822	822	
823	823	

Para. No. in 2009	Para. No. in 2005	Remarks
824	824	
825	825	
826	826	
827	827	
828	828	Editorial
829	829	
830	830	
831	831	Substantive
832	832	Substantive
833	833	Substantive
834	834	

<sup>a</sup> The electronic version of the 2005 Edition of the Regulations, available on [www.iaea.org](http://www.iaea.org), should be used when referring to paras 405–419; in the printed version of the 2005 Edition of the Regulations, paras 405–419 are incorrectly numbered as paras 406–420.

### Appendix III

#### PARAGRAPH NUMBERS OF THE 2009 EDITION OF THE REGULATIONS [1] VERSUS APPLICABLE UN NUMBERS

Para. No.	UN numbers (Schedules)	Para. No.	UN numbers (Schedules)
109	All (2908, 2909, 2910, 2911, 2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333)	314	All
110	All	315	All
301	All	401	Not applicable (classification, see Fig. 1 flow diagram)
302	All	402	Classification
303	All	403	Classification
304	All	404	Classification
305	All	405	Classification
306	All	406	Classification
307	All	407	Classification
308	All	Table 3	Classification
309	All	408	Classification
310	2919, 3331	409	Classification
311	All	409(a)	Classification
312	All	409(b)	Classification
313	All	409(c)	Classification
		410	3321, 3322, 3324, 3325
		411	Paragraph used for cross-referencing

Para. No.	UN numbers (Schedules)
412	Paragraph used for cross-referencing
413(a)	Classification
413(b)	Classification
414	Paragraph used for cross-referencing
415	Paragraph used for cross-referencing
416	Paragraph used for cross-referencing
417	Classification
418	2977, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3333
419	Classification
420	2977, 2978
421	Classification
422	Classification
423	2911
424	2910
425	2908
426	2909
427	Classification
428	Classification

Para. No.	UN numbers (Schedules)
429	2910, 2911, 2912, 2915, 2916, 2917, 2919, 3321, 3322, 3323, 3324, 3325, 3327, 3328, 3329, 3330, 3331, 3332, 3333
430	Classification
431	2916, 3328
432	2917, 3329
433	Classification
434	3323, 3330
435	Classification
501(a)	2912, 2913, 2915, 2916, 2917, 2919, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
501(b)	2916, 2917, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3333
501(c)	3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3333
502(a)	2912, 2913, 2915, 2916, 2917, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3332, 3333
502(b)	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333

Para. No.	UN numbers (Schedules)
502(c)	2916, 2917, 2977, 2978, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3333
502(d)	2916, 2917, 3323, 3328, 3329, 3330
502(e)	2916, 2917, 3323, 3328, 3329, 3330
502(f)	2916, 2917, 3323, 3328, 3329, 3330, 3332, 3333
502(g)	2977, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3333
502(h)	2916, 2917, 3323, 3328, 3329, 3330
503	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
504	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
505	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
506	All

Para. No.	UN numbers (Schedules)
507	All
508	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
509	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
510	All
511	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
512	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
513	2912, 2913 (SCO-I only), 3326 (SCO-I only)
514	Paragraph used for cross-referencing
515	2908, 2909, 2910, 2911
516	2912, 2913, 3321, 3322, 3324, 3325, 3326

Para. No.	UN numbers (Schedules)
517	Paragraph used for cross-referencing
518	2912, 2913, 3326
518(a)	2912, 2913, 3326
518(b)	2912, 2913, 3326
518(c)	2913, 3326
519	Classification
520	2912, 2913, 3321, 3322, 3324, 3325, 3326
Table 7	2912, 2913, 3321, 3322, 3324, 3325, 3326
521	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
521(a)	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
521(b)	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333

Para. No.	UN numbers (Schedules)
Table 8	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
521(c)	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
522	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
523	2977, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3333
524	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
525	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
526	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333

Para. No.	UN numbers (Schedules)
527(a)	2912, 2913, 2915, 2916, 2917, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3332, 3333
527(b)	Paragraph used for cross-referencing
527(c)	2912, 2913, 2915, 2916, 2917, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3332, 3333
527(d), 527(e)	2919, 3331
528	All
529	All
530	All
Table 10	All
531	All
532(a)	2912, 2913, 2977, 2978, 3321, 3322, 3324, 3325, 3326
532(b)	2915, 2977, 2978, 3327, 3332, 3333
532(c)	2912, 2913, 2915, 2977, 2978, 3321, 3322, 3324, 3325, 3326, 3327, 3332, 3333

Para. No.	UN numbers (Schedules)
533(a),(b)	2916, 2917, 2977, 2978, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3333
533(c)	2916, 2917, 2977, 2978, 3328, 3329
533(d)	3323, 3330
534	2916, 2917, 3323, 3328, 3329, 3330
Fig. 1	2916, 2917, 3323, 3328, 3329, 3330
535	2912, 2913, 3326
536	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
Figs 2–3	2912, 2913, 2915, 2916, 2917, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3332, 3333
Fig. 4	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
537	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333

Para. No.	UN numbers (Schedules)
538	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
539	2977, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3333
Fig. 5	2977, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3333
540	2977, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3333
541	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
Fig. 6	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
542	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333

Para. No.	UN numbers (Schedules)
Fig. 7	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
543	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
544	All
544(a)	All
544(b)–(h)	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
544(i)	2977, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3333
544(j)	2916, 2917, 2919, 2977, 2978, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
544(k)	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333

Para. No.	UN numbers (Schedules)
544(l)	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
544(m)	2913, 2977, 2978, 3321, 3322, 3324, 3325, 3326
545	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
546	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
547	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
548	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
549	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333

Para. No.	UN numbers (Schedules)
550	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
551	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
552	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
553	2916, 2917, 2919, 2977, 2978, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
554	2916, 2917, 2977, 2978, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3333
555	2916, 2917, 2919, 3323, 3328, 3329, 3330, 3331
555(a)	3323, 3330
555(b)	2916, 3328
555(c)	2917, 3329
555(d)	2919, 3331
556	2916, 2917, 2919, 3323, 3328, 3329, 3330, 3331

Para. No.	UN numbers (Schedules)
557	2916, 2917, 2919, 3323, 3328, 3329, 3330, 3331
558	2916, 2917, 2919, 2977, 2978, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
559	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
560	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
561	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
562	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
563	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333

Para. No.	UN numbers (Schedules)
563(a)	2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
Table 11	2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
563(b)	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
563(c)	2977, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3333
Table 12	3324, 3325, 3326, 3327, 3328, 3329, 3330, 3333
564	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
565	2977, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3333
566	2977, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3333

Para. No.	UN numbers (Schedules)
567	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
568	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
569	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
570	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
571	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
572	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333

Para. No.	UN numbers (Schedules)
573	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
574	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
575	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
576	2908, 2909, 2910, 2911
577	2908, 2909, 2910, 2911
578	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
579	2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
601	3322, 3325
602	2916, 2917, 2919, 3323, 3328, 3329, 3330, 3331, 3332, 3333

Para. No.	UN numbers (Schedules)
603	2916, 2917, 2919, 3323, 3328, 3329, 3330, 3331, 3332, 3333
604	2916, 2917, 2919, 3323, 3328, 3329, 3330, 3331, 3332, 3333
605	2916, 2917, 2919, 3323, 3328, 3329, 3330, 3331
606	All
607	All
608	All
609	All
610	All
611	All
612	All
613	All
614	All
615	All
616	All
617	All
618	All
619	All
620	Paragraph used for cross-referencing

Para. No.	UN numbers (Schedules)
621	Paragraph used for cross-referencing
622	2913, 2977, 2978, 3321, 3322, 3324, 3325, 3326
623	Paragraph used for cross-referencing
624	2912, 2913, 2977, 2978, 3321, 3322, 3324, 3325, 3326
625	2912, 2913, 2977, 2978, 3321, 3322, 3324, 3325, 3326
626	2912, 2913, 2977, 2978, 3321, 3322, 3324, 3325, 3326
627	2912, 2913, 2977, 2978, 3321, 3322, 3324, 3325, 3326
628	2912, 2913, 2977, 2978, 3321, 3322, 3324, 3325, 3326
629	2919, 2977, 2978, 3331
630	2919, 2977, 2978, 3331
631	2919, 2977, 2978, 3331
632	2919, 2977, 2978, 3331
633	Paragraph used for cross-referencing

Para. No.	UN numbers (Schedules)
634	2908, 2910, 2911, 2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
635	2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333
636	2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3327, 3328, 3329, 3330, 3332, 3333, 3331
637	2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3327, 3328, 3329, 3330, 3331, 3332, 3333
638	2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3327, 3328, 3329, 3330, 3331, 3332, 3333
639	2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3327, 3328, 3329, 3330, 3331, 3332, 3333
640	2916, 2917, 2919, 3323, 3328, 3329, 3330, 3331, 3332, 3333

Para. No.	UN numbers (Schedules)
641	2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3327, 3328, 3329, 3330, 3331, 3332, 3333
642	2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3327, 3328, 3329, 3330, 3331, 3332, 3333
643	2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3327, 3328, 3329, 3330, 3331, 3332, 3333
644	2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3327, 3328, 3329, 3330, 3331, 3332, 3333
645	2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3327, 3328, 3329, 3330, 3331, 3332, 3333
646(a)	2915, 2919, 2977, 2978, 3321, 3322, 3324, 3325, 3327, 3331, 3332, 3333
646(b)	2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3327, 3328, 3329, 3330, 3331, 3332, 3333

Para. No.	UN numbers (Schedules)
647	2915, 2916, 2917, 2919, 2977, 2978, 3321, 3322, 3323, 3324, 3325, 3327, 3328, 3329, 3330, 3331, 3332, 3333
648	2915, 2919, 3327, 3331, 3332, 3333
649	2915, 2919, 3327, 3331, 3332, 3333
650	Paragraph used for cross-referencing
651	2916, 2917, 2919, 2977, 2978, 3323, 3328, 3329, 3330, 3331
652	2916, 2917, 2919, 2977, 2978, 3323, 3328, 3329, 3330, 3331
653	2916, 2917, 2919, 2977, 2978, 3323, 3328, 3329, 3330, 3331
654	2916, 2917, 2919, 2977, 2978, 3323, 3328, 3329, 3330, 3331
655	2916, 2917, 2919, 2977, 2978, 3323, 3328, 3329, 3330, 3331
Table 13	2916, 2917, 2919, 2977, 2978, 3323, 3328, 3329, 3330, 3331
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OF THE IAEA REGULATIONS  
FOR THE SAFE TRANSPORT  
OF RADIOACTIVE MATERIAL  
(2005 EDITION)

SAFETY GUIDE

INTERNATIONAL ATOMIC ENERGY AGENCY  
VIENNA, 2010

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# 1. INTRODUCTION

## BACKGROUND

1.1. The Regulations for the Safe Transport of Radioactive Material (IAEA Safety Standards Series No. TS-R-1, 2005 Edition [1]), henceforth called ‘the 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. Protection from harmful effects of radiation during the transport of radioactive material is achieved by means of a combination of limitations on the contents of a package according to the quantity and type of radioactivity, the package design, and certain simple handling, storage and stowage precautions that are to be followed during transport.

1.2. While some provisions of the Regulations concern administrative controls (e.g. the requirement for the carrier to apply segregation to limit the radiation level in occupied areas), reliance is placed in the main on provisions relating to the package, the responsibility for which rests primarily with the consignor of the package.

1.3. The Regulations are structured topically in terms of definitions, general provisions, activity limits and material restrictions, requirements and controls for transport, requirements for radioactive materials and for packagings and packages, test procedures, and approval and administrative requirements.

1.4. The Regulations are supplemented by Safety Guides that provide recommendations on meeting the requirements of the Regulations.

1.5. This Safety Guide is prepared on the basis of the Regulations. It reproduces certain parts of the Regulations in a user friendly format for specified types of consignments, classified according to their associated UN numbers, but does not contain any additional requirements. Details, in particular of design, construction and testing of packagings, are omitted.

1.6. Although much of the information may not apply, a user desiring to transport a particular type of consignment of radioactive material would need to study and assimilate requirements from all sections of the Regulations. This Safety Guide aims to aid such users by providing a consolidation of certain requirements of the Regulations for each type of radioactive material, package or

shipment. Once a consignor has properly classified the radioactive material to be shipped (following the recommendations provided in Section 2 and Fig. 1 of this Safety Guide), the appropriate UN number can be assigned and the specific requirements for shipment can be found in the corresponding schedule. References are provided so that the Regulations can be readily consulted when necessary.

1.7. In order to reflect the mandatory status of the Regulations and to comply with the IAEA requirements on the preparation of Safety Guides, and without diluting their status, the word “shall” in the Regulations, where it needs to be reflected in this Safety Guide, has been replaced by the words “is required to” or “requirements apply”, while the phrase “shall not” in the Regulations has been replaced by the words “is not allowed”. In the event of a conflict or anomaly between the provisions of the Regulations and this Safety Guide, the requirements in the Regulations apply. For regulatory purposes, reference should be made to the detailed provisions of the Regulations.

## OBJECTIVE

1.8. The objective of this Safety Guide is to provide information to aid users in determining the correct package type and the appropriate operational and administrative requirements to be applied.

## SCOPE

1.9. This Safety Guide can be used for all transport of radioactive material. It contains 25 schedules corresponding to the UN numbers and associated proper shipping names for the radioactive material to be shipped.

1.10. The user’s attention is drawn to the fact that there may be deviations (exceptions, additions, etc.) from the Regulations necessitated by national and modal regulations and carrier restrictions, which are not reflected in this Safety Guide.

## STRUCTURE

1.11. Section 2 describes how the material is to be classified and assigned to the appropriate UN number with the associated proper shipping name. The Safety

Guide further contains 25 schedules corresponding to the number of UN numbers and associated proper shipping names for the radioactive material to be shipped.

1.12. The schedules are set out in numerical order of UN number. The information provided in each schedule follows the sequence of the work involved in transporting radioactive material.

1.13. Each schedule has the same eight subjects:

- (1) General provisions;
- (2) Contents limits for packages;
- (3) Contamination;
- (4) Maximum radiation levels;
- (5) Categories of packages and overpacks;
- (6) Marking and labelling;
- (7) Requirements before shipment;
- (8) Provisions concerning transport operations.

## **2. DEFINITIONS AND CLASSIFICATION**

### INTRODUCTION

2.1. This section defines terms that are necessary for the purposes of this Safety Guide and describes how radioactive material should be classified and assigned the appropriate UN number and associated proper shipping name.

### DEFINITIONS

2.2. The following definitions are taken from the Regulations and reproduced here for the convenience of the user.

#### *Contamination*

“214. *Contamination* shall mean the presence of a radioactive substance on a surface in quantities in excess of 0.4 Bq/cm<sup>2</sup> for beta and gamma emitters and *low toxicity alpha emitters*, or 0.04 Bq/cm<sup>2</sup> for all other alpha emitters.”

### *Exclusive use*

“221. *Exclusive use* shall mean the sole use, by a single *consignor*, of a *conveyance* or of a large *freight container*, in respect of which all initial, intermediate and final loading and unloading is carried out in accordance with the directions of the *consignor* or *consignee*.”

### *Fissile material*

“222. *Fissile material* shall mean 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*

“225. *Low dispersible radioactive material* shall mean 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 material*

“226. *Low specific activity (LSA) material* shall mean *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*.

*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 [of the Regulations]; 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 [of the Regulations], excluding *fissile material* in quantities not excepted under para. 672 [of the Regulations].
- (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  $0.1A_2$ ; and
  - (iii) The estimated average *specific activity* of the solid, excluding any shielding material, does not exceed  $2 \times 10^{-3}A_2/g$ .”

#### *Low toxicity alpha emitters*

“227. *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.”

#### *Package*

“230. *Package* shall mean the *packaging* with its *radioactive contents* as presented for transport. The types of *packages* covered by these Regulations, which are subject to the activity limits and material restrictions of Section IV and meet the corresponding requirements, are:

- (a) *Excepted package*;
- (b) *Industrial package Type 1 (Type IP-1)*;
- (c) *Industrial package Type 2 (Type IP-2)*;
- (d) *Industrial package Type 3 (Type IP-3)*;
- (e) *Type A package*;
- (f) *Type B(U) package*;
- (g) *Type B(M) package*;
- (h) *Type C package*.

#### *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 [of the Regulations].”

#### *Special form radioactive material*

“239. *Special form radioactive material* shall mean either an indispersible solid *radioactive material* or a sealed capsule containing *radioactive material*.”

#### *Surface contaminated object*

“241. *Surface contaminated object (SCO)* shall mean a solid object which is not itself radioactive but which has *radioactive material* distributed on its surfaces. *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 cm<sup>2</sup> (or the area of the surface if less than 300 cm<sup>2</sup>) does not exceed 4 Bq/cm<sup>2</sup> for beta and gamma emitters and *low toxicity alpha emitters*, or 0.4 Bq/cm<sup>2</sup> for all other alpha emitters; and
  - (ii) the *fixed contamination* on the accessible surface averaged over 300 cm<sup>2</sup> (or the area of the surface if less than 300 cm<sup>2</sup>) does not exceed  $4 \times 10^4$  Bq/cm<sup>2</sup> for beta and gamma emitters and low toxicity alpha emitters, or  $4 \times 10^3$  Bq/cm<sup>2</sup> for all other alpha emitters; and

- (iii) the *non-fixed contamination* plus the *fixed contamination* on the inaccessible surface averaged over 300 cm<sup>2</sup> (or the area of the surface if less than 300 cm<sup>2</sup>) does not exceed  $4 \times 10^4$  Bq/cm<sup>2</sup> for beta and gamma emitters and *low toxicity alpha emitters*, or  $4 \times 10^3$  Bq/cm<sup>2</sup> for all other alpha emitters.
- (b) *SCO-II*: A solid object on which either the *fixed* or *non-fixed contamination* on the surface exceeds the applicable limits specified for *SCO-I* in (a) above and on which:
  - (i) the *non-fixed contamination* on the accessible surface averaged over 300 cm<sup>2</sup> (or the area of the surface if less than 300 cm<sup>2</sup>) does not exceed 400 Bq/cm<sup>2</sup> for beta and gamma emitters and *low toxicity alpha emitters*, or 40 Bq/cm<sup>2</sup> for all other alpha emitters; and
  - (ii) the *fixed contamination* on the accessible surface, averaged over 300 cm<sup>2</sup> (or the area of the surface if less than 300 cm<sup>2</sup>) does not exceed  $8 \times 10^5$  Bq/cm<sup>2</sup> for beta and gamma emitters and *low toxicity alpha emitters*, or  $8 \times 10^4$  Bq/cm<sup>2</sup> for all other alpha emitters; and
  - (iii) the *non-fixed contamination* plus the *fixed contamination* on the inaccessible surface averaged over 300 cm<sup>2</sup> (or the area of the surface if less than 300 cm<sup>2</sup>) does not exceed  $8 \times 10^5$  Bq/cm<sup>2</sup> for beta and gamma emitters and *low toxicity alpha emitters*, or  $8 \times 10^4$  Bq/cm<sup>2</sup> for all other alpha emitters.”

### *Unilateral approval*

“205. *Unilateral approval* shall mean an approval of a *design* which is required to be given by the *competent authority* of the country of origin of the *design* only.”

## CLASSIFICATION

2.3. Radioactive material is required to be assigned one of the UN numbers specified in Table 1. The UN number assigned depends on the activity level of the radionuclides contained in the package, the fissile or non-fissile properties of these radionuclides, the type of package, and the nature or form of the radioactive contents of the package, or special arrangements governing the transport operation.

2.4. In all cases of international transport of packages requiring approval of design or shipment by the competent authority for which different approval types apply in the different countries concerned by the shipment, the UN number, proper shipping name, categorization, labelling and marking are required to be in accordance with the certificate of the country of origin of the design.

2.5. A flow diagram for classification of radioactive material to the appropriate UN number is provided in Fig. 1 to aid the assignment process. The objective of the flow diagram is not to indicate all possible options allowed by the regulations, nor to incorporate all of the detailed requirements and limits. Rather, it has to be seen as a tool to indicate the most suitable or optimized option for classification.

2.6. It is clear that it has to be verified that all of the requirements, limitations and prescriptions related to the UN number assigned can be complied with. If not, an alternative UN number will need to be assigned.

2.7. It is possible that for specific cases more than one UN number may be appropriate. In such cases the choice of UN number would be left to the operator or consignor. Two examples of such situations are set out in the following:

- (1) Some radioactive material may meet the criteria for both “limited quantity” and “LSA or SCO”. If the radioactive material is not fissile, following the route of the diagram, the first decision box encountered is “limited quantity”. If this option is selected, the material could be classified as UN 2910 — limited quantity of material in excepted package. This option has minimal administrative burden and requirements for the package, but the activity of such an excepted package is required to be very low. However, this is not the only option for the package. Rather, the choice may be made to proceed to the decision box “LSA or SCO”. The material will now be classified as LSA or SCO (depending on the case) and can be shipped unpackaged in a larger amount as LSA-I or SCO-I without the restriction on the activity limit that is a requirement for excepted packages. However, the option “LSA or SCO” may incur a higher administrative burden that will need to be considered.
- (2) If the amount of LSA material is such that the radiation level at 3 m from the unshielded material is not lower than 10 mSv/h, then the consignor has the choice of limiting the amount of LSA material per package accordingly and classifying the package as an IP package, or using a Type B package and assigning the appropriate UN number.

TABLE 1. UN NUMBERS AND RELATED PARAGRAPH NUMBERS OF THE REGULATIONS

UN No.	Proper shipping name	Paragraph number of the Regulations [1] in which content limits and basic requirements are established
<b>EXCEPTED PACKAGES</b>		
2908	RADIOACTIVE MATERIAL, EXCEPTED PACKAGE — EMPTY PACKAGING	516, 520
2909	RADIOACTIVE MATERIAL, EXCEPTED PACKAGE — ARTICLES MANUFACTURED FROM NATURAL URANIUM or DEPLETED URANIUM or NATURAL THORIUM	409*, 516
2910	RADIOACTIVE MATERIAL, EXCEPTED PACKAGE — LIMITED QUANTITY OF MATERIAL	408(b), 516, 518
2911	RADIOACTIVE MATERIAL, EXCEPTED PACKAGE — INSTRUMENTS or ARTICLES	408(a), 516, 517
<b>LOW SPECIFIC ACTIVITY (LSA) MATERIAL</b>		
2912	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY(LSA-I), non-fissile or fissile-excepted	411, 523, 524
3321	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-II), non-fissile or fissile-excepted	411, 412, 524
3322	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-III), non-fissile or fissile-excepted	411, 412, 524
3324	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-II), FISSILE	411, 412, 418, 522, 524
3325	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-III), FISSILE	411, 412, 418, 522, 524

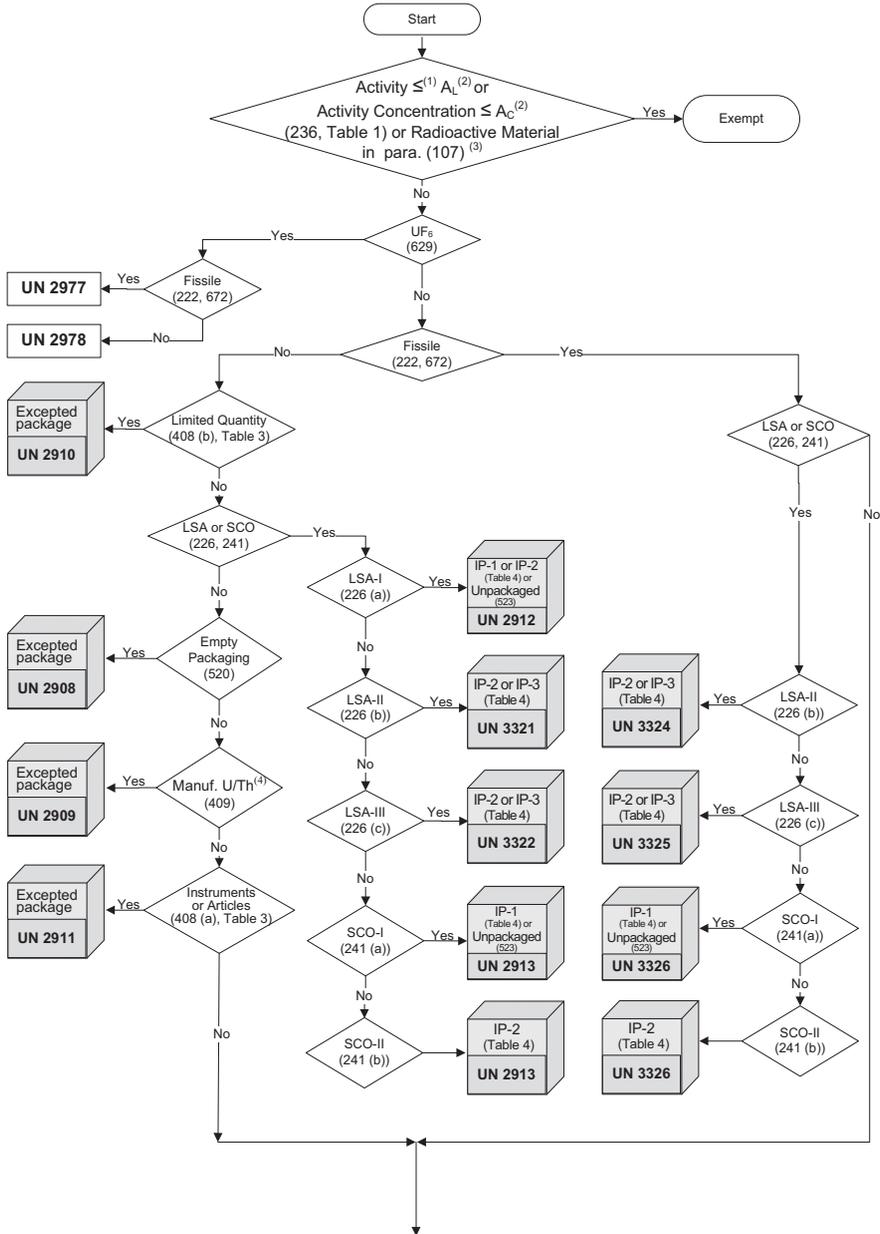
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 \* The electronic version of the 2005 Edition of the Regulations, available on [www.iaea.org](http://www.iaea.org), should be used when referring to paras 405–419; in the printed version of the 2005 Edition of the Regulations, paras 405–419 are incorrectly numbered as 406–420.

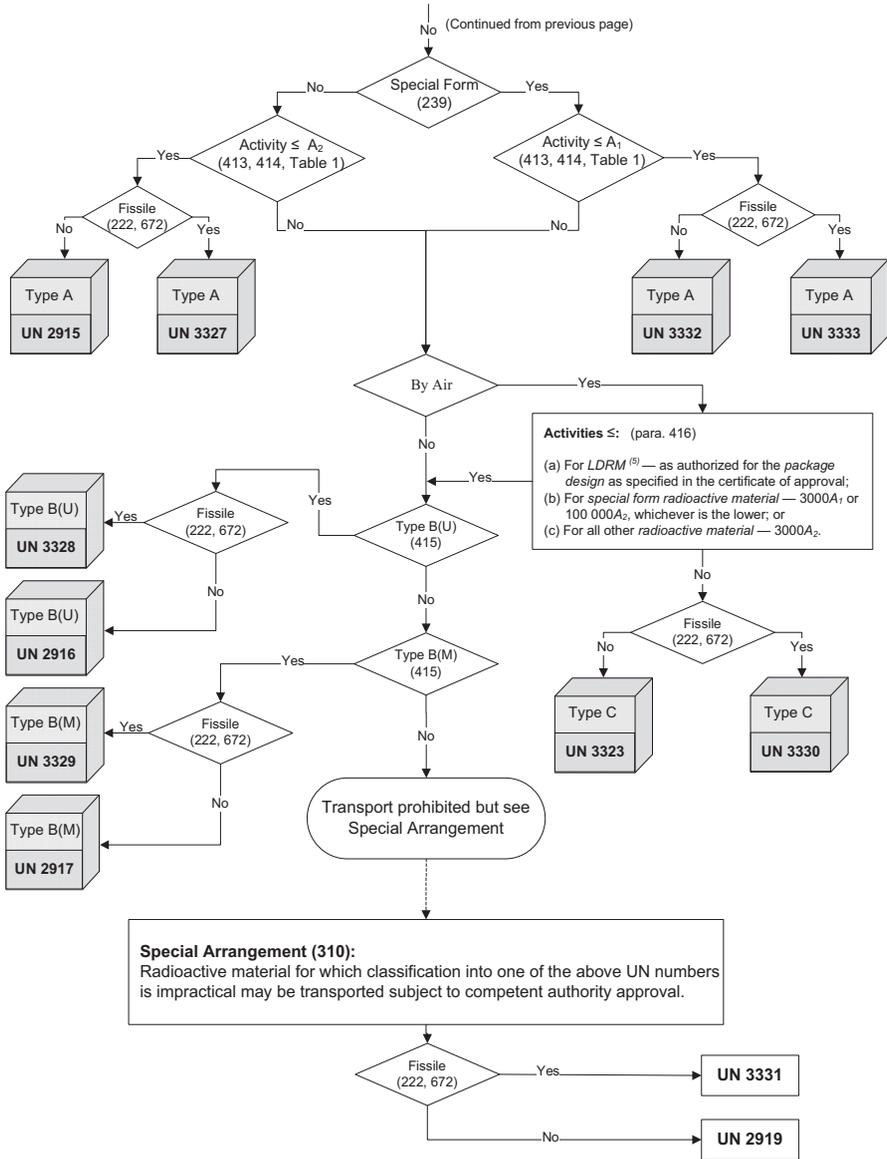
TABLE 1. UN NUMBERS AND RELATED PARAGRAPH NUMBERS OF THE REGULATIONS (cont.)

UN No.	Proper shipping name	Paragraph number of the Regulations [1] in which content limits and basic requirements are established
<b>SURFACE CONTAMINATED OBJECTS (SCOs)</b>		
2913	RADIOACTIVE MATERIAL, SURFACE CONTAMINATED OBJECTS (SCO-I or SCO-II), non-fissile or fissile-excepted	411, 523, 524
3326	RADIOACTIVE MATERIAL, SURFACE CONTAMINATED OBJECTS (SCO-I or SCO-II), FISSILE	411, 418, 522, 524
<b>TYPE A PACKAGES</b>		
2915	RADIOACTIVE MATERIAL, TYPE A PACKAGE, non-special form, non-fissile or fissile-excepted	413(b), 414
3327	RADIOACTIVE MATERIAL, TYPE A PACKAGE, FISSILE, non-special form	413(b), 414, 418
3332	RADIOACTIVE MATERIAL, TYPE A PACKAGE, SPECIAL FORM, non-fissile or fissile-excepted	413(a), 414
3333	RADIOACTIVE MATERIAL, TYPE A PACKAGE, SPECIAL FORM, FISSILE	413(a), 414, 418
<b>TYPE B(U) PACKAGES</b>		
2916	RADIOACTIVE MATERIAL, TYPE B(U) PACKAGE, non-fissile or fissile-excepted	415, 416, 806–808 (excluding 806(a))
3328	RADIOACTIVE MATERIAL, TYPE B(U) PACKAGE, FISSILE	415, 416, 418, 806(a) and 807, 808
<b>TYPE B(M) PACKAGES</b>		
2917	RADIOACTIVE MATERIAL, TYPE B(M) PACKAGE, non-fissile or fissile-excepted	415, 416, 809–811
3329	RADIOACTIVE MATERIAL, TYPE B(M) PACKAGE, FISSILE	415, 416, 418, 809–811

TABLE 1. UN NUMBERS AND RELATED PARAGRAPH NUMBERS OF THE REGULATIONS (cont.)

UN No.	Proper shipping name	Paragraph number of the Regulations [1] in which content limits and basic requirements are established
<b>TYPE C PACKAGES</b>		
3323	RADIOACTIVE MATERIAL, TYPE C PACKAGE, non-fissile or fissile-excepted	417, 806–808 (excluding 806(a))
3330	RADIOACTIVE MATERIAL, TYPE C PACKAGE, FISSILE	417, 418, 806–808
<b>SPECIAL ARRANGEMENT</b>		
2919	RADIOACTIVE MATERIAL, TRANSPORTED UNDER SPECIAL ARRANGEMENT, non-fissile or fissile-excepted	310, 824–826
3331	RADIOACTIVE MATERIAL, TRANSPORTED UNDER SPECIAL ARRANGEMENT, FISSILE	310, 824–826
<b>URANIUM HEXAFLUORIDE</b>		
2977	RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE, FISSILE	418, 419, 805
2978	RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE, non-fissile or fissile-excepted	419, 805





- (1)  $\leq$ : Less than or equal to.
- (2) A<sub>L</sub>: Activity limit for an exempt consignment in Table 1 of the Regulations.  
A<sub>C</sub>: Activity concentration for exempt material in Table 1 of the Regulations.
- (3) The number in ( ): The paragraph number or table of the Regulations.
- (4) Manuf. U/Th: Articles manufactured from natural uranium or depleted uranium or natural thorium.
- (5) LDRM: Lower Dispersible Radioactive Material.

FIG. 1. Flow diagram for classification of radioactive material into appropriate UN number.

## SCHEDULE FOR UN 2908

### RADIOACTIVE MATERIAL, EXCEPTED PACKAGE — EMPTY PACKAGING

<b>Paragraph number(s) of the Regulations [1]</b>	<b>Subject</b>
	1. GENERAL PROVISIONS
109, 507	Other dangerous properties of contents and transport with other dangerous goods.
301–303	General provisions for radiation protection.
304, 305	Emergency response.
306	Quality assurance.
311–314	Training.
502	Requirements before each shipment.
515	Requirements — general.
606–616	Design requirements for the packaging and the package.
617–619	Additional design requirements — air transport.
801	The consignor is required to demonstrate on request that the package design complies with all applicable requirements.
815	Transitional arrangements for packages designed under the provisions of the 1985 or 1985 (As Amended 1990) Editions of the Regulations.

## 2. CONTENTS LIMITS FOR PACKAGES

Only contamination is allowed (see below).

## 3. CONTAMINATION

508 Non-fixed contamination on the external surfaces of any package is required to be kept as low as practicable and is not allowed to exceed the following limits, averaged over any area of 300 cm<sup>2</sup> of any part of the surface:

- (a) Beta, gamma and low toxicity alpha emitters, 4.0 Bq/cm<sup>2</sup>;
- (b) All other alpha emitters, 0.4 Bq/cm<sup>2</sup>.

520(c) Non-fixed contamination on the internal surfaces is not allowed to exceed 100 times the levels specified in para. 508.

## 4. MAXIMUM RADIATION LEVELS

516 The radiation level at any point on the external surface of an excepted package is not allowed to exceed 5 µSv/h.

## 5. CATEGORIES OF PACKAGES AND OVERPACKS

Not applicable.

## 6. MARKING AND LABELLING

507 Packages, freight containers and overpacks containing materials having other dangerous properties (e.g. corrosiveness) are also required to be marked and labelled as required by the relevant transport regulations.

535–537 All package markings are required to be legible and durable, and are required to be on the outside of the packaging.

- 535 Each package is required to be marked with an identification of either the consignor or the consignee, or both.
- 536 Packages are required to bear the mark “UN 2908”.
- 537 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass.
- 520(d), 555 Any labels which do not relate to the radioactive contents are required to be removed or covered.
- 549 It is the consignor’s responsibility to comply with the requirements of marking, labelling and placarding.

## 7. REQUIREMENTS BEFORE SHIPMENT

- 502(a), (b) Before each shipment of any package, the following requirements apply:
- (a) For any package, it is required to ensure that all of the requirements specified in the relevant provisions of the Regulations have been satisfied.
  - (b) It is required to ensure that lifting attachments which do not meet the requirements of para. 607 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 608 of the Regulations.
- 550(c) The transport documents with each consignment (consignment notes) are required to include the identification of the consignor and the consignee, including their names and addresses, and the UN number, UN 2908.

## 8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

### **8.1. Modal requirements**

580 A consignment may be accepted for domestic movement by national postal authorities, subject to such additional requirements as those established in para. 580 of the Regulations and as prescribed by the authorities.

581 A consignment may be accepted for international movement by post, subject to such additional requirements as those established in para. 581 of the Regulations and as prescribed by the Acts of the Universal Postal Union.

### **8.2. Placarding**

507, 549 Placards may be required for other dangerous properties of the contents, but not for the radioactive properties.

### **8.3. Stowage during transport, storage in transit and segregation**

Not applicable.

### **8.4. Damaged or leaking packages**

511 Movement of packages which are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport.

### **8.5. Decontamination**

504 Tanks and intermediate bulk containers used for the transport of radioactive material are not allowed to be used for storage or transport of other goods, unless decontaminated below one tenth of the levels specified in paras 508 and 509 of the Regulations.

## **8.6. Other provisions**

- 309 In the event of non-compliance, appropriate actions are required to be taken as soon as possible, including communication and remedy.
- 520(a), (b) Transport of empty packaging is subject to additional requirements.

## SCHEDULE FOR UN 2909

### RADIOACTIVE MATERIAL, EXCEPTED PACKAGE — ARTICLES MANUFACTURED FROM NATURAL URANIUM OR DEPLETED URANIUM OR NATURAL THORIUM

<b>Paragraph number(s) of the Regulations [1]</b>	<b>Subject</b>
	1. GENERAL PROVISIONS
109, 507	Other dangerous properties of contents and transport with other dangerous goods.
301–303	General provisions for radiation protection.
304, 305	Emergency response.
306	Quality assurance.
311–314	Training.
409	Activity limits and specific provision.
515	Requirements — general.
606–616	Design requirements for the packaging and the package.
617–619	Additional design requirements — air transport.
801	The consignor is required to demonstrate on request that the package design complies with all applicable requirements.
815	Transitional arrangements for packages designed under the provisions of the 1985 or 1985 (As Amended 1990) Editions of the Regulations.

## 2. CONTENTS LIMITS FOR PACKAGES

409<sup>a</sup> An excepted package may contain any quantity of articles manufactured of natural uranium, depleted uranium or natural thorium.

## 3. CONTAMINATION

508 Non-fixed contamination on the external surfaces of any package is required to be kept as low as practicable and is not allowed to exceed the following limits, averaged over any area of 300 cm<sup>2</sup> of any part of the surface:

- (a) Beta, gamma and low toxicity alpha emitters, 4.0 Bq/cm<sup>2</sup>;
- (b) All other alpha emitters, 0.4 Bq/cm<sup>2</sup>.

## 4. MAXIMUM RADIATION LEVELS

516 The radiation level at any point on the external surface of an excepted package is not allowed to exceed 5 µSv/h.

## 5. CATEGORIES OF PACKAGES AND OVERPACKS

Not applicable.

## 6. MARKING AND LABELLING

507 Packages, freight containers and overpacks containing materials having other dangerous properties (e.g. corrosiveness) are also required to be labelled as required by the relevant transport regulations.

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<sup>a</sup> The electronic version of the 2005 Edition of the Regulations, available on [www.iaea.org](http://www.iaea.org), should be used when referring to paras 405–419; in the printed version of the 2005 Edition of the Regulations, paras 405–419 are incorrectly numbered as 406–420.

- 535–537 All package markings are required to be legible and durable, and are required to be on the outside of the packaging.
- 535 Each package is required to be marked with an identification of either the consignor or consignee, or both.
- 536 Packages are required to bear the mark “UN 2909”.
- 537 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass.
- 549 It is the consignor’s responsibility to comply with the requirements of marking, labelling and placarding.
- 581(c)–(e) A consignment may be accepted for international movement by post, subject to such additional requirements as those established in para. 580 of the Regulations and as prescribed by the Acts of the Universal Postal Union.

## 7. REQUIREMENTS BEFORE SHIPMENT

- 502(a), (b) Before each shipment of any package, the following requirements apply:
- (a) For any package, it is required to ensure that all of the requirements specified in the relevant provisions of the Regulations have been satisfied.
  - (b) It is required to ensure that lifting attachments which do not meet the requirements of para. 607 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 608 of the Regulations.
- 550(c) The transport documents with each consignment (consignment notes) are required to include the identification of the consignor and consignee, including their names and addresses, and the UN number UN 2909.

## 8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

### **8.1. Modal requirements**

580 A consignment may be accepted for domestic movement by national postal authorities, subject to such additional requirements as those established in para. 580 of the Regulations and as prescribed by the authorities.

581 A consignment may be accepted for international movement by post, subject to such additional requirements as those established in para. 581 of the Regulations and as prescribed by the Acts of the Universal Postal Union.

### **8.2. Placarding**

507, 549 Placards may be required for other dangerous properties of the contents, but not for the radioactive properties.

### **8.3. Stowage during transport, storage in transit and segregation**

Not applicable.

### **8.4. Damaged or leaking packages**

511 Movement of packages which are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport.

### **8.5. Decontamination**

Not applicable.

### **8.6. Other provisions**

309 In the event of non-compliance, appropriate actions are required to be taken as soon as possible, including communication and remedy.

## SCHEDULE FOR UN 2910

### RADIOACTIVE MATERIAL, EXCEPTED PACKAGE — LIMITED QUANTITY OF MATERIAL

<b>Paragraph number(s) of the Regulations [1]</b>	<b>Subject</b>
	1. GENERAL PROVISIONS
109, 507	Other dangerous properties of contents and transport with other dangerous goods.
301–303	General provisions for radiation protection.
304, 305	Emergency response.
306	Quality assurance.
311–314	Training.
408 <sup>a</sup> , Table 3	Activity limits and specific provisions.
515	Requirements — general.
518(a)	Retention of contents under routine conditions of transport.
606–616	Design requirements for the packaging and the package.
617–619	Additional design requirements — air transport.
634	Minimum dimensions of a package containing fissile excepted material.

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<sup>a</sup> The electronic version of the 2005 Edition of the Regulations, available on [www.iaea.org](http://www.iaea.org), should be used when referring to paras 405–419; in the printed version of the 2005 Edition of the Regulations, paras 405–419 are incorrectly numbered as 406–420.

672 If the excepted package contains fissile material, one of the fissile exceptions provided by para. 672 of the Regulations is required to be applied.

801 The consignor is required to demonstrate on request that the package design complies with all applicable requirements.

815 Transitional arrangements for packages designed under the provisions of the 1985 or 1985 (As Amended 1990) Editions of the Regulations.

## 2. CONTENTS LIMITS FOR PACKAGES

408(b), Table 3 The activity limits in Table 3 of the Regulations are required to be met.

410, Table 3 For transport by post, the total activity in each package is not allowed to exceed one tenth of the relevant limit specified in Table 3 of the Regulations.

## 3. CONTAMINATION

508 Non-fixed contamination on the external surfaces of any package is required to be kept as low as practicable and is not allowed to exceed the following limits, averaged over any area of 300 cm<sup>2</sup> of any part of the surface:

- (a) Beta, gamma and low toxicity alpha emitters, 4.0 Bq/cm<sup>2</sup>;
- (b) All other alpha emitters, 0.4 Bq/cm<sup>2</sup>.

## 4. MAXIMUM RADIATION LEVELS

516 The radiation level at any point on the external surface of an excepted package is not allowed to exceed 5 µSv/h.

## 5. CATEGORIES OF PACKAGES AND OVERPACKS

Not applicable.

## 6. MARKING AND LABELLING

- 507 Packages, freight containers and overpacks containing materials having other dangerous properties (e.g. corrosiveness) are also required to be marked and labelled as required by the relevant transport regulations.
- 518(b) The package is required to be marked “RADIOACTIVE” on an internal surface in such a manner that a warning of the presence of radioactive material is visible on opening the package.
- 535–537 These package markings are required to be legible and durable, and are required to be on the outside of the packaging.
- 535 Each package is required to be marked with an identification of either the consignor or the consignee, or both.
- 536 Packages are required to bear the mark “UN 2910”.
- 537 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass.
- 549 It is the consignor’s responsibility to comply with the requirements of marking, labelling and placarding.
- 581(c)–(e) A consignment may be accepted for international movement by post, subject to such additional requirements as those established in para. 581 of the Regulations and as prescribed by the Acts of the Universal Postal Union.

## 7. REQUIREMENTS BEFORE SHIPMENT

- 502(a), (b) Before each shipment of any package, the following requirements apply:

- (a) For any package, it is required to ensure that all of the requirements specified in the relevant provisions of the Regulations have been satisfied.
- (b) It is required to ensure that lifting attachments which do not meet the requirements of para. 607 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 608 of the Regulations.

550(c) The transport documents with each consignment (consignment notes) are required to include the identification of the consignor and consignee, including their names and addresses, and the UN number UN 2910.

## 8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

### 8.1. Modal requirements

580, Table 3 A consignment may be accepted for domestic movement by national postal authorities, subject to such additional requirements as those established in para. 580 of the Regulations and as prescribed by the authorities.

581, Table 3 A consignment may be accepted for international movement by post, subject to such additional requirements as those established in para. 581 of the Regulations and as prescribed by the Acts of the Universal Postal Union.

### 8.2. Placarding

507, 549 Placards may be required for other dangerous properties of the contents, but not for the radioactive properties.

### 8.3. Stowage during transport, storage in transit and segregation

Not applicable.

#### **8.4. Damaged or leaking packages**

511

Movement of packages which are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport.

#### **8.5. Decontamination**

Not applicable.

#### **8.6. Other provisions**

309

In the event of non-compliance, appropriate actions are required to be taken as soon as possible, including communication and remedy.

## SCHEDULE FOR UN 2911

### RADIOACTIVE MATERIAL, EXCEPTED PACKAGE — INSTRUMENTS OR ARTICLES

<b>Paragraph number(s) of the Regulations [1]</b>	<b>Subject</b>
	1. GENERAL PROVISIONS
109, 507	Other dangerous properties of contents and transport with other dangerous goods.
301–303	General provisions for radiation protection.
304, 305	Emergency response.
306	Quality assurance.
311–314	Training.
408(a) <sup>a</sup> , Table 3	Activity limits and specific provisions.
515	Requirements — general.
606–616	Design requirements for the packaging and the package.
617–619	Additional design requirements — air transport.
634	Minimum dimensions of a package containing fissile excepted material.

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<sup>a</sup> The electronic version of the 2005 Edition of the Regulations, available on [www.iaea.org](http://www.iaea.org), should be used when referring to paras 405–419; in the printed version of the 2005 Edition of the Regulations, paras 405–419 are incorrectly numbered as 406–420.

672 If the excepted package contains fissile material, one of the fissile exceptions provided by para. 672 of the Regulations is required to be applied.

801 The consignor is required to demonstrate on request that the package design complies with all applicable competent authority requirements.

815 Transitional arrangements for packages designed under the provisions of the 1985 or 1985 (As Amended 1990) Editions of the Regulations.

## 2. CONTENTS LIMITS FOR PACKAGES

408(a), Table 3 The activity limits in Table 3 of the Regulations are required to be met.

410, Table 3 For transport by post, the total activity in each package does not exceed one tenth of the relevant limit in Table 3 of the Regulations.

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

## 3. CONTAMINATION

508 Non-fixed contamination on the external surfaces of any package is required to be kept as low as practicable and is not allowed to exceed the following limits, averaged over any area of 300 cm<sup>2</sup> of any part of the surface:

- (a) Beta, gamma and low toxicity alpha emitters, 4.0 Bq/cm<sup>2</sup>;
- (b) All other alpha emitters, 0.4 Bq/cm<sup>2</sup>.

#### 4. MAXIMUM RADIATION LEVELS

516 The radiation level at any point on the external surface is not allowed to exceed 5  $\mu\text{Sv/h}$ .

517(a) The radiation level at 10 cm from any point on the external surface of any unpackaged instrument or article is not allowed to exceed 0.1 mSv/h.

#### 5. CATEGORIES OF PACKAGES AND OVERPACKS

Not applicable.

#### 6. MARKING AND LABELLING

507 Packages, freight containers and overpacks containing materials having other dangerous properties (e.g. corrosiveness) are required to also be marked and labelled as required by the relevant transport regulations.

517(b) The instrument or article is required to be marked "RADIOACTIVE", except for radioluminescent timepieces or devices or certain consumer products as specified in para. 517(b) of the Regulations.

535–537 All package markings are required to be legible and durable, and are required to be on the outside of the packaging.

535 Each package is required to be marked with an identification of either the consignor or consignee, or both.

536 Packages are required to bear the mark "UN 2911".

537 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass.

549 It is the consignor's responsibility to comply with the requirements of marking, labelling and placarding.

581(c)–(e) A consignment may be accepted for international movement by post, subject to such additional requirements as those established in para. 581 of the Regulations and as prescribed by the Acts of the Universal Postal Union.

## 7. REQUIREMENTS BEFORE SHIPMENT

502(a), (b) Before each shipment of any package, the following requirements apply:

(a) For any package, it is required to ensure that all of the requirements specified in the relevant provisions of the Regulations have been satisfied.

(b) It is required to ensure that lifting attachments which do not meet the requirements of para. 607 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 608 of the Regulations.

550(c) The transport documents with each consignment (consignment notes) are required to include the identification of the consignor and the consignee, including their names and addresses, and the UN number UN 2911.

## 8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

### 8.1. Modal requirements

580, Table 3 A consignment may be accepted for domestic movement by national postal authorities, subject to such additional requirements as those established in para. 580 of the Regulations and as prescribed by the authorities.

581, Table 3 A consignment may be accepted for international movement by post, subject to such additional requirements as those established in para. 581 of the Regulations and as prescribed by the Acts of the Universal Postal Union.

## **8.2. Placarding**

507, 549

Placards may be required for other dangerous properties of the contents, but not for the radioactive properties.

## **8.3. Stowage during transport, storage in transit and segregation**

Not applicable.

## **8.4. Damaged or leaking packages**

511

Movement of packages which are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport.

## **8.5. Decontamination**

Not applicable.

## **8.6. Other provisions**

309

In the event of non-compliance, appropriate actions are required to be taken as soon as possible, including communication and remedy.

**SCHEDULE FOR UN 2912**

**RADIOACTIVE MATERIAL,  
LOW SPECIFIC ACTIVITY (LSA-I),  
non-fissile or fissile-excepted**

<b>Paragraph number(s) of the Regulations [1]</b>	<b>Subject</b>
	1. GENERAL PROVISIONS
109, 507	Other dangerous properties of contents and transport with other dangerous goods.
301–303	General provisions for radiation protection.
304, 305, 556(c)	Emergency response.
306	Quality assurance.
311–314	Training.
501(a)	Requirement before the first shipment.
502	Requirements before each shipment.
525, Table 5	Activity limits.
606–616, 621	Design requirements for Type IP-1 packages.
617–619	Additional design requirements — air transport.
622	Additional design requirements for Type IP-2 packages (liquid contents, not under exclusive use).

- 624–628      Alternative design requirements for Type IP-2 packages (liquid contents, not under exclusive use).
- 634            Minimum dimensions of the package.
- 672            If the package contains fissile material, one of the fissile exceptions provided by para. 672 of the Regulations is required to be applied.
- 801            The consignor is required to demonstrate on request that the package design complies with all applicable competent authority requirements.
- 815            Transitional arrangements for packages designed under the provisions of the 1985 or 1985 (As Amended 1990) Editions of the Regulations.

## 2. CONTENTS LIMITS FOR PACKAGES

- 411<sup>a</sup>, 521      The contents are required to be restricted in accordance with the radiation levels specified in para. 521 of the Regulations.
- 503            A package is not allowed to contain any items other than those that are necessary for the use of the radioactive material. The interaction between these items and the package, under the conditions of transport applicable to the design, is not allowed to reduce the safety of the package.
- 523            LSA-I and SCO-I may be transported unpackaged under the conditions as stated in para. 523 of the Regulations.

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<sup>a</sup> The electronic version of the 2005 Edition of the Regulations, available on [www.iaea.org](http://www.iaea.org), should be used when referring to paras 405–419; in the printed version of the 2005 Edition of the Regulations, paras 405–419 are incorrectly numbered as 406–420.

### 3. CONTAMINATION

508, 509 Non-fixed contamination on the external surfaces of any package and on the external and internal surfaces of overpacks, freight containers, tanks, intermediate bulk containers and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over 300 cm<sup>2</sup> of any part of the surface:

- (a) Beta, gamma and low toxicity alpha emitters, 4.0 Bq/cm<sup>2</sup>;
- (b) All other alpha emitters, 0.4 Bq/cm<sup>2</sup>.

514 The requirements of paras 508 and 509 of the Regulations on non-fixed contamination do not apply to the internal surfaces of a freight container, tank, intermediate bulk container or conveyance dedicated to the transport of unpackaged LSA-I material under exclusive use, for as long as it remains under exclusive use.

### 4. MAXIMUM RADIATION LEVELS

- 530–532, 575
- (i) The radiation level for a package or overpack is required to be such that the transport index (TI) of the package or overpack does not exceed 10, except when transported under exclusive use; and
  - (ii) The maximum radiation level at any point on any external surface of the package or overpack is not allowed to exceed 2 mSv/h, except when the package or overpack is transported under exclusive use by rail or by road, or under exclusive use by sea<sup>b</sup>; and
  - (iii) The maximum radiation level at any point on any external surface of a package or overpack transported under exclusive use is not allowed to exceed 10 mSv/h.

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<sup>b</sup> Packages or overpacks having a surface radiation level greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels in accordance with Table 9 of the Regulations, footnote a, provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel.

## 5. CATEGORIES OF PACKAGES AND OVERPACKS

- 524, Table 4 LSA material and SCO are required to be packaged in accordance with Table 4 of the Regulations.
- 526, 527 The TI is required to be derived in accordance with the procedure as stated in paras 526 and 527 of the Regulations.
- 533, Table 7 Packages and overpacks are required to be assigned to category I-WHITE, category II-YELLOW or category III-YELLOW.

## 6. MARKING AND LABELLING

- 507 Packages, freight containers and overpacks containing materials having other dangerous properties (e.g. corrosiveness) are also required to be marked and labelled as required by the relevant transport regulations.
- 535 Each package is required to be marked with an identification of either the consignor or the consignee, or both.
- 535–538 All markings are required to be legible and durable, and are required to be on the outside of the packaging.
- 536, Table 8 Packages are required to bear the mark “UN 2912” and the proper shipping name “RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-I)”.
- 537 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass.
- 538(a) Each package which conforms to an IP-1 or IP-2 design is required to be marked with “TYPE IP-1” or “TYPE IP-2” as appropriate.

- 538(c) Each package which conforms to an IP-2 design is required to be marked with the international vehicle registration code (VRI Code) of the country of origin of design and either the name of the manufacturer or other identification of the packaging specified by the competent authority of the country of origin of design.
- 541 When the material is contained in receptacles or wrapping and is transported under exclusive use, it may be marked “RADIOACTIVE LSA-I”.
- 542 Any labels which do not relate to the radioactive contents are required to be removed or covered.
- 542, 547,  
Figs 2–4 Each package, overpack and freight container is required to bear the appropriate labels. Paragraph 547 of the Regulations sets out alternative provisions for large freight containers and tanks.
- 543 The labels are required to be fixed to two opposite sides of the outside of the package or overpack, or on all four sides of a freight container or tank. The labels are not allowed to cover the markings specified in paras 535–538 and para. 541 of the Regulations (see above).
- 544(a) The contents need to be marked on the label only as “LSA-I”.
- 544(b) The maximum activity of the contents is required to be marked on the label.
- 544(c) Except for mixed loads, each label on a freight container or overpack is required to be marked with:
- (a) The radioactive contents; and
  - (b) The maximum activity of the total radioactive contents during transport.

For mixed loads, such entries may read “See Transport Documents”.

544(d) Each label is required to show the TI, except for category I-WHITE, for which the TI is not required.

549 It is the consignor's responsibility to comply with the requirements of marking, labelling and placarding.

## 7. REQUIREMENTS BEFORE SHIPMENT

501(a) Before the first shipment of any package for which the design pressure exceeds 35 kPa, confirmation is required that the confinement system conforms to the approved design.

502(a), (b) Before each shipment of any package, the following requirements apply:

(a) For any package it is required to ensure that all the requirements specified in the relevant provisions of the Regulations have been satisfied.

(b) It is required to ensure that lifting attachments which do not meet the requirements of para. 607 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 608 of the Regulations.

550 Transport documents with each consignment (consignment notes) are required to include all relevant particulars of the consignment.

551–554 The consignor is required to include a declaration in the transport documents.

556 The consignor is required to provide a statement regarding actions to be taken by the carrier.

## 8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

### 8.1. Modal requirements

- 573(a)–(c) For transport by rail and by road: for consignments under exclusive use, the radiation level is not allowed to exceed:
- (a) 10 mSv/h at any point on the external surface of any package or overpack, and may only exceed 2 mSv/h provided that:
    - (i) The vehicle is equipped with an enclosure which prevents unauthorized access during transport; and
    - (ii) The package or overpack is secured to retain its position within the enclosure during routine transport; and
    - (iii) There are no loading or unloading operations between the beginning and the end of the shipment;
  - (b) 2 mSv/h at any point on the outer surfaces of the vehicle, including the upper and lower surfaces, or, in the case of an open vehicle, at any point on the vertical planes projected from the outer edges of the vehicle, on the upper surface of the load, and on the lower external surface of the vehicle; and
  - (c) 0.1 mSv/h at any point 2 m from the vertical planes represented by the outer lateral surfaces of the vehicle, or, if the load is transported in an open vehicle, at any point 2 m from the vertical planes projected from the outer edges of the vehicle.
- 574 For transport by road: no persons other than the driver and assistants are permitted in vehicles carrying packages, overpacks or freight containers bearing category II-YELLOW or category III-YELLOW labels.
- 575 For transport by vessels: packages or overpacks having a surface radiation level greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with Table 9 of the Regulations, footnote a, are not allowed to be transported.

576 For transport by vessels: the transport of consignments by means of a special use vessel is excepted from the requirements of para. 567 of the Regulations relating to TI and radiation level provided that the conditions stated in para. 576 of the Regulations are met.

579 For transport by air: packages or overpacks having a surface radiation level greater than 2 mSv/h are not allowed to be transported.

580, 581 Transport by post is not permitted.

## **8.2. Placarding**

507, 549 Placards may be required for other dangerous properties of the contents.

547, Fig. 6 Large freight containers and tanks are required to bear four placards in a vertical orientation on the two external side walls and the two external end walls.

547 Any placards which do not relate to the contents are required to be removed.

547, Figs 2–4, Fig. 6 As an alternative to the use of placards on large freight containers and tanks, enlarged labels are permitted.

548, Figs 6, 7 Where the consignment in a freight container or tank is unpackaged UN 2912 LSA-I, or where an exclusive use consignment in a freight container is packaged UN 2912 LSA-I, and no other UN number commodities are present in the freight container, the UN number “UN 2912” is required to be displayed, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

571, Figs 2–4, Fig. 6 The location of placards and the use of placards with reduced dimensions on a road or rail vehicle are stipulated.

572, Figs 6, 7 For carriage in or on a road or rail vehicle, where either the consignment is unpackaged UN 2912 LSA-I, or where an exclusive use consignment is packaged UN 2912 LSA-I only, and no other UN number commodities are present, the UN number “UN 2912” is required to be displayed, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

### **8.3. Stowage during transport, storage in transit and segregation**

505 The transport of other goods together with consignments being transported under exclusive use may be permitted.

563 Packages, overpacks and freight containers are required to be segregated during transport and during storage in transit. The criteria for segregation are set out in paras 563(a)–(d) and para. 506 of the Regulations:

563(a) Criteria for segregation from workers in regularly occupied working areas;

563(b) Criteria for segregation from members of the public;

563(c) Criteria for segregation from undeveloped photographic film; and

563(d), 506 Criteria for segregation from other dangerous goods.

564 Category II-YELLOW or category III-YELLOW packages or overpacks may be carried in compartments occupied by passengers under specific conditions.

565 Consignments are required to be securely stowed.

566 A package or overpack may be carried or stored among packaged general cargo.

567(a) For consignments of LSA-I material there is no limit on the total sum of TIs for packages, overpacks and freight containers aboard a single conveyance.

567(b) Limits on the radiation levels from freight containers and conveyances. See paras 573(b) and 573(c) of the Regulations for exceptions.

568 Any package or overpack having a TI greater than 10 is required to be transported only under exclusive use.

576 For a special use vessel, the storage arrangements are excepted from the requirements of para. 567 of the Regulations provided that the conditions stated in para. 576 of the Regulations are met.

#### **8.4. Damaged or leaking packages**

510 Actions to be taken when a package has been damaged or is leaking, or where it is suspected that the package may have leaked or been damaged.

511 Movement of packages which are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport.

#### **8.5. Decontamination**

504 Tanks and intermediate bulk containers used for the transport of radioactive material are not allowed to be used for storage or transport of other goods, unless decontaminated below one tenth of the levels specified in paras 508 and 509 of the Regulations.

512 Periodic checking of conveyances and equipment is required to determine the level of contamination.

514 A freight container, intermediate bulk container or conveyance dedicated to the transport of unpackaged LSA-I or SCO-I material under exclusive use may be excepted from the requirements specified in paras 508, 509 and 513 of the Regulations solely with regard to its internal surfaces and only for as long as it remains under that specific exclusive use.

513 Decontamination of conveyances, equipment or part thereof which have become contaminated.

#### **8.6. Other provisions**

309 In the event of non-compliance, appropriate actions are required to be taken as soon as possible, including communication and remedy.

582 Customs operations may be carried out only in a place where adequate means of controlling radiation exposure are provided.

583 Where a consignment is undeliverable, appropriate actions are required to be taken as soon as possible.

## SCHEDULE FOR UN 2913

### RADIOACTIVE MATERIAL, SURFACE CONTAMINATED OBJECTS (SCO-I OR SCO-II), non-fissile or fissile-excepted

<b>Paragraph number(s) of the Regulations [1]</b>	<b>Subject</b>
	1. GENERAL PROVISIONS
109, 507	Other dangerous properties of contents and transport with other dangerous goods.
301–303	General provisions for radiation protection.
304, 305, 556(c)	Emergency response.
306	Quality assurance.
311–314	Training.
501(a)	Requirement before the first shipment.
502	Requirements before each shipment.
525, Table 5	Activity limits.
606–616, 621	Design requirements for the packaging and the package, Type IP-1.
617–619	Additional design requirements — air transport.
622	Additional design requirements for the packaging and the package, Type IP-2.

- 624–628      Alternative design requirements for the packaging and the package, Type IP-2.
- 634            Minimum dimensions of the package.
- 672            If the excepted package contains fissile material, one of the fissile exceptions provided by para. 672 of the Regulations is required to be applied.
- 801            The consignor is required to demonstrate on request that the package design complies with all applicable competent authority requirements.
- 815            Transitional arrangements for packages designed under the provisions of the 1985 or 1985 (As Amended 1990) Editions of the Regulations.

## 2. CONTENTS LIMITS FOR PACKAGES

- 411<sup>a</sup>, 521      The contents are required to be restricted in accordance with the radiation levels specified in para. 521 of the Regulations.
- 503            A package is not allowed to contain any items other than those that are necessary for the use of the radioactive material. The interaction between these items and the package, under the conditions of transport applicable to the design, is not allowed to reduce the safety of the package.
- 523            LSA-I and SCO-I may be transported unpackaged under the conditions as stated in para. 523 of the Regulations.

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<sup>a</sup> The electronic version of the 2005 Edition of the Regulations, available on [www.iaea.org](http://www.iaea.org), should be used when referring to paras 405–419; in the printed version of the 2005 Edition of the Regulations, paras 405–419 are incorrectly numbered as 406–420.

### 3. CONTAMINATION

508, 509 Non-fixed contamination on the external surfaces of any package and on the external and internal surfaces of overpacks, freight containers, tanks, intermediate bulk containers and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over 300 cm<sup>2</sup> of any part of the surface:

- (a) Beta, gamma and low toxicity alpha emitters, 4.0 Bq/cm<sup>2</sup>;
- (b) All other alpha emitters, 0.4 Bq/cm<sup>2</sup>.

514 The requirements of paras 508 and 509 of the Regulations on non-fixed contamination do not apply to the internal surfaces of a freight container, tank, intermediate bulk container or conveyance dedicated to the transport of unpackaged SCO-I material under exclusive use, for as long as it remains under exclusive use.

### 4. MAXIMUM RADIATION LEVELS

- 530–532, 575
- (i) The radiation level for a package or overpack is required to be such that the TI of the package or overpack does not exceed 10, except when transported under exclusive use; and
  - (ii) The maximum radiation level at any point on any external surface of the package or overpack is not allowed to exceed 2 mSv/h, except when transported under exclusive use by rail or by road, or under exclusive use by sea<sup>b</sup>; and
  - (iii) The maximum radiation level at any point on any external surface of a package or overpack transported under exclusive use is not allowed to exceed 10 mSv/h.

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<sup>b</sup> Packages or overpacks having a surface radiation level greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels in accordance with Table 9 of the Regulations, footnote a, provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel.

## 5. CATEGORIES OF PACKAGES AND OVERPACKS

- 524, Table 4 LSA material and SCO are required to be packaged in accordance with Table 4 of the Regulations.
- 526, 527 The TI is required to be derived in accordance with the procedure as stated in paras 526 and 527 of the Regulations.
- 533, Table 7 Packages and overpacks are required to be assigned to category I-WHITE, category II-YELLOW or category III-YELLOW.

## 6. MARKING AND LABELLING

- 507 Packages, freight containers and overpacks containing materials having other dangerous properties (e.g. corrosiveness) are also required to be marked and labelled as required by the relevant transport regulations.
- 535 Each package is required to be marked with an identification of either the consignor or the consignee, or both.
- 535–538 All markings are required to be legible and durable, and are required to be on the outside of the packaging.
- 536, Table 8 Packages are required to bear the mark “UN 2913” and the proper shipping name, either “RADIOACTIVE MATERIAL, SURFACE CONTAMINATED OBJECTS (SCO-I)” or “RADIOACTIVE MATERIAL, SURFACE CONTAMINATED OBJECTS (SCO-II)”, depending on the contents.
- 537 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass.
- 538(a) Each package which conforms to an IP-1 or IP-2 design is required to be marked with “TYPE IP-1” or “TYPE IP-2” as appropriate.

- 538(c) Each package which conforms to an IP-2 design is required to be marked with the international vehicle registration code (VRI Code) of the country of origin of design and either the name of the manufacturer or other identification of the packaging specified by the competent authority of the country of origin of design.
- 541 When the material is contained in receptacles or wrapping and is transported under exclusive use, it may be marked “RADIOACTIVE SCO-I”.
- 542 Any labels which do not relate to the radioactive contents are required to be removed or covered.
- 542, 547,  
Figs 2–4 Each package, overpack and freight container is required to bear the appropriate labels. Paragraph 547 of the Regulations sets out alternative provisions for large freight containers and tanks.
- 543 The labels are required to be fixed to two opposite sides of the outside of the package or overpack, or on all four sides of a freight container or tank. The labels are not allowed to cover the markings specified in paras 535–538 and para. 541 of the Regulations (see above).
- 544(a) Each label is required to be marked with the name(s) of the radionuclide(s), followed by either “SCO-I” or “SCO-II”, as applicable. Paragraph 544(a) of the Regulations also establishes requirements for labelling mixtures of radionuclides.
- 544(b) The maximum activity of the contents is required to be marked on the label.
- 544(c) Except for mixed loads, each label on a freight container or overpack is required to be marked with:

- (a) The radioactive contents; and
- (b) The maximum activity of the total radioactive contents during transport.

For mixed loads such entries may read “See Transport Documents”.

544(d) Each label is required to show the TI, except for category I-WHITE, for which the TI is not required.

549 It is the consignor’s responsibility to comply with the requirements of marking, labelling and placarding.

## 7. REQUIREMENTS BEFORE SHIPMENT

501(a) Before the first shipment of any package for which the design pressure exceeds 35 kPa, confirmation is required that the confinement system conforms to the approved design.

502(a), (b) Before each shipment of any package, the following requirements apply:

- (a) For any package it is required to ensure that all the requirements specified in the relevant provisions of the Regulations have been satisfied.
- (b) It is required to ensure that lifting attachments which do not meet the requirements of para. 607 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 608 of the Regulations.

550 Transport documents with each consignment (consignment notes) are required to include all relevant particulars of the consignment.

551–554 The consignor is required to include a declaration in the transport documents.

556 The consignor is required to provide a statement regarding actions to be taken by the carrier.

## 8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

### 8.1. Modal requirements

573(a)–(c) For transport by rail and by road: for consignments under exclusive use, the radiation level is not allowed to exceed:

- (a) 10 mSv/h at any point on the external surface of any package or overpack, and may only exceed 2 mSv/h provided that:
  - (i) The vehicle is equipped with an enclosure which prevents unauthorized access during transport; and
  - (ii) The package or overpack is secured to retain its position within the enclosure during routine transport; and
  - (iii) There are no loading or unloading operations between the beginning and the end of the shipment;
- (b) 2 mSv/h at any point on the outer surfaces of the vehicle, including the upper and lower surfaces, or, in the case of an open vehicle, at any point on the vertical planes projected from the outer edges of the vehicle, on the upper surface of the load, and on the lower external surface of the vehicle; and
- (c) 0.1 mSv/h at any point 2 m from the vertical planes represented by the outer lateral surfaces of the vehicle, or, if the load is transported in an open vehicle, at any point 2 m from the vertical planes projected from the outer edges of the vehicle.

- 574 For transport by road: no persons other than the driver and assistants are permitted in vehicles carrying packages, overpacks or freight containers bearing category II-YELLOW or category III-YELLOW labels.
- 575 For transport by vessels: packages or overpacks having a surface radiation level greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with Table 9 of the Regulations, footnote a, are not allowed to be transported.
- 576 For transport by vessels: the transport of consignments by means of a special use vessel is exempted from the requirements of para. 567 of the Regulations relating to TI and radiation level provided that the conditions stated in para. 576 of the Regulations are met.
- 579 For transport by air: packages or overpacks having a surface radiation level greater than 2 mSv/h are not allowed to be transported.
- 580, 581 Transport by post is not permitted.

## **8.2. Placarding**

- 507, 549 Placards may be required for other dangerous properties of the contents.
- 547, Fig. 6 Large freight containers are required to bear four placards in a vertical orientation on the two external side walls and the two external end walls.
- 547 Any placards which do not relate to the contents are required to be removed.
- 547, Figs 2–4, Fig. 6 As an alternative to the use of placards on large freight containers, enlarged labels are permitted.

- 548, Figs 6, 7      Where the consignment in the freight container is unpackaged SCO-I, or where an exclusive use consignment in a freight container is packaged UN 2913 SCO-I or SCO-II, and no other UN number commodities are present, the UN number “UN 2913” is required to be displayed on all four sides of the freight container, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.
- 571, Figs 2–4,  
Fig. 6      The location of placards and the use of placards with reduced dimensions on a road or rail vehicle are stipulated.
- 572, Figs 6, 7      Where the consignment in or on a road or rail vehicle is unpackaged UN 2913 SCO-I only, or where an exclusive use consignment is packaged UN 2913 SCO-I or SCO-II only, and no other UN number commodities are present, the UN number “UN 2913” is required to be displayed, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

### **8.3. Stowage during transport, storage in transit and segregation**

- 505      The transport of other goods together with consignments being transported under exclusive use may be permitted.
- 563      Packages, overpacks and freight containers are required to be segregated during transport and during storage in transit. The criteria for segregation are set out in paras 563(a)–563(d) and para. 506 of the Regulations:
- 563(a)      Criteria for segregation from workers in regularly occupied working areas;
- 563(b)      Criteria for segregation from members of the public;
- 563(c)      Criteria for segregation from undeveloped photographic film;

- 563(d), 506 Criteria for segregation from other dangerous goods.
- 564 Category II-YELLOW or category III-YELLOW packages or overpacks may be carried in compartments occupied by passengers under specific conditions.
- 565 Consignments are required to be securely stowed.
- 566 A package or overpack may be carried or stored among packaged general cargo.
- 567(a), Table 9 Transport index limits for freight containers and conveyances.  
567(b) Limits on the radiation levels from freight containers and conveyances. See paras 573(b) and 573(c) of the Regulations for exceptions.
- 568 Any package or overpack having a TI greater than 10 is required to be transported only under exclusive use.
- 576 For a special use vessel, the storage arrangements are excepted from the requirements of para. 567 of the Regulations provided that the conditions stated in para. 576 of the Regulations are met.

#### **8.4. Damaged or leaking packages**

- 510 Actions to be taken when a package has been damaged or is leaking, or where it is suspected that the package may have leaked or been damaged.
- 511 Movement of packages which are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport.

#### **8.5. Decontamination**

- 504 Intermediate bulk containers used for the transport of radioactive material are not allowed to be used for storage or transport of other goods, unless decontaminated below one tenth of the levels specified in paras 508 and 509 of the Regulations.

512 Periodic checking of conveyances and equipment is required to determine the level of contamination.

514 A freight container, intermediate bulk container or conveyance dedicated to the transport of unpackaged LSA-I or SCO-I material under exclusive use may be excepted from the requirements specified in paras 508, 509 and 513 of the Regulations solely with regard to its internal surfaces and only for as long as it remains under that specific exclusive use.

513 Decontamination of conveyances, equipment or part thereof which have become contaminated.

#### **8.6. Other provisions**

309 In the event of non-compliance, appropriate actions are required to be taken as soon as possible, including communication and remedy.

582 Customs operations may be carried out only in a place where adequate means of controlling radiation exposure are provided.

583 Where a consignment is undeliverable, appropriate actions are required to be taken as soon as possible.

## SCHEDULE FOR UN 2915

### **RADIOACTIVE MATERIAL, TYPE A PACKAGE, non-special form, non-fissile or fissile-excepted**

<b>Paragraph number(s) of the Regulations [1]</b>	<b>Subject</b>
	1. GENERAL PROVISIONS
109, 507	Other dangerous properties of contents and transport with other dangerous goods.
301–303	General provisions for radiation protection.
304, 305, 556(c)	Emergency response.
306	Quality assurance.
311–314	Training.
501(a)	Requirements before the first shipment.
502	Requirements before each shipment.
606–616	Design requirements for all packagings and packages.
617–619	Additional design requirements — air transport.
633	Design requirements for Type A packages, summary.
634–646	Additional design requirements for Type A packages.
647–648	Additional design requirements for packages containing liquids.

- 649 Additional design requirements for packages containing gases.
- 672 If the package contains fissile material, one of the fissile exceptions provided by para. 672 of the Regulations is required to be applied.
- 801 The consignor is required to demonstrate on request that the package design complies with all applicable competent authority requirements.
- 815 Transitional arrangements for packages designed under the provisions of the 1985 or 1985 (As Amended 1990) Editions of the Regulations.

## 2. CONTENTS LIMITS FOR PACKAGES

- 413(b)<sup>a</sup>, 414 The quantity of radioactive material is not allowed to exceed the limits specified in paras 413(b) and 414 of the Regulations.
- 503 A package is not allowed to contain any items other than those that are necessary for the use of the radioactive material. The interaction between these items and the package, under the conditions of transport applicable to the design, is not allowed to reduce the safety of the package.

## 3. CONTAMINATION

- 508, 509 Non-fixed contamination on the external surfaces of any package and on the external and internal surfaces of overpacks, freight containers, tanks, intermediate bulk containers and conveyances is required to be kept as low as practicable and not exceed the following limits, when averaged over any area of 300 cm<sup>2</sup> of any part of the surface:

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<sup>a</sup> The electronic version of the 2005 Edition of the Regulations, available on [www.iaea.org](http://www.iaea.org), should be used when referring to paras 405–419; in the printed version of the 2005 Edition of the Regulations, paras 405–419 are incorrectly numbered as 406–420.

- (a) Beta, gamma and low toxicity alpha emitters, 4.0 Bq/cm<sup>2</sup>;
- (b) All other alpha emitters, 0.4 Bq/cm<sup>2</sup>.

#### 4. MAXIMUM RADIATION LEVELS

- 530–532, 575
- (i) The radiation level for a package or overpack is required to be such that the TI of the package or overpack does not exceed 10, except when transported under exclusive use; and
  - (ii) The maximum radiation level at any point on any external surface of the package or overpack is not allowed to exceed 2 mSv/h, except when the package or overpack is transported under exclusive use by rail or by road, or under exclusive use by sea<sup>b</sup>; and
  - (iii) The maximum radiation level at any point on any external surface of a package or overpack transported under exclusive use is not allowed to exceed 10 mSv/h.

#### 5. CATEGORIES OF PACKAGES AND OVERPACKS

- 526, 527
- The TI is required to be derived in accordance with the procedure as stated in paras 526 and 527 of the Regulations.
- 533, Table 7
- Packages and overpacks are required to be assigned to category I-WHITE, category II-YELLOW or category III-YELLOW.

#### 6. MARKING AND LABELLING

- 507
- Packages, freight containers and overpacks containing materials having other dangerous properties (e.g. corrosiveness) are required to be marked and labelled as required by the relevant transport regulations.

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<sup>b</sup> Packages or overpacks having a surface radiation level greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels in accordance with Table 9 of the Regulations, footnote a, provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel.

- 535 Each package is required to be marked with an identification of either the consignor or the consignee, or both.
- 535–538 All markings are required to be legible and durable, and are required to be on the outside of the packaging.
- 536, Table 8 Packages are required to bear the mark “UN 2915” and the proper shipping name “RADIOACTIVE MATERIAL, TYPE A PACKAGE”.
- 537 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass.
- 538(b) Each package is required to be marked with “TYPE A”.
- 538(c) Each package is required to be marked with the international vehicle registration code (VRI Code) of the country of origin of design and either the name of the manufacturer or other identification of the packaging specified by the competent authority of the country of origin of the design.
- 542 Any labels which do not relate to the radioactive contents are required to be removed or covered.
- 542, 547,  
Figs 2–4 Each package, overpack and freight container is required to bear the appropriate labels. Paragraph 547 of the Regulations sets out alternative provisions for large freight containers.
- 543 The labels are required to be fixed to two opposite sides of the outside of the package or overpack, or on all four sides of a freight container. The labels are not allowed to cover the markings specified in paras 535–538 of the Regulations.
- 544(a), (b), (d),  
Table 1 Each label is required to be marked with the name(s) of the radionuclide(s), the maximum activity of the contents and the TI, except for category I-WHITE, for which the TI is not required. Paragraph 544(a) of the Regulations establishes requirements for labelling mixtures of radionuclides.

544(c) Except for mixed loads, each label on a freight container or overpack is required to be marked with:

- (a) The radioactive contents; and
- (b) The maximum activity of the total radioactive contents during transport.

For mixed loads such entries may read “See Transport Documents”.

549 It is the consignor’s responsibility to comply with the requirements of marking, labelling and placarding.

## 7. REQUIREMENTS BEFORE SHIPMENT

501(a) Before the first shipment of any package for which the design pressure exceeds 35 kPa, confirmation is required that the confinement system conforms to the approved design.

502(a), (b) Before each shipment of any package, the following requirements apply:

- (a) For any package it is required to ensure that all the requirements specified in the relevant provisions of the Regulations have been satisfied.
- (b) It is required to ensure that lifting attachments which do not meet the requirements of para. 607 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 608 of the Regulations.

550 Transport documents with each consignment (consignment notes) are required to include all relevant particulars of the consignment.

551–554 The consignor is required to include a declaration in the transport documents.

556 The consignor is required to provide a statement regarding actions to be taken by the carrier.

## 8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

### 8.1. Modal requirements

- 573(a)–(c) For transport by rail and by road: for consignments under exclusive use, the radiation level is not allowed to exceed:
- (a) 10 mSv/h at any point on the external surface of any package or overpack, and may only exceed 2 mSv/h provided that:
    - (i) The vehicle is equipped with an enclosure which prevents unauthorized access during transport; and
    - (ii) The package or overpack is secured to retain its position within the enclosure during routine transport; and
    - (iii) There are no loading or unloading operations between the beginning and the end of the shipment;
  - (b) 2 mSv/h at any point on the outer surfaces of the vehicle, including the upper and lower surfaces, or, in the case of an open vehicle, at any point on the vertical planes projected from the outer edges of the vehicle, on the upper surface of the load, and on the lower external surface of the vehicle; and
  - (c) 0.1 mSv/h at any point 2 m from the vertical planes represented by the outer lateral surfaces of the vehicle, or, if the load is transported in an open vehicle, at any point 2 m from the vertical planes projected from the outer edges of the vehicle.
- 574 For transport by road: no persons other than the driver and assistants are permitted in vehicles carrying packages, overpacks or freight containers bearing category II-YELLOW or category III-YELLOW labels.
- 575 For transport by vessels: packages or overpacks having a surface radiation level greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with Table 9 of the Regulations, footnote a, are not allowed to be transported.

576 For transport by vessels: the transport of consignments by means of a special use vessel may be excepted from the requirements of para. 567 of the Regulations provided that the conditions stated in para. 576 of the Regulations are met.

579 For transport by air: packages or overpacks having a surface radiation level greater than 2 mSv/h are not allowed to be transported.

580, 581 Transport by post is not permitted.

## **8.2. Placarding**

507, 549 Placards may be required for other dangerous properties of the contents.

547, Fig. 6 Large freight containers are required to bear four placards in a vertical orientation on the two external side walls and the two external end walls.

547 Any placards which do not relate to the contents are required to be removed.

547, Figs 2–4, Fig. 6 As an alternative to the use of placards on large freight containers and tanks, enlarged labels are permitted.

548, Figs 6, 7 Where an exclusive use consignment in a freight container is UN 2915 Type A packages, and no other UN number commodities are present, the UN number “UN 2915” is required to be displayed on all four sides of the freight container, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

571, Figs 2–4, Fig. 6 The location of placards and the use of placards with reduced dimensions on a road or rail vehicle are stipulated.

572, Figs 6, 7 Where an exclusive use consignment in or on a road or rail vehicle is UN 2915 Type A packages only, and no other UN number commodities are present, the UN number “UN 2915” is required to be displayed, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

### **8.3. Stowage during transport, storage in transit and segregation**

505 The transport of other goods together with consignments being transported under exclusive use may be permitted.

563 Packages, overpacks and freight containers are required to be segregated during transport and during storage in transit. The criteria for segregation are set out in paras 563(a)–563(d) and para. 506 of the Regulations:

563(a) Criteria for segregation from workers in regularly occupied working areas;

563(b) Criteria for segregation from members of the public;

563(c) Criteria for segregation from undeveloped photographic film; and

563(d), 506 Criteria for segregation from other dangerous goods.

564 Category II-YELLOW or category III-YELLOW packages or overpacks may be carried in compartments occupied by passengers under specific conditions.

565 Consignments are required to be securely stowed.

566 A package or overpack may be carried or stored among packaged general cargo.

567(a), Table 9 Transport index limits for freight containers and conveyances.

567(b) Limits on the radiation levels from freight containers and conveyances. See paras 573(b) and 573(c) of the Regulations for exceptions.

568 Any package or overpack having a TI greater than 10 is required to be transported only under exclusive use.

576 For a special use vessel, the storage arrangements are excepted from the requirements of para. 567 of the Regulations provided that the conditions stated in para. 576 of the Regulations are met.

#### **8.4. Damaged or leaking packages**

510 Actions to be taken when a package has been damaged or is leaking, or where it is suspected that the package may have leaked or been damaged.

511 Movement of packages which are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport.

#### **8.5. Decontamination**

512 Periodic checking of conveyances and equipment is required to determine the level of contamination.

513 Decontamination of conveyances, equipment or part thereof which have become contaminated.

#### **8.6. Other provisions**

309 In the event of non-compliance, appropriate actions are required to be taken as soon as possible, including communication and remedy.

582 Customs operations may be carried out only in a place where adequate means of controlling radiation exposure are provided.

583 Where a consignment is undeliverable, appropriate actions are required to be taken as soon as possible.

## SCHEDULE FOR UN 2916

### RADIOACTIVE MATERIAL, TYPE B(U) PACKAGE, non-fissile or fissile-excepted

<b>Paragraph number(s) of the Regulations [1]</b>	<b>Subject</b>
	1. GENERAL PROVISIONS
109, 507	Other dangerous properties of contents and transport with other dangerous goods.
301–303	General provisions for radiation protection.
304, 305, 556(c)	Emergency response.
306	Quality assurance.
311–314	Training.
501(a), (b)	Requirements before the first shipment.
502	Requirements before each shipment.
562	Possession of package design certificates, and instructions for (a) the proper closing of the package and (b) other preparations for shipment.
650	Design requirements for Type B(U) packages, summary.
602–604	Design requirements for special form radioactive material.
605	Design requirements for low dispersible radioactive material.
606–616	Design requirements for all packagings and packages.

- 617–619 Additional design requirements — air transport.
- 634–645, 646(b) Additional design requirements for Type B (and Type A) packages.
- 651–664 Additional design requirements for Type B packages.
- 647 Additional design requirements for packages containing liquids.
- 672 If the package contains fissile material, one of the fissile exceptions provided by para. 672 of the Regulations is required to be applied.
- 802(a), 806–808 Package design requirements — competent authority approval.
- 816, 817 Transitional arrangements for packages approved under the 1973, 1973 (As Amended), 1985 and 1985 (As Amended 1990) Editions of the Regulations.
- 818 Transitional arrangements for special form radioactive material approved under the 1973, 1973 (As Amended), 1985 and 1985 (As Amended 1990) Editions of the Regulations.
- 819 Packaging serial numbers — informing the competent authority.

## 2. CONTENTS LIMITS FOR PACKAGES

- 415<sup>a</sup>, 416 The quantity of radioactive material is not allowed to exceed the limits specified in paras 415 and 416 of the Regulations.

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<sup>a</sup> The electronic version of the 2005 Edition of the Regulations, available on [www.iaea.org](http://www.iaea.org), should be used when referring to paras 405–419; in the printed version of the 2005 Edition of the Regulations, paras 405–419 are incorrectly numbered as 406–420.

503 A package is not allowed to contain any other items other than those that are necessary for the use of the radioactive material. The interaction between these items and the package, under the conditions of transport applicable to the design, is not allowed to reduce the safety of the package.

### 3. CONTAMINATION

508, 509 Non-fixed contamination on the external surfaces of any package and on the external and internal surfaces of overpacks, freight containers, tanks, intermediate bulk containers and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over any area of 300 cm<sup>2</sup> of any part of the surface:

- (a) Beta, gamma and low toxicity alpha emitters, 4.0 Bq/cm<sup>2</sup>;
- (b) All other alpha emitters, 0.4 Bq/cm<sup>2</sup>.

### 4. MAXIMUM RADIATION LEVELS

- 530–532, 575
- (i) The radiation level for a package or overpack is required to be such that the TI of the package or overpack does not exceed 10, except when transported under exclusive use; and
  - (ii) The maximum radiation level at any point on any external surface of the package or overpack is not allowed to exceed 2 mSv/h, except when transported under exclusive use by rail or by road, or under exclusive use by sea<sup>b</sup>; and
  - (iii) The maximum radiation level at any point on any external surface of a package or overpack transported under exclusive use is not allowed to exceed 10 mSv/h.

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<sup>b</sup> Packages or overpacks having a surface radiation level greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels in accordance with Table 9 of the Regulations, footnote a, provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel.

## 5. CATEGORIES OF PACKAGES AND OVERPACKS

- 526, 527 The TI is required to be derived in accordance with the procedure as stated in paras 526 and 527 of the Regulations.
- 533, Table 7 Packages and overpacks are required to be assigned to category I-WHITE, category II-YELLOW or category III-YELLOW.

## 6. MARKING AND LABELLING

- 507 Packages, freight containers and overpacks containing materials having additional dangerous properties (e.g. corrosiveness) are required to be marked and labelled as required by the relevant transport regulations.
- 535 Each package is required to be marked with an identification of either the consignor or the consignee, or both.
- 535–537, 539 All markings are required to be legible and durable, and are required to be on the outside of the packaging.
- 536, Table 8 Packages are required to bear the mark “UN 2916” and the proper shipping name “RADIOACTIVE MATERIAL, TYPE B(U) PACKAGE”.
- 537 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass.
- 539 Each package is required to be marked with:
- (a) The identification mark allocated to that design by the competent authority;
  - (b) A serial number to uniquely identify each packaging which conforms to that design;
  - (c) “TYPE B(U)”.

- 540, Fig. 1            The outside of the outermost receptacle which is resistant to the effects of fire and water is required to be plainly marked by embossing, stamping, or other means resistant to the effects of fire and water, with the trefoil symbol shown in Fig. 1 of the Regulations.
- 542                    Any labels which do not relate to the radioactive contents are required to be removed or covered.
- 542, 547,  
Figs 2–4                Each package, overpack and freight container is required to bear the appropriate labels. Paragraph 547 of the Regulations sets out alternative provisions for large freight containers and tanks.
- 543                    The labels are required to be fixed to two opposite sides of the outside of the package or overpack, or on all four sides of a freight container or tank, and are not allowed to cover the markings specified in paras 535–537, para. 539 and para. 540 of the Regulations.
- 544(a), (b), (d),  
Table 1                Each label is required to be marked with the name(s) of the radionuclide(s), the maximum activity of the contents and the TI. Paragraph 544(a) of the Regulations establishes requirements for labelling mixtures of radionuclides.
- 544(c)                Except for mixed loads, each label on a freight container or overpack is required to be marked with:
- (a) The radioactive contents; and  
(b) The maximum activity of the total radioactive contents during transport.
- For mixed loads such entries may read “See Transport Documents”.
- 549                    It is the consignor’s responsibility to comply with the requirements of marking, labelling and placarding.

## 7. REQUIREMENTS BEFORE SHIPMENT

- 501(a), (b) Before the first shipment, confirmation is required that the shielding, containment, heat transfer characteristics and confinement system conform to the approved design.
- 502(a)–(f), (h) Before each shipment of any package, the following requirements apply:
- (a) For any package it is required to ensure that all the requirements specified in the relevant provisions of the Regulations have been satisfied.
  - (b) It is required to ensure that lifting attachments which do not meet the requirements of para. 607 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 608 of the Regulations.
  - (c) For each package, it is required to ensure that all the requirements specified in the competent authority approval certificates have been satisfied.
  - (d) Each package is required to 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 package, it is required to ensure 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 paras 657 and 669 of the Regulations were made.
  - (f) For each special form radioactive material, it is required to ensure that all the requirements specified in the approval certificate and the relevant provisions of the Regulations have been satisfied.

- (h) For each low dispersible radioactive material, it is required to ensure that all the requirements specified in the approval certificate and the relevant provisions of the Regulations have been satisfied.
- 550 Transport documents with each consignment (consignment notes) are required to include all relevant particulars of the consignment.
- 551–554 The consignor is required to include a declaration in the transport documents.
- 556 The consignor is required to provide a statement regarding actions to be taken by the carrier.
- 557 The consignor is required to make competent authority certificates available to the carrier(s) before loading and unloading.
- 558 Before the first shipment, the consignor is required to ensure that copies of each competent authority certificate applying to that package design have been submitted to the competent authority of each country through or into which the consignment is to be transported. The consignor is not required to await an acknowledgement from the competent authority, nor is the competent authority required to make an acknowledgement of receiving the certificate.
- 559(b) For each shipment containing radioactive material with an activity greater than  $3000A_1$  or  $3000A_2$ , as appropriate, or 1000 TBq, whichever is the lower, the consignor is required to notify the competent authority of each country through or into which the consignment is to be transported. This notification is required to have been received by each competent authority prior to the commencement of the shipment, and preferably at least 7 days in advance. See also para. 560 of the Regulations.

- 560 The notification referred to in para. 559 of the Regulations is required to include:
- (a) Clear identification of the package, including all applicable certificate numbers and identification marks;
  - (b) The date of shipment, the expected date of arrival and the proposed routing;
  - (c) The names of the radioactive materials or nuclides;
  - (d) Descriptions of the physical and chemical forms of the radioactive material, or whether it is special form radioactive material or low dispersible radioactive material;
  - (e) The maximum activity of the radioactive contents during transport, expressed in becquerels (Bq) with the appropriate SI prefix symbol (see Annex II of the Regulations).

821, 827 Shipments — competent authority authorization of transport or shipment approval.

## 8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

### 8.1. Modal requirements

416 Conditions for air transport.

573(a)–(c) For transport by rail and by road: for consignments under exclusive use, the radiation level is not allowed to exceed:

- (a) 10 mSv/h at any point on the external surface of any package or overpack, and may only exceed 2 mSv/h provided that:
  - (i) The vehicle is equipped with an enclosure which prevents unauthorized access during transport; and
  - (ii) The package or overpack is secured to retain its position within the enclosure during routine transport; and
  - (iii) There are no loading or unloading operations between the beginning and the end of the shipment.

- (b) 2 mSv/h at any point on the outer surfaces of the vehicle, including the upper and lower surfaces, or, in the case of an open vehicle, at any point on the vertical planes projected from the outer edges of the vehicle, on the upper surface of the load, and on the lower external surface of the vehicle; and
- (c) 0.1 mSv/h at any point 2 m from the vertical planes represented by the outer lateral surfaces of the vehicle, or, if the load is transported in an open vehicle, at any point 2 m from the vertical planes projected from the outer edges of the vehicle.

574 For transport by road: no persons other than the driver and assistants are permitted in vehicles carrying packages, overpacks or freight containers bearing category II-YELLOW or category III-YELLOW labels.

575 For transport by vessels: Packages or overpacks having a surface radiation level greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with Table 9 of the Regulations, footnote a, are not allowed to be transported.

576 For transport by vessels: the transport of consignments by means of a special use vessel may be excepted from the requirements of para. 567 of the Regulations relating to TI and radiation level provided that the conditions stated in para. 576 of the Regulations are met.

579 For transport by air: packages or overpacks having a surface radiation level greater than 2 mSv/h are not allowed to be transported.

580, 581 Transport by post is not permitted.

## **8.2. Placarding**

507, 549 Placards may be required for other dangerous properties of the contents.

- 547, Fig. 6 Large freight containers and tanks are required to bear four placards in a vertical orientation on the two external side walls and the two external end walls.
- 547 Any placards which do not relate to the contents are required to be removed.
- 547, Figs 2–4, Fig. 6 As an alternative to the use of placards on large freight containers and tanks, enlarged labels are permitted.
- 548, Figs 6, 7 Where an exclusive use consignment in a freight container is UN 2916 Type B(U) packages, and no other UN number commodities are present, the UN number “UN 2916” is required to be displayed on all four sides of the freight container, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.
- 571, Figs 2–4, Fig. 6 The location of placards and the use of placards with reduced dimensions on a road or rail vehicle are stipulated.
- 572, Figs 6, 7 Where an exclusive use consignment in or on a road or rail vehicle is UN 2916 Type B(U) packages only, and no other UN number commodities are present, the UN number “UN 2916” is required to be displayed, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

### **8.3. Stowage during transport, storage in transit and segregation**

- 505 The transport of other goods together with consignments being transported under exclusive use may be permitted.

- 563 Packages, overpacks and freight containers are required to be segregated during transport and during storage in transit. The criteria for segregation are set out in paras 563(a)–563(d) and para. 506 of the Regulations:
- 563(a) Criteria for segregation from workers in regularly occupied working areas;
- 563(b) Criteria for segregation from members of the public;
- 563(c) Criteria for segregation from undeveloped photographic film;
- 563(d), 506 Criteria for segregation from other dangerous goods.
- 564 Category II-YELLOW or category III-YELLOW packages or overpacks may be carried in compartments occupied by passengers under specific conditions.
- 565 Consignments are required to be securely stowed.
- 566 A package or overpack may be carried or stored among packaged general cargo.
- 567(a), Table 9 Transport index limits for freight containers and conveyances.
- 567(b) Limits on the radiation levels from freight containers and conveyances. See paras 573(b) and 573(c) of the Regulations for exceptions.
- 568 Any package or overpack having a TI greater than 10 is required to be transported only under exclusive use.
- 576 For a special use vessel, the storage arrangements are excepted from the requirements of para. 567 of the Regulations provided that the conditions stated in para. 576 of the Regulations are met.

#### **8.4. Damaged or leaking packages**

- 510 Actions to be taken when a package has been damaged or is leaking, or where it is suspected that the package may have leaked or been damaged.

511 Movement of packages which are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport.

### **8.5. Decontamination**

512 Periodic checking of conveyances and equipment is required to determine the level of contamination.

513 Decontamination of conveyances, equipment or part thereof which have become contaminated.

### **8.6. Other provisions**

309 In the event of non-compliance, appropriate actions are required to be taken as soon as possible, including communication and remedy.

582 Customs operations may be carried out only in a place where adequate means of controlling radiation exposure are provided.

583 Where a consignment is undeliverable, appropriate actions are required to be taken as soon as possible.

## SCHEDULE FOR UN 2917

### RADIOACTIVE MATERIAL, TYPE B(M) PACKAGE, non-fissile or fissile-excepted

<b>Paragraph number(s) of the Regulations [1]</b>	<b>Subject</b>
	1. GENERAL PROVISIONS
109, 507	Other dangerous properties of contents and transport with other dangerous goods.
301–303	General provisions for radiation protection.
304, 305, 556(c)	Emergency response.
306	Quality assurance.
311–314	Training.
501(a), (b)	Requirements before the first shipment.
502	Requirements before each shipment.
562	Possession of package design approval certificates, and possession of instructions for (a) the proper closing of the package and (b) other preparations for shipment.
665	Design requirements for Type B(M) packages, summary and exceptions.
602–604	Design requirements for special form radioactive material.
605	Design requirements for low dispersible radioactive material.
606–616	Design requirements for all packagings and packages.

- 617–619 Additional design requirements — air transport.
- 634–645, 646(b) Additional design requirements for Type A and Type B packages.
- 651–664 Additional design requirements for Type B packages.
- 647 Additional design requirements for packages containing liquids.
- 672 If the package contains fissile material, one of the fissile exceptions provided by para. 672 of the Regulations is required to be applied.
- 802(a), 809–811 Package design requirements — competent authority approval.
- 816, 817 Transitional arrangements for packages approved under the 1973, 1973 (As Amended), 1985 and 1985 (As Amended 1990) Editions of the Regulations.
- 818 Transitional arrangements for special form radioactive material approved under the 1973, 1973 (As Amended), 1985 and 1985 (As Amended 1990) Editions of the Regulations.
- 819 Packaging serial numbers — informing the competent authority.

## 2. CONTENTS LIMITS FOR PACKAGES

- 415<sup>a</sup>, 416 The quantity of radioactive material is not allowed to exceed the limits specified in paras 415 and 416 of the Regulations.

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<sup>a</sup> The electronic version of the 2005 Edition of the Regulations, available on [www.iaea.org](http://www.iaea.org), should be used when referring to paras 405–419; in the printed version of the 2005 Edition of the Regulations, paras 405–419 are incorrectly numbered as 406–420.

503 A package is not allowed to contain any items other than those that are necessary for the use of the radioactive material. The interaction between these items and the package, under the conditions of transport applicable to the design, is not allowed to reduce the safety of the package.

### 3. CONTAMINATION

508, 509 Non-fixed contamination on the external surfaces of any package and on the external and internal surfaces of overpacks, freight containers, tanks, intermediate bulk containers and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over any area of 300 cm<sup>2</sup> of any part of the surface:

- (a) Beta, gamma and low toxicity alpha emitters, 4.0 Bq/cm<sup>2</sup>;
- (b) All other alpha emitters, 0.4 Bq/cm<sup>2</sup>.

### 4. MAXIMUM RADIATION LEVELS

- 530–532, 575
- (i) The radiation level for a package or overpack is required to be such that the TI of the package or overpack does not exceed 10, except when transported under exclusive use; and
  - (ii) The maximum radiation level at any point on any external surface of the package or overpack is not allowed to exceed 2 mSv/h, except when transported under exclusive use by rail or by road, or under exclusive use by sea<sup>b</sup>; and
  - (iii) The maximum radiation level at any point on any external surface of a package or overpack transported under exclusive use is not allowed to exceed 10 mSv/h.

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<sup>b</sup> Packages or overpacks having a surface radiation level greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels in accordance with Table 9 of the Regulations, footnote a, provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel.

## 5. CATEGORIES OF PACKAGES AND OVERPACKS

- 526, 527 The TI is required to be derived in accordance with the procedure as stated in paras 526 and 527 of the Regulations.
- 533, Table 7 Packages and overpacks are required to be assigned to category I-WHITE, category II-YELLOW or category III-YELLOW.

## 6. MARKING AND LABELLING

- 507 Packages, freight containers and overpacks containing materials having other dangerous properties (e.g. corrosiveness) are required also to be marked and labelled as required by the relevant transport regulations.
- 535 Each package is required to be marked with an identification of either the consignor or the consignee, or both.
- 535–539 All markings are required to be legible and durable, and are required to be on the outside of the packaging.
- 536, Table 8 Packages are required to bear the mark “UN 2917” and the proper shipping name “RADIOACTIVE MATERIAL, TYPE B(M) PACKAGE”.
- 537 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass.
- 539 Each package is required to be marked with:
- (a) The identification mark allocated to that design by the competent authority;
  - (b) A serial number to uniquely identify each packaging which conforms to that design;
  - (c) “TYPE B(M)”.

- 540, Fig. 1            The outside of the outermost receptacle which is resistant to the effects of fire and water is required to be plainly marked by embossing, stamping, or other means resistant to the effects of fire and water, with the trefoil symbol shown in Fig. 1 of the Regulations.
- 542                    Any labels which do not relate to the radioactive contents are required to be removed or covered.
- 542, 547,  
Figs 2–4              Each package, overpack and freight container is required to bear the appropriate labels. Paragraph 547 of the Regulations sets out alternative provisions for large freight containers and tanks.
- 543                    The labels are required to be fixed to two opposite sides of the outside of the package or overpack, or on all four sides of a freight container or tank. The labels are not allowed to cover the markings specified in paras 535–537, para. 539 and para. 540 of the Regulations.
- 544(a), (b), (d),  
Table 1              Each label is required to be marked with the name(s) of the radionuclide(s), the maximum activity of the contents and the TI. Paragraph 544(a) of the Regulations establishes requirements for labelling mixtures of radionuclides.
- 544(c)                Except for mixed loads, each label on a freight container or overpack is required to be marked with:
- (a) The radioactive contents; and
  - (b) The maximum activity of the total radioactive contents during transport.
- For mixed loads such entries may read “See Transport Documents”.
- 549                    It is the consignor’s responsibility to comply with the requirements of marking, labelling and placarding.

## 7. REQUIREMENTS BEFORE SHIPMENT

- 501(a), (b) Before the first shipment, confirmation is required that the shielding, containment, heat transfer characteristics and confinement system conform to the approved design.
- 502(a)–(f), (h) Before each shipment of any package, the following requirements apply:
- (a) For any package it is required to ensure that all the requirements specified in the relevant provisions of the Regulations have been satisfied.
  - (b) It is required to ensure that lifting attachments which do not meet the requirements of para. 607 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 608 of the Regulations.
  - (c) For each package, it is required to ensure that all the requirements specified in the competent authority approval certificates have been satisfied.
  - (d) Each package is required to 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 package, it is required to ensure 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 paras 657 and 669 of the Regulations were made.
  - (f) For each special form radioactive material, it is required to ensure that all the requirements specified in the approval certificate and the relevant provisions of the Regulations have been satisfied.

- (h) For each low dispersible radioactive material, it is required to ensure that all the requirements specified in the approval certificate and the relevant provisions of the Regulations have been satisfied.
- 550 Transport documents with each consignment (consignment notes) are required to include all relevant particulars of the consignment.
- 551–554 The consignor is required to include a declaration in the transport documents.
- 556 The consignor is required to provide a statement regarding actions to be taken by the carrier.
- 557 The consignor is required to make competent authority certificates available to the carrier(s) before loading and unloading.
- 558 Before the first shipment, the consignor is required to ensure that copies of each competent authority certificate applying to that package design have been submitted to the competent authority of each country through or into which the consignment is to be transported. The consignor is not required to await an acknowledgement from the competent authority, nor is the competent authority required to make an acknowledgement of receiving the certificate.
- 559(c) For each shipment, the consignor is required to notify the competent authority of each country through or into which the consignment is to be transported. This notification is required to have been received by each competent authority prior to the commencement of the shipment, and preferably at least 7 days in advance. See also para. 560 of the Regulations.
- 560 The notification referred to in para. 559 of the Regulations is required to include:
- (a) Clear identification of the package, including all applicable certificate numbers and identification marks;

- (b) The date of shipment, the expected date of arrival and the proposed routing;
- (c) The names of the radioactive materials or nuclides;
- (d) Descriptions of the physical and chemical forms of the radioactive material, or whether it is special form radioactive material or low dispersible radioactive material;
- (e) The maximum activity of the radioactive contents during transport, expressed in becquerels (Bq) with the appropriate SI prefix symbol (see Annex II of the Regulations).

561 Separate notification is not required if the information has been included in the application for shipment approval (see para. 822 of the Regulations).

820(a), (b) Shipments — competent authority approval.

821, 827 Shipments — competent authority authorization of transport or shipment approval.

822 Information to be included in an application for shipment approval.

823 When a shipment has been approved, the competent authority is required to issue an approval certificate.

## 8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

### **8.1. Modal requirements**

416 Conditions for air transport.

573(a)–(c) For transport by rail and by road: for consignments under exclusive use, the radiation level is not allowed to exceed:

- (a) 10 mSv/h at any point on the external surface of any package or overpack, and may only exceed 2 mSv/h provided that:
  - (i) The vehicle is equipped with an enclosure which prevents unauthorized access during transport; and
  - (ii) The package or overpack is secured to retain its position within the enclosure during routine transport; and
  - (iii) There are no loading or unloading operations between the beginning and the end of the shipment;
- (b) 2 mSv/h at any point on the outer surfaces of the vehicle, including the upper and lower surfaces, or, in the case of an open vehicle, at any point on the vertical planes projected from the outer edges of the vehicle, on the upper surface of the load, and on the lower external surface of the vehicle; and
- (c) 0.1 mSv/h at any point 2 m from the vertical planes represented by the outer lateral surfaces of the vehicle, or, if the load is transported in an open vehicle, at any point 2 m from the vertical planes projected from the outer edges of the vehicle.

574 For transport by road: no persons other than the driver and assistants are permitted in vehicles carrying packages, overpacks or freight containers bearing category II-YELLOW or category III-YELLOW labels.

575 For transport by vessels: packages or overpacks having a surface radiation level greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with Table 9 of the Regulations, footnote a, are not allowed to be transported.

576 For transport by vessels: the transport of consignments by means of a special use vessel is exempted from the requirements of para. 567 of the Regulations relating to TI and radiation level provided that the conditions stated in this para. 576 of the Regulations are met.

577–579 Restrictions on transport by air are set out in paras 577–579 of the Regulations.

580, 581 Transport by post is not permitted.

## **8.2. Placarding**

507, 549 Placards may be required for other dangerous properties of the contents.

547, Fig. 6 Large freight containers and tanks are required to bear four placards in a vertical orientation on the two external side walls and the two external end walls.

547 Any placards which do not relate to the contents are required to be removed.

547, Figs 2–4, Fig. 6 As an alternative to the use of placards on large freight containers and tanks, enlarged labels are permitted.

548, Figs 6, 7 Where an exclusive use consignment in a freight container is UN 2917 Type B(M) packages, and no other UN number commodities are present, the UN number “UN 2917” is required to be displayed on all four sides of the freight container, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

571, Figs 2–4, Fig. 6 The location of placards and the use of placards with reduced dimensions on a road or rail vehicle are stipulated.

572, Figs 6, 7      Where an exclusive use consignment in or on a road or rail vehicle is UN 2917 Type B(M) packages only, and no other UN number commodities are present, the UN number “UN 2917” is required to be displayed, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

### **8.3. Stowage during transport, storage in transit and segregation**

505      The transport of other goods together with consignments being transported under exclusive use may be permitted.

563      Packages, overpacks and freight containers are required to be segregated during transport and during storage in transit. The criteria for segregation are set out in paras 563(a)–563(d) and para. 506 of the Regulations:

563(a)      Criteria for segregation from workers in regularly occupied working areas;

563(b)      Criteria for segregation from members of the public;

563(c)      Criteria for segregation from undeveloped photographic film; and

563(d), 506      Criteria for segregation from other dangerous goods.

564      Category II-YELLOW or category III-YELLOW packages or overpacks may be carried in compartments occupied by passengers under specific conditions.

565      Consignments are required to be securely stowed.

566      A package or overpack may be carried or stored among packaged general cargo.

567(a), Table 9      Transport index limits for freight containers and conveyances.

567(b)      Limits on the radiation levels from freight containers and conveyances. See paras 573(b) and 573(c) of the Regulations for exceptions.

568 Any package or overpack having a TI greater than 10 is required to be transported only under exclusive use.

576 For a special use vessel, the storage arrangements are excepted from the requirements of para. 567 of the Regulations provided that the conditions stated in para. 576 of the Regulations are met.

#### **8.4. Damaged or leaking packages**

510 Actions to be taken when a package has been damaged or is leaking, or where it is suspected that the package may have leaked or been damaged.

511 Movement of packages which are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport.

#### **8.5. Decontamination**

512 Periodic checking of conveyances and equipment is required to determine the level of contamination.

513 Decontamination of conveyances, equipment or part thereof which have become contaminated.

#### **8.6. Other provisions**

309 In the event of non-compliance, appropriate actions are required to be taken as soon as possible, including communication and remedy.

582 Customs operations may be carried out only in a place where adequate means of controlling radiation exposure are provided.

583 Where a consignment is undeliverable, appropriate actions are required to be taken as soon as possible.

666 Intermittent venting of Type B(M) packages may be permitted during transport under certain conditions.

## SCHEDULE FOR UN 2919

### RADIOACTIVE MATERIAL, TRANSPORTED UNDER SPECIAL ARRANGEMENT, non-fissile or fissile-excepted

<b>Paragraph number(s) of the Regulations [1]</b>	<b>Subject</b>
	1. GENERAL PROVISIONS
109, 507	Other dangerous properties of contents and transport with other dangerous goods.
301–303	General provisions for radiation protection.
304, 305, 556(c)	Emergency response.
306	Quality assurance.
310	Special arrangement.
311–314	Training.
501(a), (b)	Requirements before the first shipment.
502	Requirements before each shipment.
562	Possession of package design approval certificates, and possession of instructions for (a) the proper closing of the package and (b) other preparations for shipment.
602–604	Additional design requirements for special form radioactive material.
605	Additional design requirements for low dispersible radioactive material.

606–616	Design requirements for all packagings and packages.
617–619	Additional design requirements — air transport.
634–645, 646(b)	Additional design requirements for Type A and Type B packages.
647	Additional design requirements for packages containing liquids.
651–664	Additional design requirements for Type B(U) packages.
665	Design requirements for Type B(M) packages, summary and exceptions.
667	Design requirements for Type C packages.
672	If the package contains fissile material, one of the fissile exceptions provided by para. 672 of the Regulations is required to be applied.
802(b)	Special arrangements – competent authority approval.
803–804	Design requirements for special form radioactive material and low dispersible radioactive material — competent authority approval.
806–811	Package design requirements — competent authority approval.
816, 817	Transitional arrangements for packages approved under the 1973, 1973 (As Amended), 1985 and 1985 (As Amended 1990) Editions of the Regulations.
818	Transitional arrangements for special form radioactive material approved under the 1973, 1973 (As Amended), 1985 and 1985 (As Amended 1990) Editions of the Regulations.
819	Packaging serial numbers — informing the competent authority.

## 2. CONTENTS LIMITS FOR PACKAGES

503 A package is not allowed to contain any items other than those that are necessary for the use of the radioactive material. The interaction between these items and the package, under the conditions of transport applicable to the design, is not allowed to reduce the safety of the package.

831(j) The quantity of radioactive material is not allowed to exceed the limits given in the competent authority approval certificate.

## 3. CONTAMINATION

508, 509 Non-fixed contamination on the external surfaces of any package and on the external and internal surfaces of overpacks, freight containers, tanks, intermediate bulk containers and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over any area of 300 cm<sup>2</sup> of any part of the surface:

- (a) Beta, gamma and low toxicity alpha emitters, 4.0 Bq/cm<sup>2</sup>;
- (b) All other alpha emitters, 0.4 Bq/cm<sup>2</sup>.

## 4. MAXIMUM RADIATION LEVELS

- 530–532, 575,  
579
- (i) The radiation level for a package or overpack is required to be such that the TI of the package or overpack does not exceed 10, except when transported under exclusive use; and
  - (ii) The maximum radiation level at any point on any external surface of the package or overpack is not allowed to exceed 2 mSv/h, except when transported under exclusive use by rail or by road, or under special arrangement by air or by sea; and
  - (iii) The maximum radiation level at any point on any external surface of a package or overpack transported under exclusive use is not allowed to exceed 10 mSv/h.

## 5. CATEGORIES OF PACKAGES AND OVERPACKS

526, 527 The TI is required to be derived in accordance with the procedure as stated in paras 526 and 527 of the Regulations.

533, 534 A package, or an overpack containing packages, transported under special arrangement is required to be assigned to category III-YELLOW, except under certain provisions stated in para. 534 of the Regulations.

## 6. MARKING AND LABELLING

507 Packages, freight containers and overpacks containing materials having other dangerous properties (e.g. corrosiveness) are also required to be marked and labelled as required by the relevant transport regulations.

535 Each package is required to be marked with an identification of either the consignor or the consignee, or both.

535–537, 539, 540 All markings are required to be legible and durable, and are required to be on the outside of the packaging.

536, Table 8 Packages are required to bear the mark “UN 2919” and the proper shipping name “RADIOACTIVE MATERIAL, TRANSPORTED UNDER SPECIAL ARRANGEMENT”.

537 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass.

539 Each package is required to be marked, if appropriate, with:

- (a) The identification mark allocated to that design by the competent authority;
- (b) A serial number to uniquely identify each packaging which conforms to that design;
- (c) In the case of a Type B(U) or Type B(M) package design, with “TYPE B(U)” or “TYPE B(M)”;
- (d) In the case of a Type C package design, with “TYPE C”.

- 540, Fig. 1 For Type B(U), Type B(M) or Type C packages, the outside of the outermost receptacle which is resistant to the effects of fire and water is required to be plainly marked by embossing, stamping, or other means resistant to the effects of fire and water, with the trefoil symbol shown in Fig. 1 of the Regulations.
- 542 Any labels which do not relate to the radioactive contents are required to be removed or covered.
- 542, 547, Figs 2–4 Each package, overpack and freight container is required to bear the appropriate labels. Paragraph 547 of the Regulations sets out alternative provisions for large freight containers and tanks.
- 543 The labels are required to be fixed to two opposite sides of the outside of the package or overpack, or on all four sides of a freight container or tank. The labels are not allowed to cover the markings specified in paras 535–537 and paras 539 and 540 of the Regulations.
- 544(a), (b), (d), Table 1 Each label is required to be marked with the name(s) of the radionuclide(s), the maximum activity of the contents and the TI. Paragraph 544(a) of the Regulations establishes requirements for labelling mixtures of radionuclides. Except for mixed loads, each label on a freight container or overpack is required to be marked with:
- (a) The radioactive contents; and
  - (b) The maximum activity of the total radioactive contents during transport.
- 544(c) For mixed loads such entries may read “See Transport Documents”.
- 549 It is the consignor’s responsibility to comply with the requirements of marking, labelling and placarding.

## 7. REQUIREMENTS BEFORE SHIPMENT

- 501(a), (b) Before the first shipment, confirmation is required that the shielding, containment, heat transfer characteristics and confinement system conform to the approved design.
- 502(a)–(f), (h) Before each shipment of any package, the following requirements apply:
- (a) For any package it is required to ensure that all the requirements specified in the relevant provisions of the Regulations have been satisfied.
  - (b) It is required to ensure that lifting attachments which do not meet the requirements of para. 607 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 608 of the Regulations.
  - (c) For each package, it is required to ensure that all the requirements specified in the competent authority approval certificates have been satisfied.
  - (d) Each package is required to 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 package, it is required to ensure 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 paras 657 and 669 of the Regulations were made.
  - (f) For each special form radioactive material, it is required to ensure that all the requirements specified in the approval certificate and the relevant provisions of the Regulations have been satisfied.

- (h) For each low dispersible radioactive material, it is required to ensure that all of the requirements specified in the approval certificate and the relevant provisions of the Regulations have been satisfied.
- 550 Transport documents with each consignment (consignment notes) are required to include all relevant particulars of the consignment.
- 551–554 The consignor is required to include a declaration in the transport documents.
- 556 The consignor is required to provide a statement regarding actions to be taken by the carrier.
- 557 The consignor is required to make competent authority certificates available to the carrier(s) before loading and unloading.
- 559(d) For each shipment, the consignor is required to notify the competent authority of each country through or into which the consignment is to be transported. This notification is required to have been received by each competent authority prior to the commencement of the shipment, and preferably at least 7 days in advance. See also para. 560 of the Regulations.
- 560 The notification referred to in para. 559 of the Regulations is required to include:
- (a) Clear identification of the package, including all applicable certificate numbers and identification marks;
  - (b) The date of shipment, the expected date of arrival and the proposed routing;
  - (c) The names of the radioactive materials or nuclides;
  - (d) Descriptions of the physical and chemical forms of the radioactive material, or whether it is special form radioactive material or low dispersible radioactive material;

(e) The maximum activity of the radioactive contents during transport, expressed in becquerels (Bq) with the appropriate SI prefix symbol (see Annex II of the Regulations).

561 Separate notification is not required if the information has been included in the application for shipment approval.

824–826 Approval of shipments under special arrangement.

827 Competent authority approval certificates.

## 8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

### 8.1. Modal requirements

573(a)–(c) For transport by rail and by road: for consignments under exclusive use, the radiation level is not allowed to exceed:

(a) 10 mSv/h at any point on the external surface of any package or overpack, and may only exceed 2 mSv/h provided that:

(i) The vehicle is equipped with an enclosure which prevents unauthorized access during transport; and

(ii) The package or overpack is secured to retain its position within the enclosure during routine transport; and

(iii) There are no loading or unloading operations between the beginning and the end of the shipment;

(b) 2 mSv/h at any point on the outer surfaces of the vehicle, including the upper and lower surfaces, or, in the case of an open vehicle, at any point on the vertical planes projected from the outer edges of the vehicle, on the upper surface of the load, and on the lower external surface of the vehicle; and

(c) 0.1 mSv/h at any point 2 m from the vertical planes represented by the outer lateral surfaces of the vehicle, or, if the load is transported in an open vehicle, at any point 2 m from the vertical planes projected from the outer edges of the vehicle.

574 For transport by road: no persons other than the driver and assistants are permitted in the vehicles.

575 For transport by vessels: packages or overpacks having a surface radiation level greater than 2 mSv/h may be transported under special arrangement.

576 For transport by vessels: The transport of consignments by means of a special use vessel is excepted from the requirements of para. 567 of the Regulations relating to TI and radiation level provided that the conditions stated in para. 576 of the Regulations are met.

577–579 Restrictions on transport by air are set out in paras 577–579 of the Regulations.

580, 581 Transport by post is not permitted.

## **8.2. Placarding**

507, 549 Placards may be required for other dangerous properties of the contents.

547, Fig. 6 Large freight containers and tanks are required to bear four placards in a vertical orientation on the two external side walls and the two external end walls.

547 Any placards which do not relate to the contents are required to be removed.

547, Figs 2–4, Fig. 6 As an alternative to the use of placards on large freight containers and tanks, enlarged labels are permitted.

- 548, Figs 6, 7      Where an exclusive use consignment in a freight container is a UN 2919 Special Arrangement, and no other UN number commodities are present, the UN number “UN 2919” is required to be displayed on all four sides of the freight container, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.
- 571, Figs 2–4,  
Fig. 6              The location of placards and the use of placards with reduced dimensions on a road or rail vehicle are stipulated.
- 572, Figs 6, 7      Where an exclusive use consignment in or on a road or rail vehicle is a UN 2919 Special Arrangement, and no other UN number commodities are present, the UN number “UN 2919” is required to be displayed, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

### **8.3. Stowage during transport, storage in transit and segregation**

- 505                  The transport of other goods together with consignments being transported under exclusive use may be permitted.
- 563                  Packages, overpacks and freight containers are required to be segregated during transport and during storage in transit. The criteria for segregation are set out in paras 563(a)–563(d) and para. 506 of the Regulations:
- 563(a)              Criteria for segregation from workers in regularly occupied working areas;
- 563(b)              Criteria for segregation from members of the public;
- 563(c)              Criteria for segregation from undeveloped photographic film; and
- 563(d), 506        Criteria for segregation from other dangerous goods.

- 564 Category II-YELLOW or category III-YELLOW packages or overpacks may be carried in compartments occupied by passengers under specific conditions.
- 565 Consignments are required to be securely stowed.
- 566 A package or overpack may be carried or stored among packaged general cargo.
- 567(a), Table 9 Transport index limits for freight containers and conveyances.
- 567(b) Limits on the radiation levels from freight containers and conveyances. See paras 573(b) and 573(c) of the Regulations for exceptions.
- 568 Any package or overpack having a TI greater than 10 is required to be transported only under exclusive use.
- 576 For a special use vessel, the storage arrangements are excepted from the requirements of para. 567 of the Regulations provided that the conditions stated in para. 576 of the Regulations are met.

#### **8.4. Damaged or leaking packages**

- 510 Actions to be taken when a package has been damaged or is leaking, or where it is suspected that the package may have leaked or been damaged.
- 511 Movement of packages which are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport.

#### **8.5. Decontamination**

- 512 Periodic checking of conveyances and equipment is required to determine the level of contamination.
- 513 Decontamination of conveyances, equipment or part thereof which have become contaminated.

## **8.6. Other provisions**

- 309 In the event of non-compliance, appropriate actions are required to be taken as soon as possible, including communication and remedy.
- 582 Customs operations may be carried out only in a place where adequate means of controlling radiation exposure are provided.
- 583 Where a consignment is undeliverable, appropriate actions are required to be taken as soon as possible.
- 666 Intermittent venting of Type B(M) packages may be permitted during transport under certain conditions.

## SCHEDULE FOR UN 2977

### RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE, FISSILE

<b>Paragraph number(s) of the Regulations [1]</b>	<b>Subject</b>
	1. GENERAL PROVISIONS
109, 507	Uranium hexafluoride has corrosive properties (Class 8) and these are required to be taken into account during transport.
301–303	General provisions for radiation protection.
304, 305, 556(c)	Emergency response.
306	Quality assurance.
311–314	Training.
501(a)–(c)	Requirements before the first shipment.
502	Requirements before each shipment.
562	Possession of package design certificates, and instructions for (a) the proper closing of the package and (b) other preparations for shipment.
606–616	Design requirements for all packagings and packages.
617–619	Additional design requirements — air transport.
	Uranium hexafluoride, fissile, is required to be transported, as appropriate, in:

- 622–624 Industrial packages of Type IP-2 or Type IP-3, as applicable;  
633 Type A packages;  
650 Type B(U) packages;  
665 Type B(M) packages;  
667 Type C packages.
- 629–632 Additional requirements for packages designed to transport 0.1 kg or more of uranium hexafluoride.
- 671–682 Additional requirements for packages containing fissile material.
- 802(a), 805–811 Package design requirements — competent authority approval, as appropriate.
- 812–814 Approval of package designs to contain fissile material.
- 816, 817 Transitional arrangements for packages approved under the 1973, 1973 (As Amended), 1985 and 1985 (As Amended 1990) Editions of the Regulations.
- 819 Packaging serial numbers — informing the competent authority.
- 824–826 Approval of shipments under special arrangement.

## 2. CONTENTS LIMITS FOR PACKAGES

- 411<sup>a</sup>–419 The quantity of uranium hexafluoride is not allowed to exceed the relevant limits specified in paras 411–417 of the Regulations, as appropriate for each type of package, and, in addition, para. 418 of the Regulations (fissile material) and para. 419 of the Regulations (uranium hexafluoride).

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<sup>a</sup> The electronic version of the 2005 Edition of the Regulations, available on [www.iaea.org](http://www.iaea.org), should be used when referring to paras 405–419; in the printed version of the 2005 Edition of the Regulations, paras 405–419 are incorrectly numbered as 406–420.

503 A package is not allowed to contain any other items other than those that are necessary for the use of the uranium hexafluoride. The interaction between these items and the package, under the conditions of transport applicable to the design, is not allowed to reduce the safety of the package.

### 3. CONTAMINATION

508, 509 Non-fixed contamination on the external surfaces of any package and on the external and internal surfaces of overpacks, freight containers, tanks, intermediate bulk containers and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over any area of 300 cm<sup>2</sup> of any part of the surface:

- (a) Beta, gamma and low toxicity alpha emitters, 4.0 Bq/cm<sup>2</sup>;
- (b) All other alpha emitters, 0.4 Bq/cm<sup>2</sup>.

### 4. MAXIMUM RADIATION LEVELS

- 530–532, 575
- (i) The radiation level for a package or overpack is required to be such that the TI of the package or overpack does not exceed 10, and the criticality safety index does not exceed 50, except when transported under exclusive use; and
  - (ii) The maximum radiation level at any point on any external surface of the package or overpack is not allowed to exceed 2 mSv/h, except when the package or overpack is transported under exclusive use by rail or by road, or under exclusive use by sea<sup>b</sup>; and
  - (iii) The maximum radiation level at any point on any external surface of a package or overpack transported under exclusive use is not allowed to exceed 10 mSv/h.

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<sup>b</sup> Packages or overpacks having a surface radiation level greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels in accordance with Table 9 of the Regulations, footnote a, provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel.

## 5. CATEGORIES OF PACKAGES AND OVERPACKS

- 526, 527 The TI is required to be derived in accordance with the procedure as stated in paras 526 and 527 of the Regulations.
- 528, 529 The criticality safety index (CSI) for packages containing fissile material is required to be obtained in accordance with paras 528 and 529 of the Regulations.
- 533, Table 7 Packages and overpacks are required to be assigned to category I-WHITE, category II-YELLOW or category III-YELLOW.

## 6. MARKING AND LABELLING

- 507 Packages, freight containers and overpacks containing materials having other dangerous properties (e.g. corrosiveness) are required also to be marked and labelled as required by the relevant transport regulations.
- 507 Class 8 labels are also required because of the corrosive properties of the contents.
- 535 Each package is required to be marked with an identification of either the consignor or the consignee, or both.
- 535–539 All markings are required to be legible and durable, and are required to be on the outside of the packaging.
- 536, Table 8 Packages are required to bear the mark “UN 2977” and the proper shipping name “RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE, FISSILE”.
- 537 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass.

- 538(a), (b) Each package which conforms to:
- (a) An IP-2 or an IP-3 design is required to be marked with “TYPE IP-2” or “TYPE IP-3” as appropriate;
  - (b) A Type A package design is required to be marked with “TYPE A”.
- 538(c) Each package which conforms to a TYPE IP-2, TYPE IP-3 or TYPE A package design is required to be marked with the international vehicle registration code (VRI Code) of the country of origin of design and either the name of the manufacturer or other identification of the packaging specified by the competent authority of the country of origin of the design.
- 539 Each package is required to be marked with:
- (a) The identification mark allocated to that design by the competent authority;
  - (b) A serial number to uniquely identify each packaging which conforms to that design;
  - (c) In the case of a Type B(U) or Type B(M) package design, with “TYPE B(U)” or “TYPE B(M)”;
  - (d) In the case of a Type C package design, with “TYPE C”.
- 540, Fig. 1 For Type B(U), Type B(M) or Type C packages, the outside of the outermost receptacle which is resistant to the effects of fire and water is required to be plainly marked by embossing, stamping, or other means resistant to the effects of fire and water, with the trefoil symbol shown in Fig. 1 of the Regulations.
- 542 For all packages, any labels which do not relate to the radioactive contents are required to be removed or covered.
- 542, 545–547,  
Figs 2–5 Each package, overpack and freight container is required to bear the appropriate labels. Paragraph 547 of the Regulations sets out alternative provisions for large freight containers and tanks.

543 The labels are required to be fixed to two opposite sides of the outside of the package or overpack, or on all four sides of a freight container or tank. The labels are not allowed to cover the markings specified in paras 535–540 of the Regulations.

544(a), (b), (d),  
Table 1 Each label is required to be marked with the name of the radionuclide, the maximum activity of the contents and the TI. The mass of fissile material, in grams (g), or multiples of grams, may be used instead of the activity.

544(c) Except for mixed loads, each label on a freight container or overpack is required to be marked with:

- (a) The radioactive contents; and
- (b) The maximum activity of the total radioactive contents during transport.

For mixed loads such entries may read “See Transport Documents”.

549 It is the consignor’s responsibility to comply with the requirements of marking, labelling and placarding.

## 7. REQUIREMENTS BEFORE SHIPMENT

501(a)–(c) Before the first shipment, confirmation is required that the shielding, containment, heat transfer characteristics, confinement system and neutron poisons conform to the approved design.

502(a)–(e), (g) Before each shipment of any package, the following requirements apply:

- (a) For any package it is required to ensure that all the requirements specified in the relevant provisions of the Regulations have been satisfied.

- (b) It is required to ensure that lifting attachments which do not meet the requirements of para. 607 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 608 of the Regulations.
- (c) For each package requiring competent authority approval, it is required to ensure that all the requirements specified in the approval certificates have been satisfied.
- (d) Each Type B(U), Type B(M) and Type C package is required to 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 is required to ensure 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 paras 657 and 669 of the Regulations were made.
- (g) For packages containing fissile material, the measurement specified in para. 674(b) of the Regulations and the tests to demonstrate closure of each package as specified in para. 677 of the Regulations are required to be performed where applicable.

550                      Transport documents with each consignment (consignment notes) are required to include all relevant particulars of the consignment.

551–554                The consignor is required to include a declaration in the transport documents.

556                      The consignor is required to provide a statement regarding actions to be taken by the carrier.

557 The consignor is required to make competent authority certificates available to the carrier(s) before loading and unloading.

558 Before the first shipment, the consignor is required to ensure that copies of each competent authority certificate applying to that package design have been submitted to the competent authority of each country through or into which the consignment is to be transported. The consignor is not required to await an acknowledgement from the competent authority, nor is the competent authority required to make an acknowledgement of receiving the certificate.

559 For each shipment listed below:

- (a) Type C or Type B(U) packages containing radioactive material with an activity greater than  $3000A_1$  or  $3000A_2$ , as appropriate, or 1000 TBq, whichever is the lower;
- (b) Type B(M) packages;
- (c) Shipments under special arrangement;

the consignor is required to notify the competent authority of each country through or into which the consignment is to be transported. This notification is required to have been received by each competent authority prior to the commencement of the shipment, and preferably at least 7 days in advance. See also para. 560 of the Regulations.

560 The notification referred to in para. 559 of the Regulations is required to include:

- (a) Clear identification of the package, including all applicable certificate numbers and identification marks;
- (b) The date of shipment, the expected date of arrival and the proposed routeing;
- (c) The names of the radioactive materials or nuclides;
- (d) Descriptions of the physical and chemical forms of the radioactive material;

- (e) The maximum activity of the radioactive contents during transport, expressed in becquerels (Bq) with the appropriate SI prefix symbol (see Annex II of the Regulations). The mass of fissile material in grams (g), or multiples of grams, may be used in place of activity.
- 561 Separate notification is not required if the information has been included in the application for shipment approval (see para. 822 of the Regulations).
- 820(c) Shipments — competent authority multilateral approval is required where the criticality safety index is greater than 50.
- 821, 827 Shipments — competent authority authorization of transport without shipment approval.
- 822 Information to be included in an application for shipment approval.
- 823 When a shipment has been approved, the competent authority is required to issue an approval certificate.
- 824–826 Approval of shipments under special arrangement.

## 8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

### 8.1. Modal requirements

- 416, 577–579 Restrictions on transport by air are set out in para. 416 and paras 577–579 of the Regulations.
- 573(a)–(c) For transport by rail and by road: for consignments under exclusive use, the radiation level is not allowed to exceed:
- (a) 10 mSv/h at any point on the external surface of any package or overpack, and may only exceed 2 mSv/h provided that:

- (i) The vehicle is equipped with an enclosure which prevents unauthorized access during transport; and
  - (ii) The package or overpack is secured to retain its position within the enclosure during routine transport; and
  - (iii) There are no loading or unloading operations between the beginning and the end of the shipment;
- (b) 2 mSv/h at any point on the outer surfaces of the vehicle, including the upper and lower surfaces, or, in the case of an open vehicle, at any point on the vertical planes projected from the outer edges of the vehicle, on the upper surface of the load, and on the lower external surface of the vehicle; and
- (c) 0.1 mSv/h at any point 2 m from the vertical planes represented by the outer lateral surfaces of the vehicle, or, if the load is transported in an open vehicle, at any point 2 m from the vertical planes projected from the outer edges of the vehicle.

574 For transport by road: no persons other than the driver and assistants are permitted in vehicles carrying packages, overpacks or freight containers bearing category II-YELLOW or category III-YELLOW labels.

575 For transport by vessels: packages or overpacks having a surface radiation level greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with Table 9 of the Regulations, footnote a, are not allowed to be transported.

576 For transport by vessels: the transport of consignments by means of a special use vessel is excepted from the requirements of para. 567 of the Regulations relating to TI, criticality safety index and radiation level provided that the conditions stated in para. 576 of the Regulations are met.

580, 581 Transport by post is not permitted.

## 8.2. Placarding

- 507, 549 Class 8 placards are also required because of the corrosive properties of the contents.
- 547, Fig. 6 Large freight containers and tanks are required to bear four placards in a vertical orientation on the two external side walls and the two external end walls.
- 547 Any placards which do not relate to the contents are required to be removed.
- 547, Figs 2–6 As an alternative to the use of placards on large freight containers and tanks, enlarged labels are permitted.
- 548, Figs 6, 7 Where an exclusive use consignment in a freight container is UN 2977 packaged fissile uranium hexafluoride and no other UN number commodities are present, the UN number “UN 2977” is required to be displayed on all four sides of the freight container, in black digits not less than 65 mm high, either in the lower half of the placards shown in Fig. 6 of the Regulations against the white background, or on the placards shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.
- 571, Figs 2–6 The location of placards and the use of placards with reduced dimensions on a road or rail vehicle are stipulated.
- 572, Figs 6, 7 Where an exclusive use consignment in or on a road or rail vehicle is UN 2977 packaged fissile uranium hexafluoride, and no other UN number commodities are present, the UN number “UN 2977” is required to be displayed in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

### **8.3. Stowage during transport, storage in transit and segregation**

- 505 The transport of other goods together with consignments being transported under exclusive use may be permitted.
- 563 Packages, overpacks and freight containers are required to be segregated during transport and during storage in transit. The criteria for segregation are set out in paras 563(a)–563(d) and para. 506 of the Regulations:
- 563(a) Criteria for segregation from workers in regularly occupied working areas;
- 563(b) Criteria for segregation from members of the public;
- 563(c) Criteria for segregation from undeveloped photographic film; and
- 563(d), 506 Criteria for segregation from other dangerous goods.
- 564 Category II-YELLOW or category III-YELLOW packages or overpacks may be carried in compartments occupied by passengers under specific conditions.
- 565 Consignments are required to be securely stowed.
- 566 A package or overpack may be carried or stored among packaged general cargo.
- 567(a), Table 9 Transport index limits for freight containers and conveyances.
- 567(b) Limits on the radiation levels from freight containers and conveyances. See paras 573(b) and 573(c) of the Regulations for exceptions.
- 567(c), Table 10 Critical safety index limits for freight containers and conveyances.
- 568 Any package or overpack having a TI greater than 10, or any consignment having a CSI greater than 50, is required to be transported only under exclusive use.

569, 570,  
Table 10 Segregation of packages during transport and storage in transit.

576 For a special use vessel, the storage arrangements are excepted from the requirements of para. 567 of the Regulations provided that the conditions stated in para. 576 of the Regulations are met.

#### **8.4. Damaged or leaking packages**

510 Actions to be taken when a package has been damaged or is leaking, or where it is suspected that the package may have leaked or been damaged.

511 Movement of packages which are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport.

#### **8.5. Decontamination**

512 Periodic checking of conveyances and equipment is required to determine the level of contamination.

513 Decontamination of conveyances, equipment or part thereof which have become contaminated.

#### **8.6. Other provisions**

309 In the event of non-compliance, appropriate actions are required to be taken as soon as possible, including communication and remedy.

582 Customs operations may be carried out only in a place where adequate means of controlling radiation exposure are provided.

583 Where a consignment is undeliverable, appropriate actions are required to be taken as soon as possible.

## SCHEDULE FOR UN 2978

### **RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE, non-fissile or fissile-excepted**

<b>Paragraph number(s) of the Regulations [1]</b>	<b>Subject</b>
	1. GENERAL PROVISIONS
109, 507	Uranium hexafluoride has corrosive properties (Class 8) and these are required to be taken into account during transport.
301–303	General provisions for radiation protection.
304, 305, 556(c)	Emergency response.
306	Quality assurance.
311–314	Training.
501(a), (b)	Requirements before the first shipment.
502	Requirements before each shipment.
562	Possession of package design certificates, and instructions for (a) the proper closing of the package and (b) other preparations for shipment.
606–616	Design requirements for all packagings and packages.
617–619	Additional design requirements — air transport. Uranium hexafluoride is required to be transported, as appropriate, in:
515	Excepted packages;

621–624	Industrial packages of Type IP-1, Type IP-2 or Type IP-3, as applicable;
633	Type A packages;
650	Type B(U) packages;
665	Type B(M) packages;
667	Type C packages.
629–632	Additional requirements for packages designed to transport 0.1 kg or more of uranium hexafluoride.
672	If the package contains fissile material, one of the fissile exceptions provided by para. 672 of the Regulations is required to be applied.
801	The consignor is required to demonstrate on request that the package design complies with all applicable competent authority requirements.
802(a), 805–811	Package design requirements — competent authority approval.
815–817	Transitional arrangements for packages approved under the 1973, 1973 (As Amended), 1985 and 1985 (As Amended 1990) Editions of the Regulations.
819	Packaging serial numbers — informing the competent authority.
824–826	Approval of shipments under special arrangement.

## 2. CONTENTS LIMITS FOR PACKAGES

408 <sup>a</sup> –417, 419	The quantity of uranium hexafluoride is not allowed to exceed the relevant limits specified in paras 408–417 of the Regulations, as appropriate for each type of package, and, in addition, para. 419 of the Regulations (uranium hexafluoride).
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<sup>a</sup> The electronic version of the 2005 Edition of the Regulations, available on [www.iaea.org](http://www.iaea.org), should be used when referring to paras 405–419; in the printed version of the 2005 Edition of the Regulations, paras 405–419 are incorrectly numbered as 406–420.

503 A package is not allowed to contain any other items other than those that are necessary for the use of the uranium hexafluoride. The interaction between these items and the package, under the conditions of transport applicable to the design, is not allowed to reduce the safety of the package.

### 3. CONTAMINATION

508, 509 Non-fixed contamination on the external surfaces of any package and on the external and internal surfaces of overpacks, freight containers, tanks, intermediate bulk containers and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over any area of 300 cm<sup>2</sup> of any part of the surface:

- (a) Beta, gamma and low toxicity alpha emitters, 4.0 Bq/cm<sup>2</sup>;
- (b) All other alpha emitters, 0.4 Bq/cm<sup>2</sup>.

### 4. MAXIMUM RADIATION LEVELS

516 When UF<sub>6</sub> is transported in an excepted package, the maximum radiation level is not allowed to exceed 5 µSv/h on the external surface.

- 530–532, 575
- (i) The radiation level for a package or overpack is required to be such that the TI of the package or overpack does not exceed 10, except when transported under exclusive use; and
  - (ii) The maximum radiation level at any point on any external surface of the package or overpack is not allowed to exceed 2 mSv/h, except when transported under exclusive use by rail or by road, or under exclusive use by sea<sup>b</sup>; and

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<sup>b</sup> Packages or overpacks having a surface radiation level greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels in accordance with Table 9 of the Regulations, footnote a, provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel.

- (iii) The maximum radiation level at any point on any external surface of a package or overpack transported under exclusive use is not allowed to exceed 10 mSv/h.

## 5. CATEGORIES OF PACKAGES AND OVERPACKS

526, 527 The TI is required to be derived in accordance with the procedure as stated in paras 526 and 527 of the Regulations.

533, Table 7 Packages and overpacks are required to be assigned to category I-WHITE, category II-YELLOW or category III-YELLOW.

## 6. MARKING AND LABELLING

507 Packages, freight containers and overpacks containing materials having other dangerous properties (e.g. corrosiveness) are also required to be marked and labelled as required by the relevant transport regulations.

507 Class 8 labels are also required because of the corrosive properties of the contents.

535 Each package is required to be marked with an identification of either the consignor or the consignee, or both.

535–539 All markings are required to be legible and durable, and are required to be on the outside of the packaging.

536, Table 8 Packages are required to bear the mark “UN 2978” and for packages, other than excepted packages, the proper shipping name “RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE”.

537 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass.

- 538(a), (b) Each package which conforms to:
- (a) An IP-1, IP-2 or an IP-3 design is required to be marked with “TYPE IP-1, TYPE IP-2” or “TYPE IP-3” as appropriate;
  - (b) A Type A package design is required to be marked with “TYPE A”.
- 538(c) Each package which conforms to a TYPE IP-2, TYPE IP-3 or TYPE A package design is required to be marked with the international vehicle registration code (VRI Code) of the country of origin of design and either the name of the manufacturer or other identification of the packaging specified by the competent authority of the country of origin of the design.
- 539 Each package is required to be marked with:
- (a) The identification mark allocated to that design by the competent authority;
  - (b) A serial number to uniquely identify each packaging which conforms to that design;
  - (c) In the case of a Type B(U) or Type B(M) package design, with “TYPE B(U)” or “TYPE B(M)”;
  - (d) In the case of a Type C package design, with “TYPE C”.
- 540, Fig. 1 The outside of the outermost receptacle which is resistant to the effects of fire and water is required to be plainly marked by embossing, stamping, or other means resistant to the effects of fire and water, with the trefoil symbol shown in Fig. 1 of the Regulations.
- 542 Any labels which do not relate to the radioactive contents are required to be removed or covered.
- 542, Figs 2–4,  
547 Each package, overpack and freight container is required to bear the appropriate labels. Paragraph 547 of the Regulations sets out alternative provisions for large freight containers and tanks.

543 The labels are required to be fixed to two opposite sides of the outside of the package or overpack, or on all four sides of a freight container or tank. The labels are not allowed to cover the markings specified in paras 535–540 of the Regulations.

544(a), (b), (d),  
Table 1 Each label is required to be marked with the name of the radionuclide, the maximum activity of the contents and the TI. The mass of fissile material, in grams (g), or multiples of grams, may be used instead of the activity.

544(c) Except for mixed loads, each label on a freight container or overpack is required to be marked with:

- (a) The radioactive contents; and
- (b) The maximum activity of the total radioactive contents during transport.

For mixed loads such entries may read “See Transport Documents”.

549 It is the consignor’s responsibility to comply with the requirements of marking, labelling and placarding.

## 7. REQUIREMENTS BEFORE SHIPMENT

501(a), (b) Before the first shipment, confirmation is required that the shielding, containment, heat transfer characteristics and confinement system conform to the approved design.

502(a)–(e) Before each shipment of any package, the following requirements apply:

- (a) For any package it is required to ensure that all the requirements specified in the relevant provisions of the Regulations have been satisfied.

- (b) It is required to ensure that lifting attachments which do not meet the requirements of para. 607 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 608 of the Regulations.
- (c) For each package requiring competent authority approval, it is required to ensure that all the requirements specified in the approval certificates have been satisfied.
- (d) Each Type B(U), Type B(M) and Type C package is required to 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 is required to ensure 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 paras 657 and 669 of the Regulations were made.

550 Transport documents with the consignment (consignment notes) are required to include all relevant particulars of the consignment. For excepted packages, only para. 550(c) of the Regulations is applicable.

551–554 The consignor is required to include a declaration in the transport documents<sup>c</sup>.

556 The consignor is required to provide a statement regarding actions to be taken by the carrier<sup>c</sup>.

557 The consignor is required to make competent authority certificates available to the carrier(s) before loading and unloading<sup>c</sup>.

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<sup>c</sup> Not applicable to excepted packages.

558 Before the first shipment, the consignor is required to ensure that copies of each competent authority certificate applying to that package design have been submitted to the competent authority of each country through or into which the consignment is to be transported<sup>c</sup>. The consignor is not required to await an acknowledgement from the competent authority, nor is the competent authority required to make an acknowledgement of receiving the certificate.

559 For each shipment listed below:

- (a) Type C or Type B(U) packages containing radioactive material with an activity greater than  $3000A_1$  or  $3000A_2$ , as appropriate, or 1000 TBq, whichever is the lower;
- (b) Type B(M) packages;
- (c) Shipments under special arrangement;

the consignor is required to notify the competent authority of each country through or into which the consignment is to be transported. This notification is required to have been received by each competent authority prior to the commencement of the shipment, and preferably at least 7 days in advance. See also para. 560 of the Regulations.

560 The notification referred to in para. 559 of the Regulations is required to include:

- (a) Clear identification of the package, including all applicable certificate numbers and identification marks;
- (b) The date of shipment, the expected date of arrival and the proposed routing;
- (c) The names of the radioactive materials or nuclides;
- (d) Descriptions of the physical and chemical forms of the radioactive material;
- (e) The maximum activity of the radioactive contents during transport, expressed in becquerels (Bq) with the appropriate SI prefix symbol (see Annex II of the Regulations). The mass of fissile material in grams (g), or multiples of grams, may be used in place of activity.

- 561 Separate notification is not required if the information has been included in the application for shipment approval (see para. 822 of the Regulations).
- 821, 827 Shipments — competent authority authorization of transport without shipment approval.
- 822 Information to be included in an application for shipment approval.
- 823 When a shipment has been approved, the competent authority is required to issue an approval certificate.
- 824–826 Approval of shipments under special arrangement.

## 8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

### 8.1. Modal requirements

- 416, 577–579 Restrictions on transport by air are set out in para. 416 and paras 577–579 of the Regulations.
- 573(a)–(c) For transport by rail and by road: for consignments under exclusive use, the radiation level is not allowed to exceed:
- (a) 10 mSv/h at any point on the external surface of any package or overpack, and may only exceed 2 mSv/h provided that:
    - (i) The vehicle is equipped with an enclosure which prevents unauthorized access during transport; and
    - (ii) The package or overpack is secured to retain its position within the enclosure during routine transport; and
    - (iii) There are no loading or unloading operations between the beginning and the end of the shipment;

- (b) 2 mSv/h at any point on the outer surfaces of the vehicle, including the upper and lower surfaces, or, in the case of an open vehicle, at any point on the vertical planes projected from the outer edges of the vehicle, on the upper surface of the load, and on the lower external surface of the vehicle; and
- (c) 0.1 mSv/h at any point 2 m from the vertical planes represented by the outer lateral surfaces of the vehicle, or, if the load is transported in an open vehicle, at any point 2 m from the vertical planes projected from the outer edges of the vehicle.

574 For transport by road: no persons other than the driver and assistants are permitted in vehicles carrying packages, overpacks or freight containers bearing category II-YELLOW or category III-YELLOW labels.

575 For transport by vessels: packages or overpacks having a surface radiation level greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with Table 9 of the Regulations, footnote a, are not allowed to be transported.

576 For transport by vessels: the transport of consignments by means of a special use vessel is exempted from the requirements of para. 567 of the Regulations relating to TI and radiation level provided that the conditions stated in para. 576 of the Regulations are met.

580, 581 Transport by post is not permitted.

## **8.2. Placarding**

507, 549 Class 8 placards are also required because of the corrosive properties of the contents.

547, Fig. 6 Large freight containers and tanks are required to bear four placards in a vertical orientation on the two external side walls and the two external end walls.

- 547 Any placards which do not relate to the contents are required to be removed.
- 547, Figs 2–4,  
Fig. 6 As an alternative to the use of placards on large freight containers and tanks, enlarged labels are permitted.
- 548, Figs 6, 7 Where an exclusive use consignment in a freight container is UN 2978 packaged non-fissile or fissile-excepted uranium hexafluoride and no other UN number commodities are present, the UN number “UN 2978” is required to be displayed on all four sides of the freight container, in black digits not less than 65 mm high, either in the lower half of the placards shown in Fig. 6 of the Regulations against the white background, or on the placards shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.
- 571, Figs 2–4,  
Fig. 6 The location of placards and the use of placards with reduced dimensions on a road or rail vehicle are stipulated.
- 572, Figs 6, 7 Where an exclusive use consignment in or on a road or rail vehicle is UN 2978 packaged non-fissile or fissile-excepted uranium hexafluoride only, and no other UN number commodities are present, the UN number “UN 2978” is required to be displayed in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

### **8.3. Stowage during transport, storage in transit and segregation**

- 505 The transport of other goods together with consignments being transported under exclusive use may be permitted.

- 563 Packages, overpacks and freight containers are required to be segregated during transport and during storage in transit. The criteria for segregation are set out in paras 563(a)–563(d) and para. 506 of the Regulations:
- 563(a) Criteria for segregation from workers in regularly occupied working areas;
- 563(b) Criteria for segregation from members of the public;
- 563(c) Criteria for segregation from undeveloped photographic film; and
- 563(d), 506 Criteria for segregation from other dangerous goods.
- 564 Category II-YELLOW or category III-YELLOW packages or overpacks may be carried in compartments occupied by passengers under specific conditions.
- 565 Consignments are required to be securely stowed.
- 566 A package or overpack may be carried or stored among packaged general cargo.
- 567(a), Table 9 Transport index limits for freight containers and conveyances.
- 567(b) Limits on the radiation levels from freight containers and conveyances. See paras 573(b) and 573(c) of the Regulations for exceptions.
- 568 Any package or overpack having a TI greater than 10 is required to be transported only under exclusive use.
- 576 For a special use vessel, the storage arrangements are excepted from the requirements of para. 567 of the Regulations provided that the conditions stated in para. 576 of the Regulations are met.

#### **8.4. Damaged or leaking packages**

- 510 Actions to be taken when a package has been damaged or is leaking, or where it is suspected that the package may have leaked or been damaged.

511 Movement of packages which are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport.

### **8.5. Decontamination**

512 Periodic checking of conveyances and equipment is required to determine the level of contamination.

513 Decontamination of conveyances, equipment or part thereof which have become contaminated.

### **8.6. Other provisions**

309 In the event of non-compliance, appropriate actions are required to be taken as soon as possible, including communication and remedy.

582 Customs operations may be carried out only in a place where adequate means of controlling radiation exposure are provided.

583 Where a consignment is undeliverable, appropriate actions are required to be taken as soon as possible.

## SCHEDULE FOR UN 3321

### RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-II), non-fissile or fissile-excepted

<b>Paragraph number(s) of the Regulations [1]</b>	<b>Subject</b>
	1. GENERAL PROVISIONS
109, 507	Other dangerous properties of contents and transport with other dangerous goods.
301–303	General provisions for radiation protection.
304, 305, 556(c)	Emergency response.
306	Quality assurance.
311–314	Training.
501(a)	Requirements before the first shipment.
502	Requirements before each shipment.
525, Table 5	Activity limits.
606–616	Design requirements for all packagings and packages.
617–619	Additional design requirements — air transport.
622	Additional design requirements for Type IP-2 packages.

- 623 Additional design requirements for Type IP-3 packages (LSA-II material, liquids and gases, not under exclusive use).
- 624–628 Alternative design requirements for Type IP-2 and Type IP-3 packages.
- 634 Minimum dimensions of the package.
- 672 If the package contains fissile material, one of the fissile exceptions provided by para. 672 of the Regulations is required to be applied.
- 801 The consignor is required to demonstrate on request that the package design complies with all applicable competent authority requirements.
- 815 Transitional arrangements for packages designed under the provisions of the 1985 or 1985 (As Amended 1990) Editions of the Regulations.

## 2. CONTENTS LIMITS FOR PACKAGES

- 411<sup>a</sup>, 521 The contents are required to be restricted in accordance with the radiation levels specified in para. 521 of the Regulations.
- 412 A single package of non-combustible LSA-II material, if carried by air, is not allowed to contain an activity greater than  $3000A_2$ .
- 503 A package is not allowed to contain any items other than those that are necessary for the use of the radioactive material. The interaction between these items and the package, under the conditions of transport applicable to the design, is not allowed to reduce the safety of the package.

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<sup>a</sup> The electronic version of the 2005 Edition of the Regulations, available on [www.iaea.org](http://www.iaea.org), should be used when referring to paras 405–419; in the printed version of the 2005 Edition of the Regulations, paras 405–419 are incorrectly numbered as 406–420.

### 3. CONTAMINATION

508, 509 Non-fixed contamination on the external surfaces of any package and on the external and internal surfaces of overpacks, freight containers, tanks, intermediate bulk containers and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over any area of 300 cm<sup>2</sup> of any part of the surface:

- (a) Beta, gamma and low toxicity alpha emitters, 4.0 Bq/cm<sup>2</sup>;
- (b) All other alpha emitters, 0.4 Bq/cm<sup>2</sup>.

### 4. MAXIMUM RADIATION LEVELS

- 530–532, 575
- (i) The radiation level for a package or overpack is required to be such that the TI of the package or overpack does not exceed 10, except when transported under exclusive use; and
  - (ii) The maximum radiation level at any point on any external surface of the package or overpack is not allowed to exceed 2 mSv/h, except when transported under exclusive use by rail or by road, or under exclusive use by sea<sup>b</sup>; and
  - (iii) The maximum radiation level at any point on any external surface of a package or overpack transported under exclusive use is not allowed to exceed 10 mSv/h.

### 5. CATEGORIES OF PACKAGES AND OVERPACKS

524, Table 4 LSA material and SCO are required to be packaged in accordance with Table 4 of the Regulations.

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<sup>b</sup> Packages or overpacks having a surface radiation level greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels in accordance with Table 9 of the Regulations, footnote a, provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel.

526, 527 The TI is required to be derived in accordance with the procedure as stated in paras 526 and 527 of the Regulations.

533, Table 7 Packages and overpacks are required to be assigned to category I-WHITE, category II-YELLOW or category III-YELLOW.

## 6. MARKING AND LABELLING

507 Packages, freight containers and overpacks containing materials having other dangerous properties (e.g. corrosiveness) are also required to be marked and labelled as required by the relevant transport regulations.

535 Each package is required to be marked with an identification of either the consignor or the consignee, or both.

535–538 All markings are required to be legible and durable, and are required to be on the outside of the packaging.

536, Table 8 Packages are required to bear the mark “UN 3321” and the proper shipping name “RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-II)”.

537 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass.

538(a) Each package which conforms to an IP-2 or IP-3 design is required to be marked with “TYPE IP-2” or “TYPE IP-3” as appropriate.

538(c) Each package which conforms to an IP-2 or IP-3 design is required to be marked with the international vehicle registration code (VRI Code) of the country of origin of design and either the name of the manufacturer or other identification of the packaging specified by the competent authority of the country of origin of design.

542 Any labels which do not relate to the contents are required to be removed or covered.

542, 547,  
Figs 2–4

Each package, overpack and freight container is required to bear the appropriate labels. Paragraph 547 of the Regulations sets out alternative provisions for large freight containers and tanks.

543

The labels are required to be fixed to two opposite sides of the outside of the package or overpack, or on all four sides of a freight container or tank. The labels are not allowed to cover the markings specified in paras 535–538 of the Regulations.

544(a)

Each label is required to be marked with the name(s) of the radionuclide(s), followed by “LSA-II”. Paragraph 544(a) of the Regulations establishes requirements for labelling mixtures of radionuclides.

544(b)

The maximum activity of the contents is required to be marked on the label.

544(c)

Except for mixed loads, each label on a freight container or overpack is required to be marked with:

- (a) The radioactive contents; and
- (b) The maximum activity of the total radioactive contents during transport.

For mixed loads such entries may read “See Transport Documents”.

544(d)

Each label is required to show the TI, except for category I-WHITE, for which the TI is not required.

549

It is the consignor’s responsibility to comply with the requirements of marking, labelling and placarding.

## 7. REQUIREMENTS BEFORE SHIPMENT

501(a)

Before the first shipment of any package for which the design pressure exceeds 35 kPa, confirmation is required that the confinement system conforms to the approved design.

- 502(a), (b) Before each shipment of any package, the following requirements apply:
- (a) For any package it is required to ensure that all the requirements specified in the relevant provisions of the Regulations have been satisfied.
  - (b) It is required to ensure that lifting attachments which do not meet the requirements of para. 607 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 608 of the Regulations.
- 550 Transport documents with each consignment (consignment notes) are required to include all relevant particulars of the consignment.
- 551–554 The consignor is required to include a declaration in the transport documents.
- 556 The consignor is required to provide a statement regarding actions to be taken by the carrier.

## 8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

### **8.1. Modal requirements**

- 573(a)–(c) For transport by rail and by road: for consignments under exclusive use, the radiation level is not allowed to exceed:
- (a) 10 mSv/h at any point on the external surface of any package or overpack, and may only exceed 2 mSv/h provided that:
    - (i) The vehicle is equipped with an enclosure which prevents unauthorized access during transport; and
    - (ii) The package or overpack is secured to retain its position within the enclosure during routine transport; and
    - (iii) There are no loading or unloading operations between the beginning and the end of the shipment;

- (b) 2 mSv/h at any point on the outer surfaces of the vehicle, including the upper and lower surfaces, or, in the case of an open vehicle, at any point on the vertical planes projected from the outer edges of the vehicle, on the upper surface of the load, and on the lower external surface of the vehicle; and
- (c) 0.1 mSv/h at any point 2 m from the vertical planes represented by the outer lateral surfaces of the vehicle, or, if the load is transported in an open vehicle, at any point 2 m from the vertical planes projected from the outer edges of the vehicle.

574 For transport by road: no persons other than the driver and assistants are permitted in vehicles carrying packages, overpacks or freight containers bearing category II-YELLOW or category III-YELLOW labels.

575 For transport by vessels: packages or overpacks having a surface radiation level greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with Table 9 of the Regulations, footnote a, are not allowed to be transported.

576 For transport by vessels: the transport of consignments by means of a special use vessel is exempted from the requirements of para. 567 of the Regulations relating to TI and radiation level provided that the conditions stated in para. 576 of the Regulations are met.

579 For transport by air: packages or overpacks having a surface radiation level greater than 2 mSv/h are not allowed to be transported.

580, 581 Transport by post is not permitted.

## **8.2. Placarding**

507, 549 Placards may be required for other dangerous properties of the contents.

- 547, Fig. 6 Large freight containers and tanks are required to bear four placards in a vertical orientation on the two external side walls and the two external end walls.
- 547 Any placards which do not relate to the contents are required to be removed.
- 547, Figs 2–4, Fig. 6 As an alternative to the use of placards on large freight containers and tanks, enlarged labels are permitted.
- 548, Figs 6, 7 Where an exclusive use consignment in a freight container is packaged UN 3321 LSA-II, and no other UN number commodities are present, the UN number “UN 3321” is required to be displayed on all four sides of the freight container, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.
- 571, Figs 2–4, Fig. 6 The location of placards and the use of placards with reduced dimensions on a road or rail vehicle are stipulated.
- 572, Figs 6, 7 For carriage in or on a road or rail vehicle, where an exclusive use consignment is packaged UN 3321 LSA-II only, and no other UN number commodities are present, the UN number “UN 3321” is required to be displayed, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

### **8.3. Stowage during transport, storage in transit and segregation**

- 505 The transport of other goods together with consignments being transported under exclusive use may be permitted.

- 563 Packages, overpacks and freight containers are required to be segregated during transport and during storage in transit. The criteria for segregation are set out in paras 563(a)–563(d) and para. 506 of the Regulations:
- 563(a) Criteria for segregation from workers in regularly occupied working areas;
- 563(b) Criteria for segregation from members of the public;
- 563(c) Criteria for segregation from undeveloped photographic film; and
- 563(d), 506 Criteria for segregation from other dangerous goods.
- 564 Category II-YELLOW or category III-YELLOW packages or overpacks may be carried in compartments occupied by passengers under specific conditions.
- 565 Consignments are required to be securely stowed.
- 566 A package or overpack may be carried or stored among packaged general cargo.
- 567(a), Table 9 Transport index limits for freight containers and conveyances.
- 567(b) Limits on the radiation levels from freight containers and conveyances. See paras 573(b) and 573(c) of the Regulations for exceptions.
- 568 Any package or overpack having a TI greater than 10 is required to be transported only under exclusive use.
- 576 For a special use vessel, the storage arrangements are excepted from the requirements of para. 567 of the Regulations provided that the conditions stated in para. 576 of the Regulations are met.

#### **8.4. Damaged or leaking packages**

- 510 Actions to be taken when a package has been damaged or is leaking, or where it is suspected that the package may have leaked or been damaged.

511 Movement of packages which are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport.

### **8.5. Decontamination**

504 Tanks and intermediate bulk containers used for the transport of radioactive material are not allowed to be used for storage or transport of other goods, unless decontaminated below one tenth of the levels specified in paras 508 and 509 of the Regulations.

512 Periodic checking of conveyances and equipment is required to determine the level of contamination.

513 Decontamination of conveyances, equipment or part thereof which have become contaminated.

### **8.6. Other provisions**

309 In the event of non-compliance, appropriate actions are required to be taken as soon as possible, including communication and remedy.

582 Customs operations may be carried out only in a place where adequate means of controlling radiation exposure are provided.

583 Where a consignment is undeliverable, appropriate actions are required to be taken as soon as possible.

## SCHEDULE FOR UN 3322

### RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-III), non-fissile or fissile-excepted

<b>Paragraph number of the Regulations [1]</b>	<b>Subject</b>
	1. GENERAL PROVISIONS
109, 507	Other dangerous properties of contents and transport with other dangerous goods.
301–303	General provisions for radiation protection.
304, 305, 556(c)	Emergency response.
306	Quality assurance.
311–314	Training.
501(a)	Requirements before the first shipment.
502	Requirements before each shipment.
525, Table 5	Activity limits.
601	Additional requirement for LSA-III material.
606–616	Design requirements for all packagings and packages.
617–619	Additional design requirements — air transport.
622	Additional design requirements for Type IP-2 packages (LSA-III material, under exclusive use).

- 623 Additional design requirements for Type IP-3 packages (LSA-III material, not under exclusive use).
- 624, 625, 627, 628 Alternative design requirements for Type IP-2 and Type IP-3 packages.
- 634 Minimum dimensions of the package.
- 672 If the package contains fissile material, one of the fissile exceptions provided by para. 672 of the Regulations is required to be applied.
- 801 The consignor is required to demonstrate that the package design complies with all applicable competent authority requirements.
- 815 Transitional arrangements for packages designed under the provisions of the 1985 or 1985 (As Amended 1990) Editions of the Regulations.

## 2. CONTENTS LIMITS FOR PACKAGES

- 411<sup>a</sup>, 521 The contents are required to be restricted in accordance with the radiation levels specified in para. 521 of the Regulations.
- 412 A single package of non-combustible LSA-III material, if carried by air, is not allowed to contain an activity greater than  $3000A_2$ .
- 503 A package is not allowed to contain any items other than those that are necessary for the use of the radioactive material. The interaction between these items and the package, under the conditions of transport applicable to the design, is not allowed to reduce the safety of the package.

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<sup>a</sup> The electronic version of the 2005 Edition of the Regulations, available on [www.iaea.org](http://www.iaea.org), should be used when referring to paras 405–419; in the printed version of the 2005 Edition of the Regulations, paras 405–419 are incorrectly numbered as 406–420.

### 3. CONTAMINATION

508, 509 Non-fixed contamination on the external surfaces of any package and on the external and internal surfaces of overpacks, freight containers, tanks, intermediate bulk containers and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over any area of 300 cm<sup>2</sup> of any part of the surface:

- (a) Beta, gamma and low toxicity alpha emitters, 4.0 Bq/cm<sup>2</sup>;
- (b) All other alpha emitters, 0.4 Bq/cm<sup>2</sup>.

### 4. MAXIMUM RADIATION LEVELS

- 530–532, 575
- (i) The radiation level for a package or overpack is required to be such that the TI of the package or overpack does not exceed 10, except when transported under exclusive use; and
  - (ii) The maximum radiation level at any point on any external surface of the package or overpack is not allowed to exceed 2 mSv/h, except when transported under exclusive use by rail or by road, or under exclusive use by sea<sup>b</sup>; and
  - (iii) The maximum radiation level at any point on any external surface of a package or overpack transported under exclusive use is not allowed to exceed 10 mSv/h.

### 5. CATEGORIES OF PACKAGES AND OVERPACKS

524, Table 4 LSA material and SCO are required to be packaged in accordance with Table 4 of the Regulations.

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<sup>b</sup> Packages or overpacks having a surface radiation level greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels in accordance with Table 9 of the Regulations, footnote a, provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel.

526, 527 The TI is required to be derived in accordance with the procedure as stated in paras 526 and 527 of the Regulations.

533, Table 7 Packages and overpacks are required to be assigned to category I-WHITE, category II-YELLOW or category III-YELLOW.

## 6. MARKING AND LABELLING

507 Packages, freight containers and overpacks containing materials having other dangerous properties (e.g. corrosiveness) are also required to be marked and labelled as required by the relevant transport regulations.

535 Each package is required to be marked with an identification of either the consignor or the consignee, or both.

535–538 All markings are required to be legible and durable, and are required to be on the outside of the packaging.

536, Table 8 Packages are required to bear the mark “UN 3322” and the proper shipping name “RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-III)”.

537 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass.

538(a) Each package which conforms to an IP-2 or IP-3 design is required to be marked with “TYPE IP-2” or “TYPE IP-3” as appropriate.

538(c) Each package which conforms to an IP-2 or IP-3 design is required to be marked with the international vehicle registration code (VRI Code) of the country of origin of design and either the name of the manufacturer or other identification of the packaging specified by the competent authority of the country of origin of design.

542 Any labels which do not relate to the contents are required to be removed or covered.

542, 547,  
Figs 2–4

Each package, overpack and freight container is required to bear the appropriate labels. Paragraph 547 of the Regulations sets out alternative provisions for large freight containers and tanks.

543

The labels are required to be fixed to two opposite sides of the outside of the package or overpack, or to all four sides of a freight container or tank. The labels are not allowed to cover the markings specified in paras 535–538 of the Regulations.

544(a)

Each label is required to be marked with the name(s) of the radionuclide(s), followed by “LSA-III”. Paragraph 544(a) of the Regulations establishes requirements for labelling mixtures of radionuclides.

544(b)

The maximum activity of the contents is required to be marked on the label.

544(c)

Except for mixed loads, each label on a freight container or overpack is required to be marked with:

- (a) The radioactive contents; and
- (b) The maximum activity of the total radioactive contents during transport.

For mixed loads such entries may read “See Transport Documents”.

544(d)

Each label is required to show the TI, except for category I-WHITE, for which the TI is not required.

549

It is the consignor’s responsibility to comply with the requirements of marking, labelling and placarding.

## 7. REQUIREMENTS BEFORE SHIPMENT

501(a)

Before the first shipment of any package for which the design pressure exceeds 3 kPa, confirmation is required that the confinement system conforms to the approved design.

- 502(a), (b) Before each shipment of any package, the following requirements apply:
- (a) For any package it is required to ensure that all the requirements specified in the relevant provisions of the Regulations have been satisfied.
  - (b) It is required to ensure that lifting attachments which do not meet the requirements of para. 607 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 608 of the Regulations.
- 550 Transport documents with each consignment (consignment notes) are required to include all relevant particulars of the consignment.
- 551–554 The consignor is required to include a declaration in the transport documents.
- 556 The consignor is required to provide a statement regarding actions to be taken by the carrier.

## 8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

### 8.1. Modal requirements

- 573(a)–(c) For transport by rail and by road: for consignments under exclusive use, the radiation level is not allowed to exceed:
- (a) 10 mSv/h at any point on the external surface of any package or overpack, and may only exceed 2 mSv/h provided that:
    - (i) The vehicle is equipped with an enclosure which prevents unauthorized access during transport; and
    - (ii) The package or overpack is secured to retain its position within the enclosure during routine transport; and
    - (iii) There are no loading or unloading operations between the beginning and the end of the shipment;

- (b) 2 mSv/h at any point on the outer surfaces of the vehicle, including the upper and lower surfaces, or, in the case of an open vehicle, at any point on the vertical planes projected from the outer edges of the vehicle, on the upper surface of the load, and on the lower external surface of the vehicle; and
- (c) 0.1 mSv/h at any point 2 m from the vertical planes represented by the outer lateral surfaces of the vehicle, or, if the load is transported in an open vehicle, at any point 2 m from the vertical planes projected from the outer edges of the vehicle.

574 For transport by road: no persons other than the driver and assistants are permitted in vehicles carrying packages, overpacks or freight containers bearing category II-YELLOW or category III-YELLOW labels.

575 For transport by vessels: packages or overpacks having a surface radiation level greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with Table 9 of the Regulations, footnote a, are not allowed to be transported.

576 For transport by vessels: the transport of consignments by means of a special use vessel is excepted from the requirements of para. 567 of the Regulations provided that the conditions stated in para. 576 of the Regulations are met.

579 For transport by air: packages or overpacks having a surface radiation level greater than 2 mSv/h are not allowed to be transported.

580, 581 Transport by post is not permitted.

## **8.2. Placarding**

507, 549 Placards may be required for other dangerous properties of the contents.

- 547, Fig. 6 Large freight containers and tanks are required to bear four placards in a vertical orientation on the two external side walls and the two external end walls.
- 547 Any placards which do not relate to the contents are required to be removed.
- 547, Figs 2–4, Fig. 6 As an alternative to the use of placards on large freight containers and tanks, enlarged labels are permitted.
- 548, Figs 6, 7 Where an exclusive use consignment in a freight container is packaged UN 3322 LSA-III, and no other UN number commodities are present, the UN number “UN 3322” is required to be displayed on all four sides of the freight container, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.
- 571, Figs 2–4, Fig. 6 The location of placards and the use of placards with reduced dimensions on a road or rail vehicle are stipulated.
- 572, Figs 6, 7 For carriage in or on a road or rail vehicle, where an exclusive use consignment is packaged UN 3322 LSA-III only, and no other UN number commodities are present, the UN number “UN 3322” is required to be displayed, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

### **8.3. Stowage during transport, storage in transit and segregation**

- 505 The transport of other goods together with consignments being transported under exclusive use may be permitted.

- 563 Packages, overpacks and freight containers are required to be segregated during transport and during storage in transit. The criteria for segregation are set out in paras 563(a)–563(d) and para. 506 of the Regulations:
- 563(a) Criteria for segregation from workers in regularly occupied working areas;
- 563(b) Criteria for segregation from members of the public;
- 563(c) Criteria for segregation from undeveloped photographic film; and
- 563(d), 506 Criteria for segregation from other dangerous goods.
- 564 Category II-YELLOW or category III-YELLOW packages or overpacks may be carried in compartments occupied by passengers under specific conditions.
- 565 Consignments are required to be securely stowed.
- 566 A package or overpack may be carried or stored among packaged general cargo.
- 567(a), Table 9 Transport index limits for freight containers and conveyances.
- 567(b) Limits on the radiation levels from freight containers and conveyances. See paras 573(b) and 573(c) of the Regulations for exceptions.
- 568 Any package or overpack having a TI greater than 10 is required to be transported only under exclusive use.
- 576 For a special use vessel, the storage arrangements are excepted from the requirements of para. 567 of the Regulations provided that the conditions stated in para. 576 of the Regulations are met.

#### **8.4. Damaged or leaking packages**

- 510 Actions to be taken when a package has been damaged or is leaking, or where it is suspected that the package may have leaked or been damaged.

511 Movement of packages which are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport.

### **8.5. Decontamination**

504 Intermediate bulk containers used for the transport of radioactive material are not allowed to be used for storage or transport of other goods, unless decontaminated below one tenth of the levels specified in paras 508 and 509 of the Regulations.

512 Periodic checking of conveyances and equipment is required to determine the level of contamination.

513 Decontamination of conveyances, equipment or part thereof which have become contaminated.

### **8.6. Other provisions**

309 In the event of non-compliance, appropriate actions are required to be taken as soon as possible, including communication and remedy.

582 Customs operations may be carried out only in a place where adequate means of controlling radiation exposure are provided.

583 Where a consignment is undeliverable, appropriate actions are required to be taken as soon as possible.

## SCHEDULE FOR UN 3323

### RADIOACTIVE MATERIAL, TYPE C PACKAGE, non-fissile or fissile-excepted

<b>Paragraph number of the Regulations [1]</b>	<b>Subject</b>
	1. GENERAL PROVISIONS
109, 507	Other dangerous properties of contents and transport with other dangerous goods — see paragraphs 109 and 507.
301–303	General provisions for radiation protection.
304, 305, 556(c)	Emergency response.
306	Quality assurance.
311–314	Training.
501(a), (b)	Requirements before the first shipment.
502	Requirements before each shipment.
562	Possession of package design certificates, and instructions for (a) the proper closing of the package and (b) other preparations for shipment.
602–604	Design requirements for special form radioactive material.
606–616	Design requirements for all packagings and packages.
617–619	Additional design requirements — air transport.
634–645, 646(b)	Additional design requirements for Type C (and Type A and Type B) packages.

- 647 Additional design requirements for packages containing liquids.
- 651–655, 659–664 Additional design requirements for Type C (and Type B) packages.
- 667 Design requirements for Type C packages, summary.
- 668–670 Additional design requirements for Type C packages.
- 672 If the package contains fissile material, one of the fissile exceptions provided by para. 672 of the Regulations is required to be applied.
- 802(a), 806–808 Package design requirements — competent authority approval.
- 818 Transitional arrangements for special form radioactive material approved under the 1973, 1973 (As Amended), 1985 and 1985 (As Amended 1990) Editions of the Regulations.
- 819 Packaging serial numbers — informing the competent authority.

## 2. CONTENTS LIMITS FOR PACKAGES

- 417<sup>a</sup> The quantity of radioactive material is not allowed to exceed the limits specified in para. 417 of the Regulations.
- 503 A package is not allowed to contain any other items other than those that are necessary for the use of the radioactive material. The interaction between these items and the package, under the conditions of transport applicable to the design, is not allowed to reduce the safety of the package.

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<sup>a</sup> The electronic version of the 2005 Edition of the Regulations, available on [www.iaea.org](http://www.iaea.org), should be used when referring to paras 405–419; in the printed version of the 2005 Edition of the Regulations, paras 405–419 are incorrectly numbered as 406–420.

### 3. CONTAMINATION

508, 509

Non-fixed contamination on the external surfaces of any package and on the external and internal surfaces of overpacks, freight containers, tanks, intermediate bulk containers and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over any area of 300 cm<sup>2</sup> of any part of the surface:

- (a) Beta, gamma and low toxicity alpha emitters, 4.0 Bq/cm<sup>2</sup>;
- (b) All other alpha emitters, 0.4 Bq/cm<sup>2</sup>.

### 4. MAXIMUM RADIATION LEVELS

530–532, 575

- (i) The radiation level for a package or overpack is required to be such that the TI of the package or overpack does not exceed 10, except when transported under exclusive use; and
- (ii) The maximum radiation level at any point on any external surface of the package or overpack is not allowed to exceed 2 mSv/h, except when transported under exclusive use by rail or by road, or under exclusive use by sea<sup>b</sup>; and
- (iii) The maximum radiation level at any point on any external surface of a package or overpack transported under exclusive use is not allowed to exceed 10 mSv/h.

### 5. CATEGORIES OF PACKAGES AND OVERPACKS

526, 527

The TI is required to be derived in accordance with the procedure as stated in paras 526 and 527 of the Regulations.

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<sup>b</sup> Packages or overpacks having a surface radiation level greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels in accordance with Table 9 of the Regulations, footnote a, provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel.

533, Table 7 Packages and overpacks are required to be assigned to category I-WHITE, category II-YELLOW or category III-YELLOW.

## 6. MARKING AND LABELLING

507 Packages, freight containers and overpacks containing materials having additional dangerous properties (e.g. corrosiveness) are also required to be marked and labelled as required by the relevant transport regulations.

535 Each package is required to be marked with an identification of either the consignor or the consignee, or both.

535–539 All markings are required to be legible and durable, and are required to be on the outside of the packaging.

536, Table 8 Packages are required to bear the mark “UN 3323” and the proper shipping name “RADIOACTIVE MATERIAL, TYPE C PACKAGE”.

537 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass.

539 Each package is required to be marked with:

- (a) The identification mark allocated to that design by the competent authority;
- (b) A serial number to uniquely identify each packaging which conforms to that design;
- (c) Not applicable;
- (d) “TYPE C”.

540, Fig. 1 The outside of the outermost receptacle which is resistant to the effects of fire and water is required to be plainly marked by embossing, stamping, or other means resistant to the effects of fire and water, with the trefoil symbol shown in Fig. 1 of the Regulations.

542 Any labels which do not relate to the radioactive contents are required to be removed or covered.

542, 547,  
Figs 2–4 Each package, overpack and freight container is required to bear the appropriate labels. Paragraph 547 of the Regulations sets out alternative provisions for large freight containers and tanks.

543 The labels are required to be fixed to two opposite sides of the outside of the package or overpack, or on all four sides of a freight container or tank. The labels are not allowed to cover the markings specified in paras 535–537, para. 539 and para. 540 of the Regulations.

544(a), (b), (d),  
Table 1 Each label is required to be marked with the name(s) of the radionuclide(s), the maximum activity of the contents and the TI. Paragraph 544(a) of the Regulations establishes requirements for labelling mixtures of radionuclides.

544(c) Except for mixed loads, each label on a freight container or overpack is required to be marked with:

- (a) The radioactive contents; and
- (b) The maximum activity of the total radioactive contents during transport.

For mixed loads such entries may read “See Transport Documents”.

549 It is the consignor’s responsibility to comply with the requirements of marking, labelling and placarding.

## 7. REQUIREMENTS BEFORE SHIPMENT

501(a), (b) Before the first shipment, confirmation is required that the shielding, containment, heat transfer characteristics and confinement system conform to the approved design.

- 502(a)–(f) Before each shipment of any package, the following requirements apply:
- (a) For any package it is required to ensure that all the requirements specified in the relevant provisions of the Regulations have been satisfied.
  - (b) It is required to ensure that lifting attachments which do not meet the requirements of para. 607 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 608 of the Regulations.
  - (c) For each package, it is required to ensure that all the requirements specified in the competent authority approval certificates have been satisfied.
  - (d) Each package is required to 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 package, it is required to ensure 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 paras 657 and 669 of the Regulations were made.
  - (f) For each special form radioactive material, it is required to ensure that all the requirements specified in the approval certificate and the relevant provisions of the Regulations have been satisfied.
- 550 Transport documents with each consignment (consignment notes) are required to include all relevant particulars of the consignment.
- 551–554 The consignor is required to include a declaration in the transport documents.
- 556 The consignor is required to provide a statement regarding actions to be taken by the carrier.

- 557 The consignor is required to make competent authority certificates available to the carrier(s) before loading and unloading.
- 558 Before the first shipment, the consignor is required to ensure that copies of each competent authority certificate applying to that package design have been submitted to the competent authority of each country through or into which the consignment is to be transported. The consignor is not required to await an acknowledgement from the competent authority, nor is the competent authority required to make an acknowledgement of receiving the certificate.
- 559(a) For each shipment containing radioactive material with an activity greater than  $3000A_1$  or  $3000A_2$ , as appropriate, or 1000 TBq, whichever is the lower, the consignor is required to notify the competent authority of each country through or into which the consignment is to be transported. This notification is required to have been received by each competent authority prior to the commencement of the shipment, and preferably at least 7 days in advance. See also para. 560 of the Regulations.
- 560 The notification referred to in para. 559 of the Regulations is required to include:
- (a) Clear identification of the package, including all applicable certificate numbers and identification marks;
  - (b) The date of shipment, the expected date of arrival and the proposed routing;
  - (c) The names of the radioactive materials or nuclides;
  - (d) Descriptions of the physical and chemical forms of the radioactive material, or whether it is special form radioactive material or low dispersible radioactive material;
  - (e) The maximum activity of the radioactive contents during transport, expressed in becquerels (Bq) with the appropriate SI prefix symbol (see Annex II of the Regulations).

## 8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

### 8.1. Modal requirements

- 573(a)–(c) For transport by rail and by road: for consignments under exclusive use, the radiation level is not allowed to exceed:
- (a) 10 mSv/h at any point on the external surface of any package or overpack, and may only exceed 2 mSv/h provided that:
    - (i) The vehicle is equipped with an enclosure which prevents unauthorized access during transport; and
    - (ii) The package or overpack is secured to retain its position within the enclosure during routine transport; and
    - (iii) There are no loading or unloading operations between the beginning and the end of the shipment;
  - (b) 2 mSv/h at any point on the outer surfaces of the vehicle, including the upper and lower surfaces, or, in the case of an open vehicle, at any point on the vertical planes projected from the outer edges of the vehicle, on the upper surface of the load, and on the lower external surface of the vehicle; and
  - (c) 0.1 mSv/h at any point 2 m from the vertical planes represented by the outer lateral surfaces of the vehicle, or, if the load is transported in an open vehicle, at any point 2 m from the vertical planes projected from the outer edges of the vehicle.
- 574 For transport by road: no persons other than the driver and assistants are permitted in vehicles carrying packages, overpacks or freight containers bearing category II-YELLOW or category III-YELLOW labels.
- 575 For transport by vessels: packages or overpacks having a surface radiation level greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with Table 9 of the Regulations, footnote a, are not allowed to be transported.

576 For transport by vessels: The transport of consignments by means of a special use vessel is excepted from the requirements of para. 567 of the Regulations relating to TI and radiation level provided that the conditions stated in para. 576 of the Regulations are met.

579 For transport by air: packages or overpacks having a surface radiation level greater than 2 mSv/h are not allowed to be transported.

580, 581 Transport by post is not permitted.

## **8.2. Placarding**

507, 549 Placards may be required for other dangerous properties of the contents.

547, Fig. 6 Large freight containers are required to bear four placards in a vertical orientation on the two external side walls and the two external end walls.

547 Any placards which do not relate to the contents are required to be removed.

547, Figs 2–4, Fig. 6 As an alternative to the use of placards on large freight containers, enlarged labels are permitted.

548, Figs 6, 7 Where an exclusive use consignment in a freight container is UN 3323 Type C packages, and no other UN number commodities are present, the UN number “UN 3323” is required to be displayed on all four sides of the freight container, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

571, Figs 2–4, Fig. 6 The location of placards and the use of placards with reduced dimensions on a road or rail vehicle are stipulated.

572, Figs 6, 7 Where an exclusive use consignment in or on a road or rail vehicle is UN 3323 Type C packages only, and no other UN number commodities are present, the UN number “UN 3323” is required to be displayed, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

### **8.3. Stowage during transport, storage in transit and segregation**

505 The transport of other goods together with consignments being transported under exclusive use may be permitted.

563 Packages, overpacks and freight containers are required to be segregated during transport and during storage in transit. The criteria for segregation are set out in paras 563(a)–563(d) and para. 506 of the Regulations:

563(a) Criteria for segregation from workers in regularly occupied working areas;

563(b) Criteria for segregation from members of the public;

563(c) Criteria for segregation from undeveloped photographic film;

563(d), 506 Criteria for segregation from other dangerous goods.

564 Category II-YELLOW or category III-YELLOW packages or overpacks may be carried in compartments occupied by passengers under specific conditions.

565 Consignments are required to be securely stowed.

566 A package or overpack may be carried or stored among packaged general cargo.

567(a), Table 9 Transport index limits for freight containers and conveyances.

567(b) Limits on the radiation levels from freight containers and conveyances. See paras 573(b) and 573(c) of the Regulations for exceptions.

568 Any package or overpack having a TI greater than 10 is required to be transported only under exclusive use.

576 For a special use vessel, the storage arrangements are excepted from the requirements of para. 567 of the Regulations provided that the conditions stated in para. 576 of the Regulations are met.

#### **8.4. Damaged or leaking packages**

510 Actions to be taken when a package has been damaged or is leaking, or where it is suspected that the package may have leaked or been damaged.

511 Movement of packages which are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport.

#### **8.5. Decontamination**

512 Periodic checking of conveyances and equipment is required to determine the level of contamination.

513 Decontamination of conveyances, equipment or part thereof which have become contaminated.

#### **8.6. Other provisions**

309 In the event of non-compliance, appropriate actions are required to be taken as soon as possible, including communication and remedy.

582 Customs operations may be carried out only in a place where adequate means of controlling radiation exposure are provided.

583 Where a consignment is undeliverable, appropriate actions are required to be taken as soon as possible.

**SCHEDULE FOR UN 3324**

**RADIOACTIVE MATERIAL,  
LOW SPECIFIC ACTIVITY (LSA-II), FISSILE**

<b>Paragraph number(s) of the Regulations [1]</b>	<b>Subject</b>
	1. GENERAL PROVISIONS
109, 507	Other dangerous properties of contents and transport with other dangerous goods.
301–303	General provisions for radiation protection.
304, 305, 556(c)	Emergency response.
306	Quality assurance.
311–314	Training.
501(a)–(c)	Requirements before the first shipment.
502	Requirements before each shipment.
525, Table 5	Activity limits.
562	Possession of package design approval certificates, and possession of instructions for (a) the proper closing of the package and (b) other preparations for shipment.
606–616	Design requirements for all packagings and packages.
617–619	Additional design requirements — air transport.
622	Additional design requirements for Type IP-2 packages.

- 623 Additional design requirements for Type IP-3 packages (LSA-II material, liquids and gases, not under exclusive use).
- 624–628 Alternative design requirements for Type IP-2 and Type IP-3 packages.
- 634 Minimum dimensions of the package.
- 671–682 Additional design requirements for packages containing fissile material.
- 802(a), 812–814 Package design requirements — competent authority approval.
- 816–817 Transitional arrangements for packages approved under the 1973, 1973 (As Amended), 1985 and 1985 (As Amended 1990) Editions of the Regulations.
- 819 Packaging serial numbers — informing the competent authority.

## 2. CONTENTS LIMIT FOR PACKAGES

- 411<sup>a</sup>, 521 The contents are required to be restricted in accordance with the radiation levels specified in para. 521 of the Regulations.
- 412 A single package of non-combustible LSA-II material, if carried by air, is not allowed to contain an activity greater than  $3000A_2$ .
- 418 Fissile material.

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<sup>a</sup> The electronic version of the 2005 Edition of the Regulations, available on [www.iaea.org](http://www.iaea.org), should be used when referring to paras 405–419; in the printed version of the 2005 Edition of the Regulations, paras 405–419 are incorrectly numbered as 406–420.

503 A package is not allowed to contain any items other than those that are necessary for the use of the radioactive material. The interaction between these items and the package, under the conditions of transport applicable to the design, is not allowed to reduce the safety of the package.

### 3. CONTAMINATION

508, 509 Non-fixed contamination on the external surfaces of any package and on the external and internal surfaces of overpacks, freight containers, tanks, intermediate bulk containers and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over any area of 300 cm<sup>2</sup> of any part of the surface:

- (a) Beta, gamma and low toxicity alpha emitters, 4.0 Bq/cm<sup>2</sup>;
- (b) All other alpha emitters, 0.4 Bq/cm<sup>2</sup>.

### 4. MAXIMUM RADIATION LEVELS

- 530–532, 575
- (i) The radiation level for a package or overpack is required to be such that the TI of the package or overpack does not exceed 10, and the criticality safety index is not allowed to exceed 50, except when transported under exclusive use; and
  - (ii) The maximum radiation level at any point on any external surface of the package or overpack is not allowed to exceed 2 mSv/h, except when transported under exclusive use by rail or by road, or under exclusive use by sea<sup>b</sup>; and
  - (iii) The maximum radiation level at any point on any external surface of a package or overpack transported under exclusive use is not allowed to exceed 10 mSv/h.

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<sup>b</sup> Packages or overpacks having a surface radiation level greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels in accordance with Table 9 of the Regulations, footnote a, provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel.

## 5. CATEGORIES OF PACKAGES AND OVERPACKS

- 524, Table 4 LSA material and SCO are required to be packaged in accordance with Table 4 of the Regulations.
- 526, 527 The TI is required to be derived in accordance with the procedure as stated in paras 526 and 527 of the Regulations.
- 528, 529 The criticality safety index for packages containing fissile material is required to be obtained in accordance with paras 528 and 529 of the Regulations.
- 533, Table 7 Packages and overpacks are required to be assigned to category I-WHITE, category II-YELLOW or category III-YELLOW.

## 6. MARKING AND LABELLING

- 507 Packages, freight containers and overpacks containing materials having other dangerous properties (e.g. corrosiveness) are also required to be marked and labelled as required by the relevant transport regulations.
- 535–539 All markings are required to be legible and durable, and are required to be on the outside of the packaging.
- 535 Each package is required to be marked with an identification of either the consignor or the consignee, or both.
- 536, Table 8 Packages are required to bear the mark “UN 3324” and the proper shipping name “RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-II), FISSILE”.
- 537 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass.
- 538(a) Each package which conforms to an IP-2 or IP-3 design is required to be marked with “TYPE IP-2” or “TYPE IP-3” as appropriate.

- 538(c) Each package which conforms to an IP-2 or IP-3 design is required to be marked with the international vehicle registration code (VRI Code) of the country of origin of design and either the name of the manufacturer or other identification of the packaging specified by the competent authority of the country of origin of design.
- 539 Each package is required to be marked with:
- (a) The identification mark allocated to that design by the competent authority;
  - (b) A serial number to uniquely identify each packaging which conforms to that design.
- 542 Any labels which do not relate to the radioactive contents are required to be removed or covered.
- 542, 545–547,  
Figs 2–5 Each package, overpack and freight container is required to bear the appropriate labels. Paragraph 547 of the Regulations sets out alternative provisions for large freight containers and tanks.
- 543 The labels are required to be fixed to two opposite sides of the outside of the package or overpack, or to all four sides of a freight container or tank. The labels are not allowed to cover the markings specified in paras 535–539 of the Regulations.
- 544(a) Each label is required to be marked with the name(s) of the radionuclide(s), followed by “LSA-II”. Paragraph 544(a) of the Regulations establishes requirements for labelling mixtures of radionuclides.
- 544(b) The maximum activity of the contents is required to be marked on the label. The mass of fissile material, in units of grams (g), or multiples of grams, may be used instead of the activity.

544(c) Except for mixed loads, each label on a freight container or overpack is required to be marked with:

- (a) The radioactive contents; and
- (b) The maximum activity of the total radioactive contents during transport.

For mixed loads such entries may read “See Transport Documents”.

544(d) Each label is required to show the TI, except for category I-WHITE, for which the TI is not required.

549 It is the consignor’s responsibility to comply with the requirements of marking, labelling and placarding.

## 7. REQUIREMENTS BEFORE SHIPMENT

501(a)–(c) Before the first shipment, confirmation is required that the shielding, containment, heat transfer characteristics, confinement system and neutron poisons conform to the approved design.

502(a)–(c), (g) Before each shipment of any package, the following requirements apply:

- (a) For any package it is required to ensure that all the requirements specified in the relevant provisions of the Regulations have been satisfied.
- (b) It is required to ensure that lifting attachments which do not meet the requirements of para. 607 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 608 of the Regulations.
- (c) For each package, it is required to ensure that all the requirements specified in the competent authority approval certificates have been satisfied.

- (g) For packages containing fissile material, the measurement specified in para. 674(b) of the Regulations and the tests to demonstrate closure of each package as specified in para. 677 of the Regulations are required to be performed where applicable.
- 550 Transport documents with each consignment (consignment notes) are required to include all relevant particulars of the consignment.
- 551–554 The consignor is required to include a declaration in the transport documents.
- 556 The consignor is required to provide a statement regarding actions to be taken by the carrier.
- 557 The consignor is required to make competent authority certificates available to the carrier(s) before loading and unloading.
- 558 Before the first shipment, the consignor is required to ensure that copies of each competent authority certificate applying to that package design have been submitted to the competent authority of each country through or into which the consignment is to be transported. The consignor is not required to await an acknowledgement from the competent authority, nor is the competent authority required to make an acknowledgement of receiving the certificate.
- 820(c) Shipments — competent authority multilateral approval is required where the criticality safety index is greater than 50.
- 822 Information to be included in an application for shipment approval.
- 823 When a shipment has been approved, the competent authority is required to issue an approval certificate.

## 8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

### 8.1. Modal requirements

- 573(a)–(c) For transport by rail and by road: for consignments under exclusive use, the radiation level is not allowed to exceed:
- (a) 10 mSv/h at any point on the external surface of any package or overpack, and may only exceed 2 mSv/h provided that:
    - (i) The vehicle is equipped with an enclosure which prevents unauthorized access during transport; and
    - (ii) The package or overpack is secured to retain its position within the enclosure during routine transport; and
    - (iii) There are no loading or unloading operations between the beginning and the end of the shipment;
  - (b) 2 mSv/h at any point on the outer surfaces of the vehicle, including the upper and lower surfaces, or, in the case of an open vehicle, at any point on the vertical planes projected from the outer edges of the vehicle, on the upper surface of the load, and on the lower external surface of the vehicle; and
  - (c) 0.1 mSv/h at any point 2 m from the vertical planes represented by the outer lateral surfaces of the vehicle, or, if the load is transported in an open vehicle, at any point 2 m from the vertical planes projected from the outer edges of the vehicle.
- 574 For transport by road: no persons other than the driver and assistants are permitted in vehicles carrying packages, overpacks or freight containers bearing category II-YELLOW or category III-YELLOW labels.
- 575 For transport by vessels: packages or overpacks having a surface radiation level greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with Table 9 of the Regulations, footnote a, are not allowed to be transported.

576 For transport by vessels: the transport of consignments by means of a special use vessel is excepted from the requirements of para. 567 of the Regulations relating to TI, criticality safety index and radiation level provided that the conditions stated in this paragraph are met.

579 For transport by air: packages or overpacks having a surface radiation level greater than 2 mSv/h are not allowed to be transported.

580, 581 Transport by post is not permitted.

## **8.2. Placarding**

507, 549 Placards may be required for other dangerous properties of the contents.

547, Fig. 6 Large freight containers and tanks are required to bear four placards in a vertical orientation on the two external side walls and the two external end walls.

547 Any placards which do not relate to the contents are required to be removed.

547, Figs 2–6 As an alternative to the use of placards on large freight containers and tanks, enlarged labels are permitted.

548, Figs 6, 7 Where an exclusive use consignment in a freight container is packaged UN 3324 LSA-II, and no other UN number commodities are present, the UN number “UN 3324” is required to be displayed on all four sides of the freight container, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

571,  
Figs 2–6 The location of placards and the use of placards with reduced dimensions on a road or rail vehicle are stipulated.

572, Figs 6, 7 For carriage in or on a road or rail vehicle, where an exclusive use consignment is packaged UN 3324 LSA-II only, and no other UN number commodities are present, the UN number “UN 3324” is required to be displayed, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

### **8.3. Stowage during transport, storage in transit and segregation**

505 The transport of other goods together with consignments being transported under exclusive use may be permitted.

563 Packages, overpacks and freight containers are required to be segregated during transport and during storage in transit. The criteria for segregation are set out in paras 563(a)–563(d) and para. 506 of the Regulations:

563(a) Criteria for segregation from workers in regularly occupied working areas;

563(b) Criteria for segregation from members of the public;

563(c) Criteria for segregation from undeveloped photographic film; and

563(d), 506 Criteria for segregation from other dangerous goods.

564 Category II-YELLOW or category III-YELLOW packages or overpacks may be carried in compartments occupied by passengers under specific conditions.

565 Consignments are required to be securely stowed.

566 A package or overpack may be carried or stored among packaged general cargo.

567(a), Table 9 Transport index limits for freight containers and conveyances.

- 567(b) Limits on the radiation levels from freight containers and conveyances. See paras 573(b) and 573(c) of the Regulations for exceptions.
- 567(c) Criticality safety index limits for freight containers and conveyances.
- 568 Any package or overpack having a TI greater than 10 is required to be transported only under exclusive use.
- 569, 570, Table 10 Segregation of packages during transport and storage in transit.
- 576 For a special use vessel, the storage arrangements are excepted from the requirements of para. 567 of the Regulations provided that the conditions stated in para. 576 of the Regulations are met.

#### **8.4. Damaged or leaking packages**

- 510 Actions to be taken when a package has been damaged or is leaking, or where it is suspected that the package may have leaked or been damaged.
- 511 Movement of packages which are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport.

#### **8.5. Decontamination**

- 504 Tanks and intermediate bulk containers used for the transport of radioactive material are not allowed to be used for storage or transport of other goods, unless decontaminated below one tenth of the levels specified in paras 508 and 509 of the Regulations.
- 512 Periodic checking of conveyances and equipment is required to determine the level of contamination.
- 513 Decontamination of conveyances, equipment or part thereof which have become contaminated.

## **8.6. Other provisions**

- 309 In the event of non-compliance, appropriate actions are required to be taken as soon as possible, including communication and remedy.
- 582 Customs operations may be carried out only in a place where adequate means of controlling radiation exposure are provided.
- 583 Where a consignment is undeliverable, appropriate actions are required to be taken as soon as possible.

## SCHEDULE FOR UN 3325

### RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-III), FISSILE

<b>Paragraph number(s) of the Regulations [1]</b>	<b>Subject</b>
	1. GENERAL PROVISIONS
109, 507	Other dangerous properties of contents and transport with other dangerous goods.
301–303	General provisions for radiation protection.
304, 305, 556(c)	Emergency response.
306	Quality assurance.
311–314	Training.
501(a)–(c)	Requirements before the first shipment.
502	Requirements before each shipment.
525, Table 5	Activity limits.
562	Possession of package design approval certificates, and possession of instructions for (a) the proper closing of the package and (b) other preparations for shipment.
601	Additional requirement for LSA-III material.
606–616	Design requirements for all packagings and packages.
617–619	Additional design requirements — air transport.

- 622 Additional design requirements for Type IP-2 packages (LSA-III material, under exclusive use).
- 623 Additional design requirements for Type IP-3 packages (LSA-III material, not under exclusive use).
- 624, 625, 627, 628 Alternative design requirements for Type IP-2 and Type IP-3 packages.
- 634 Minimum dimensions of the package.
- 671–682 Additional design requirements for packages containing fissile material.
- 802(a), 812–814 Package design requirements — competent authority approval.
- 816, 817 Transitional arrangements for packages approved under the 1973, 1973 (As Amended), 1985 and 1985 (As Amended 1990) Editions of the Regulations.
- 819 Packaging serial numbers — informing the competent authority.

## 2. CONTENTS LIMITS FOR PACKAGES

- 411<sup>a</sup>, 521 The contents are required to be restricted in accordance with the radiation levels specified in para. 521 of the Regulations.
- 412 A single package of non-combustible LSA-III material, if carried by air, is not allowed to contain an activity greater than  $3000A_2$ .
- 418 Fissile material.

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<sup>a</sup> The electronic version of the 2005 Edition of the Regulations, available on [www.iaea.org](http://www.iaea.org), should be used when referring to paras 405–419; in the printed version of the 2005 Edition of the Regulations, paras 405–419 are incorrectly numbered as 406–420.

503 A package is not allowed to contain any items other than those that are necessary for the use of the radioactive material. The interaction between these items and the package, under the conditions of transport applicable to the design, is not allowed to reduce the safety of the package.

### 3. CONTAMINATION

508, 509 Non-fixed contamination on the external surfaces of any package and on the external and internal surfaces of overpacks, freight containers, tanks, intermediate bulk containers and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over any area of 300 cm<sup>2</sup> of any part of the surface:

- (a) Beta, gamma and low toxicity alpha emitters, 4.0 Bq/cm<sup>2</sup>;
- (b) All other alpha emitters, 0.4 Bq/cm<sup>2</sup>.

### 4. MAXIMUM RADIATION LEVELS

- 530–532, 575
- (i) The radiation level for a package or overpack is required to be such that the TI of the package or overpack does not exceed 10, and the criticality safety index is not allowed to exceed 50, except when transported under exclusive use; and
  - (ii) The maximum radiation level at any point on any external surface of the package or overpack is not allowed to exceed 2 mSv/h, except when transported under exclusive use by rail or by road, or under exclusive use by sea<sup>b</sup>; and
  - (iii) The maximum radiation level at any point on any external surface of a package or overpack transported under exclusive use is not allowed to exceed 10 mSv/h.

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<sup>b</sup> Packages or overpacks having a surface radiation level greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels in accordance with Table 9 of the Regulations, footnote a, provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel.

## 5. CATEGORIES OF PACKAGES AND OVERPACKS

- 524, Table 4 LSA material and SCO are required to be packaged in accordance with Table 4 of the Regulations.
- 526, 527 The TI is required to be derived in accordance with the procedure as stated in paras 526 and 527 of the Regulations.
- 528, 529 The criticality safety index for packages containing fissile material is required to be obtained in accordance with paras 528 and 529 of the Regulations.
- 533, Table 7 Packages and overpacks are required to be assigned to category I-WHITE, category II-YELLOW or category III-YELLOW.

## 6. MARKING AND LABELLING

- 507 Packages, freight containers and overpacks containing materials having other dangerous properties (e.g. corrosiveness) are also required to be marked and labelled as required by the relevant transport regulations.
- 535 Each package is required to be marked with an identification of either the consignor or the consignee, or both.
- 535–539 All markings are required to be legible and durable, and are required to be on the outside of the packaging.
- 536, Table 8 Packages are required to bear the mark “UN 3325” and the proper shipping name “RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-III), FISSILE”.
- 537 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass.
- 538(a) Each package which conforms to an IP-2 or IP-3 design is required to be marked with “TYPE IP-2” or “TYPE IP-3” as appropriate.

- 538(c) Each package which conforms to an IP-2 or IP-3 design is required to be marked with the international vehicle registration code (VRI Code) of the country of origin of design and either the name of the manufacturer or other identification of the packaging specified by the competent authority of the country of origin of design.
- 539 Each package is required to be marked with:
- (a) The identification mark allocated to that design by the competent authority;
  - (b) A serial number to uniquely identify each packaging which conforms to that design.
- 542 Any labels which do not relate to the radioactive contents are required to be removed or covered.
- 542, 545–547,  
Figs 2–5 Each package, overpack and freight container is required to bear the appropriate labels. Paragraph 547 of the Regulations sets out alternative provisions for large freight containers and tanks.
- 543 The labels are required to be fixed to two opposite sides of the outside of the package or overpack, or on all four sides of a freight container or tank. The labels are not allowed to cover the markings specified in paras 535–539 of the Regulations.
- 544(a) Each label is required to be marked with the name(s) of the radionuclide(s), followed by “LSA-III”. Paragraph 544(a) of the Regulations establishes requirements for labelling mixtures of radionuclides.
- 544(b) The maximum activity of the contents is required to be marked on the label. The mass of fissile material, in units of grams (g), or multiples of grams, may be used instead of the activity.

544(c) Except for mixed loads, each label on a freight container or overpack is required to be marked with:

- (a) The radioactive contents; and
- (b) The maximum activity of the total radioactive contents during transport.

For mixed loads such entries may read “See Transport Documents”.

544(d) Each label is required to show the TI, except for category I-WHITE, for which the TI is not required.

549 It is the consignor’s responsibility to comply with the requirements of marking, labelling and placarding.

## 7. REQUIREMENTS BEFORE SHIPMENT

501(a)–(c) Before the first shipment, confirmation is required that the shielding, containment, heat transfer characteristics, confinement system and neutron poisons conform to the approved design.

502(a)–(c), (g) Before each shipment of any package, the following requirements apply:

- (a) For any package it is required to ensure that all the requirements specified in the relevant provisions of the Regulations have been satisfied.
- (b) It is required to ensure that lifting attachments which do not meet the requirements of para. 607 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 608 of the Regulations.
- (c) For each package, it is required to ensure that all the requirements specified in the competent authority approval certificates have been satisfied.

- (g) For packages containing fissile material, the measurement specified in para. 674(b) of the Regulations and the tests to demonstrate closure of each package as specified in para. 677 of the Regulations are required to be performed where applicable.
- 550 Transport documents with each consignment (consignment notes) are required to include all relevant particulars of the consignment.
- 551–554 The consignor is required to include a declaration in the transport documents.
- 556 The consignor is required to provide a statement regarding actions to be taken by the carrier.
- 557 The consignor is required to make competent authority certificates available to the carrier(s) before loading and unloading.
- 558 Before the first shipment, the consignor is required to ensure that copies of each competent authority certificate applying to that package design have been submitted to the competent authority of each country through or into which the consignment is to be transported. The consignor is not required to await an acknowledgement from the competent authority, nor is the competent authority required to make an acknowledgement of receiving the certificate.
- 820(c) Shipments — competent authority multilateral approval is required where the criticality safety index is greater than 50.
- 822 Information to be included in an application for shipment approval.
- 823 When a shipment has been approved, the competent authority is required to issue an approval certificate.

## 8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

### 8.1. Modal requirements

- 573(a)–(c) For transport by rail and by road: for consignments under exclusive use, the radiation level is not allowed to exceed:
- (a) 10 mSv/h at any point on the external surface of any package or overpack, and may only exceed 2 mSv/h provided that:
    - (i) The vehicle is equipped with an enclosure which prevents unauthorized access during transport; and
    - (ii) The package or overpack is secured to retain its position within the enclosure during routine transport; and
    - (iii) There are no loading or unloading operations between the beginning and the end of the shipment;
  - (b) 2 mSv/h at any point on the outer surfaces of the vehicle, including the upper and lower surfaces, or, in the case of an open vehicle, at any point on the vertical planes projected from the outer edges of the vehicle, on the upper surface of the load, and on the lower external surface of the vehicle; and
  - (c) 0.1 mSv/h at any point 2 m from the vertical planes represented by the outer lateral surfaces of the vehicle, or, if the load is transported in an open vehicle, at any point 2 m from the vertical planes projected from the outer edges of the vehicle.
- 574 For transport by road: no persons other than the driver and assistants are permitted in vehicles carrying packages, overpacks or freight containers bearing category II-YELLOW or category III-YELLOW labels.
- 575 For transport by vessels: packages or overpacks having a surface radiation level greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with Table 9 of the Regulations, footnote a, are not allowed to be transported.

576 For transport by vessels: the transport of consignments by means of a special use vessel is excepted from the requirements of para. 567 of the Regulations relating to TI, criticality safety index and radiation level provided that the conditions stated in para. 576 of the Regulations are met.

579 For transport by air: packages or overpacks having a surface radiation level greater than 2 mSv/h are not allowed to be transported.

580, 581 Transport by post is not permitted.

## **8.2. Placarding**

507, 549 Placards may be required for other dangerous properties of the contents.

547, Fig. 6 Large freight containers and tanks are required to bear four placards in a vertical orientation on the two external side walls and the two external end walls.

547 Any placards which do not relate to the contents are required to be removed.

547, Figs 2–6 As an alternative to the use of placards on large freight containers and tanks, enlarged labels are permitted.

548, Figs 6, 7 Where an exclusive use consignment in a freight container is packaged UN 3325 LSA-III, and no other UN number commodities are present, the UN number “UN 3325” is required to be displayed on all four sides of the freight container, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

571, Figs 2–6 The location of placards and the use of placards with reduced dimensions on a road or rail vehicle are stipulated.

572, Figs 6, 7 For carriage in or on a road or rail vehicle, where an exclusive use consignment is packaged UN 3325 LSA-III only, and no other UN number commodities are present, the UN number “UN 3325” is required to be displayed, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

### **8.3. Stowage during transport, storage in transit and segregation**

505 The transport of other goods together with consignments being transported under exclusive use may be permitted.

563 Packages, overpacks and freight containers are required to be segregated during transport and during storage in transit. The criteria for segregation are set out in paras 563(a)–563(d) and para. 506 of the Regulations:

563(a) Criteria for segregation from workers in regularly occupied working areas;

563(b) Criteria for segregation from members of the critical group of the public;

563(c) Criteria for segregation from undeveloped photographic film; and

563(d), 506 Criteria for segregation from other dangerous goods.

564 Category II-YELLOW or category III-YELLOW packages or overpacks may be carried in compartments occupied by passengers under specific conditions.

565 Consignments are required to be securely stowed.

566 A package or overpack may be carried or stored among packaged general cargo.

567(a), Table 9 Transport index limits for freight containers and conveyances.

- 567(b) Limits on the radiation levels from freight containers and conveyances. See paras 573(b) and 573(c) of the Regulations for exceptions.
- 567(c) Criticality safety index limits for freight containers and conveyances.
- 568 Any package or overpack having a TI greater than 10 is required to be transported only under exclusive use.
- 569, 570, Table 10 Segregation of packages during transport and storage in transit.
- 576 For a special use vessel, the storage arrangements are excepted from the requirements of para. 567 of the Regulations provided that the conditions stated in para. 576 of the Regulations are met.

#### **8.4. Damaged or leaking packages**

- 510 Actions to be taken when a package has been damaged or is leaking, or where it is suspected that the package may have leaked or been damaged.
- 511 Movement of packages which are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport.

#### **8.5. Decontamination**

- 504 Intermediate bulk containers used for the transport of radioactive material are not allowed to be used for storage or transport of other goods, unless decontaminated below one tenth of the levels specified in paras 508 and 509 of the Regulations.
- 512 Periodic checking of conveyances and equipment is required to determine the level of contamination.
- 513 Decontamination of conveyances, equipment or part thereof which have become contaminated.

## **8.6. Other provisions**

- 309 In the event of non-compliance, appropriate actions are required to be taken as soon as possible, including communication and remedy.
- 582 Customs operations may be carried out only in a place where adequate means of controlling radiation exposure are provided.
- 583 Where a consignment is undeliverable, appropriate actions are required to be taken as soon as possible.

## SCHEDULE FOR UN 3326

### RADIOACTIVE MATERIAL, SURFACE CONTAMINATED OBJECTS (SCO-I OR SCO-II), FISSILE

<b>Paragraph number(s) of the Regulations [1]</b>	<b>Subject</b>
	1. GENERAL PROVISIONS
109, 507	Other dangerous properties of contents and transport with other dangerous goods.
301–303	General provisions for radiation protection.
304, 305, 556(c)	Emergency response.
306	Quality assurance.
311–314	Training.
501(a)–(c)	Requirements before the first shipment.
502	Requirements before each shipment.
525, Table 5	Activity limits.
562	Possession of package design certificates, and instructions for (a) the proper closing of the package and (b) other preparations for shipment.
606–616, 621	Design requirements for the packaging and the package, Type IP-1.
617–619	Additional design requirements — air transport.

- 622 Additional design requirements for the packaging and the package, Type IP-2.
- 624–628 Alternative design requirements for the packaging and the package, Type IP-2.
- 634 Minimum dimensions of the package.
- 671–682 Additional design requirements for packages containing fissile material.
- 802(a), 812–814 Package design requirements — competent authority approval.
- 816, 817 Transitional arrangements for packages approved under the 1973, 1973 (As Amended), 1985 and 1985 (As Amended 1990) Editions of the Regulations.
- 819 Packaging serial numbers — informing the competent authority.

## 2. CONTENTS LIMITS FOR PACKAGES

- 411<sup>a</sup>, 521 The contents are required to be restricted in accordance with the radiation levels specified in para. 521 of the Regulations.
- 418 Fissile material.
- 503 A package is not allowed to contain any items other than those that are necessary for the use of the radioactive material. The interaction between these items and the package, under the conditions of transport applicable to the design, is not allowed to reduce the safety of the package.

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<sup>a</sup> The electronic version of the 2005 Edition of the Regulations, available on [www.iaea.org](http://www.iaea.org), should be used when referring to paras 405–419; in the printed version of the 2005 Edition of the Regulations, paras 405–419 are incorrectly numbered as 406–420.

### 3. CONTAMINATION

508, 509 Non-fixed contamination on the external surfaces of any package and on the external and internal surfaces of overpacks, freight containers, tanks, intermediate bulk containers and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over 300 cm<sup>2</sup> of any part of the surface:

- (a) Beta, gamma and low toxicity alpha emitters, 4.0 Bq/cm<sup>2</sup>;
- (b) All other alpha emitters, 0.4 Bq/cm<sup>2</sup>.

514 The requirements of paras 508 and 509 of the Regulations concerning non-fixed contamination do not apply to the internal surfaces of a freight container, tank, intermediate bulk container or conveyance dedicated to the transport of unpackaged SCO-I material under exclusive use, for as long as it remains under exclusive use.

### 4. MAXIMUM RADIATION LEVELS

- 530–532, 575
- (i) The radiation level for a package or overpack is required to be such that the TI of the package or overpack does not exceed 10, and the criticality safety index is not allowed to exceed 50, except when transported under exclusive use; and
  - (ii) The maximum radiation level at any point on any external surface of the package or overpack is not allowed to exceed 2 mSv/h, except when transported under exclusive use by rail or by road, or under exclusive use by sea<sup>b</sup>; and
  - (iii) The maximum radiation level at any point on any external surface of a package or overpack transported under exclusive use is not allowed to exceed 10 mSv/h.

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<sup>b</sup> Packages or overpacks having a surface radiation level greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels in accordance with Table 9 of the Regulations, footnote a, provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel.

## 5. CATEGORIES OF PACKAGES AND OVERPACKS

- 524, Table 4 LSA material and SCO are required to be packaged in accordance with Table 4 of the Regulations.
- 526, 527 The TI is required to be derived in accordance with the procedure as stated in paras 526 and 527 of the Regulations.
- 528, 529 The criticality safety index for packages containing fissile material is required to be obtained in accordance with paras 528 and 529 of the Regulations.
- 533, Table 7 Packages and overpacks are required to be assigned to category I-WHITE, category II-YELLOW or category III-YELLOW.

## 6. MARKING AND LABELLING

- 507 Packages, freight containers and overpacks containing materials having other dangerous properties (e.g. corrosiveness) are required also to be marked and labelled as required by the relevant transport regulations.
- 535 Each package is required to be marked with an identification of either the consignor or the consignee, or both.
- 535–539 All markings are required to be legible and durable, and are required to be on the outside of the packaging.
- 536, Table 8 Packages are required to bear the mark “UN 3326” and the proper shipping name, either “RADIOACTIVE MATERIAL, SURFACE CONTAMINATED OBJECTS (SCO-I) FISSILE” or “RADIOACTIVE MATERIAL, SURFACE CONTAMINATED OBJECTS (SCO-II) FISSILE”, depending on the contents.
- 537 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass.

- 538(a) Each package which conforms to an IP-1 or IP-2 design is required to be marked with “TYPE IP-1” or “TYPE IP-2” as appropriate.
- 538(c) Each package which conforms to an IP-2 design is required to be marked with the international vehicle registration code (VRI Code) of the country of origin of design and either the name of the manufacturer or other identification of the packaging specified by the competent authority of the country of origin of design.
- 539 Each package is required to be marked with:
- (a) The identification mark allocated to that design by the competent authority;
  - (b) A serial number to uniquely identify each packaging which conforms to that design.
- 541 When the material is contained in receptacles or wrapping and is transported under exclusive use, it may be marked “RADIOACTIVE SCO-I”.
- 542 Any labels which do not relate to the radioactive contents are required to be removed or covered.
- 542, 545–547,  
Figs 2–5 Each package, overpack and freight container is required to bear the appropriate labels. Paragraph 547 of the Regulations sets out alternative provisions for large freight containers and tanks.
- 543 The labels are required to be fixed to two opposite sides of the outside of the package or overpack, or on all four sides of a freight container or tank. The labels are not allowed to cover the markings specified in paras 535–539 and para. 541 of the Regulations (see above).
- 544(a) Each label is required to be marked with the name(s) of the radionuclide(s), followed by either “SCO-I” or “SCO-II”, as applicable. Paragraph 544(a) of the Regulations establishes requirements for labelling mixtures of radionuclides.

544(b) The maximum activity of the contents is required to be marked on the label. The mass of fissile material, in grams (g), or multiples of grams, may be used instead of the activity.

544(c) Except for mixed loads, each label on a freight container or overpack is required to be marked with:

- (a) The radioactive contents; and
- (b) The maximum activity of the total radioactive contents during transport.

For mixed loads such entries may read “See Transport Documents”.

544(d) Each label is required to show the TI, except for category I-WHITE, for which the TI is not required.

549 It is the consignor’s responsibility to comply with the requirements of marking, labelling and placarding.

## 7. REQUIREMENTS BEFORE SHIPMENT

501(a)–(c) Before the first shipment, confirmation is required that the shielding, containment, heat transfer characteristics, confinement system and neutron poisons conform to the approved design.

502(a)–(c), (g) Before each shipment of any package, the following requirements apply:

- (a) For any package it is required to ensure that all the requirements specified in the relevant provisions of the Regulations have been satisfied.
- (b) It is required to ensure that lifting attachments which do not meet the requirements of para. 607 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 608 of the Regulations.

- (c) For each package, it is required to ensure that all the requirements specified in the competent authority approval certificates have been satisfied.
  - (g) For packages containing fissile material, the measurement specified in para. 674(b) of the Regulations and the tests to demonstrate closure of each package as specified in para. 677 of the Regulations are required to be performed where applicable.
- 550 Transport documents with each consignment (consignment notes) are required to include all relevant particulars of the consignment.
- 551–554 The consignor is required to include a declaration in the transport documents.
- 556 The consignor is required to provide a statement regarding actions to be taken by the carrier.
- 557 The consignor is required to make competent authority certificates available to the carrier(s) before loading and unloading.
- 558 Before the first shipment, the consignor is required to ensure that copies of each competent authority certificate applying to that package design have been submitted to the competent authority of each country through or into which the consignment is to be transported. The consignor is not required to await an acknowledgement from the competent authority, nor is the competent authority required to make an acknowledgement of receiving the certificate.
- 820(c) Shipment — competent authority multilateral approval is required where the criticality safety index is greater than 50.
- 822 Information to be included in an application for shipment approval.
- 823 When a shipment has been approved, the competent authority is required to issue an approval certificate.

## 8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

### 8.1. Modal requirements

- 573(a)–(c) For transport by rail and by road: for consignments under exclusive use, the radiation level is not allowed to exceed:
- (a) 10 mSv/h at any point on the external surface of any package or overpack, and may only exceed 2 mSv/h provided that:
    - (i) The vehicle is equipped with an enclosure which prevents unauthorized access during transport; and
    - (ii) The package or overpack is secured to retain its position within the enclosure during routine transport; and
    - (iii) There are no loading or unloading operations between the beginning and the end of the shipment;
  - (b) 2 mSv/h at any point on the outer surfaces of the vehicle, including the upper and lower surfaces, or, in the case of an open vehicle, at any point on the vertical planes projected from the outer edges of the vehicle, on the upper surface of the load, and on the lower external surface of the vehicle; and
  - (c) 0.1 mSv/h at any point 2 m from the vertical planes represented by the outer lateral surfaces of the vehicle, or, if the load is transported in an open vehicle, at any point 2 m from the vertical planes projected from the outer edges of the vehicle.
- 574 For transport by road: no persons other than the driver and assistants are permitted in vehicles carrying packages, overpacks or freight containers bearing category II-YELLOW or category III-YELLOW labels.
- 575 For transport by vessels: packages or overpacks having a surface radiation level greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with Table 9 of the Regulations, footnote a, are not allowed to be transported.

576 For transport by vessels: the transport of consignments by means of a special use vessel is excepted from the requirements of para. 567 of the Regulations relating to TI, criticality safety index and radiation level provided that the conditions stated in para. 576 of the Regulations are met.

579 For transport by air: packages or overpacks having a surface radiation level greater than 2 mSv/h are not allowed to be transported.

580, 581 Transport by post is not permitted.

## **8.2. Placarding**

507, 549 Placards may be required for other dangerous properties of the contents.

547, Fig. 6 Large freight containers are required to bear four placards in a vertical orientation on the two external side walls and the two external end walls.

547 Any placards which do not relate to the contents are required to be removed.

547, Figs 2–6 As an alternative to the use of placards on large freight containers, enlarged labels are permitted.

548, Figs 6, 7 Where the consignment in the freight container is unpackaged SCO-I, or where an exclusive use consignment in a freight container is packaged UN 3326 SCO-I or SCO-II, and no other UN number commodities are present, the UN number “UN 3326” is required to be displayed on all four sides of the freight container, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

571, Figs 2–6 The location of placards and the use of placards with reduced dimensions on a road or rail vehicle are stipulated.

572, Figs 6, 7      Where the consignment in or on a road or rail vehicle is unpackaged UN 3326 SCO-I only, or where an exclusive use consignment is packaged UN 3326 SCO-I or SCO-II only, and no other UN number commodities are present, the UN number “UN 3326” is required to be displayed, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

### **8.3. Stowage during transport, storage in transit and segregation**

505      The transport of other goods together with consignments being transported under exclusive use may be permitted.

563      Packages, overpacks and freight containers are required to be segregated during transport and during storage in transit. The criteria for segregation are set out in paras 563(a)–563(d) and para. 506 of the Regulations:

563(a)      Criteria for segregation from workers in regularly occupied working areas;

563(b)      Criteria for segregation from members of the public;

563(c)      Criteria for segregation from undeveloped photographic film;

563(d), 506      Criteria for segregation from other dangerous goods.

564      Category II-YELLOW or category III-YELLOW packages or overpacks may be carried in compartments occupied by passengers under specific conditions.

565      Consignments are required to be securely stowed.

566      A package or overpack may be carried or stored among packaged general cargo.

567(a), Table 9      Transport index limits for freight containers and conveyances.

- 567(b) Limits on the radiation levels from freight containers and conveyances. See paras 573(b) and 573(c) of the Regulations for exceptions.
- 567(c) Criticality safety index limits for freight containers and conveyances.
- 568 Any package or overpack having a TI greater than 10, or any consignment having a criticality safety index greater than 50, is required to be transported only under exclusive use.
- 569, 570, Table 10 Segregation of packages during transport and storage in transit.
- 576 For a special use vessel, the storage arrangements are excepted from the requirements of para. 567 of the Regulations provided that the conditions stated in para. 576 of the Regulations are met.

#### **8.4. Damaged or leaking packages**

- 510 Actions to be taken when a package has been damaged or is leaking, or where it is suspected that the package may have leaked or been damaged.
- 511 Movement of packages which are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport.

#### **8.5. Decontamination**

- 504 Intermediate bulk containers used for the transport of radioactive material are not allowed to be used for storage or transport of other goods, unless decontaminated below one tenth of the levels specified in paras 508 and 509 of the Regulations.
- 512 Periodic checking of conveyances and equipment is required to determine the level of contamination.

513 Decontamination of conveyances, equipment or part thereof  
which have become contaminated.

514 A freight container, intermediate bulk container or  
conveyance dedicated to the transport of unpackaged LSA-I  
or SCO-I material under exclusive use may be excepted from  
the requirements specified in paras 508, 509 and 513 of the  
Regulations solely with regard to its internal surfaces and  
only for as long as it remains under that specific exclusive  
use.

### **8.6. Other provisions**

309 In the event of non-compliance, appropriate actions are  
required to be taken as soon as possible, including  
communication and remedy.

582 Customs operations may be carried out only in a place where  
adequate means of controlling radiation exposure are  
provided.

583 Where a consignment is undeliverable, appropriate actions  
are required to be taken as soon as possible.

## SCHEDULE FOR UN 3327

### RADIOACTIVE MATERIAL, TYPE A PACKAGE, FISSILE, non-special form

<b>Paragraph number(s) of the Regulations [1]</b>	<b>Subject</b>
	1. GENERAL PROVISIONS
109, 507	Other dangerous properties of contents and transport with other dangerous goods.
301–303	General provisions for radiation protection.
304, 305, 556(c)	Emergency response.
306	Quality assurance.
311–314	Training.
501(a)–(c)	Requirements before the first shipment.
502	Requirements before each shipment.
562	Possession of package design certificates, and instructions for (a) the proper closing of the package and (b) other preparations for shipment.
606–616	Design requirements for all packagings and packages.
617–619	Additional design requirements — air transport.
633	Design requirements for Type A packages, summary.
634–646	Additional design requirements for Type A packages.

- 647, 648 Additional design requirements for packages containing liquids.
- 649 Additional design requirements for packages containing gases.
- 671–682 Additional design requirements for packages containing fissile material.
- 802(a), 812–814 Package design requirements — competent authority approval.
- 816, 817 Transitional arrangements for packages approved under the 1973, 1973 (As Amended), 1985 and 1985 (As Amended 1990) Editions of the Regulations.
- 819 Packaging serial numbers — informing the competent authority.

## 2. CONTENTS LIMITS FOR PACKAGES

- 413(b)<sup>a</sup>, 414 The quantity of radioactive material is not allowed to exceed the limits specified in paras 413(b) and 414 of the Regulations.
- 418 Fissile material.
- 503 A package is not allowed to contain any items other than those that are necessary for the use of the radioactive material. The interaction between these items and the package, under the conditions of transport applicable to the design, is not allowed to reduce the safety of the package.

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<sup>a</sup> The electronic version of the 2005 Edition of the Regulations, available on [www.iaea.org](http://www.iaea.org), should be used when referring to paras 405–419; in the printed version of the 2005 Edition of the Regulations, paras 405–419 are incorrectly numbered as 406–420.

### 3. CONTAMINATION

508, 509 Non-fixed contamination on the external surfaces of any package and on the external and internal surfaces of overpacks, freight containers, tanks, intermediate bulk containers and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over any area of 300 cm<sup>2</sup> of any part of the surface:

- (a) Beta, gamma and low toxicity alpha emitters, 4.0 Bq/cm<sup>2</sup>;
- (b) All other alpha emitters, 0.4 Bq/cm<sup>2</sup>

### 4. MAXIMUM RADIATION LEVELS

- 530–532, 575
- (i) The radiation level for a package or overpack is required to be such that the TI of the package or overpack does not exceed 10, and the criticality safety index is not allowed to exceed 50, except when transported under exclusive use; and
  - (ii) The maximum radiation level at any point on any external surface of the package or overpack is not allowed to exceed 2 mSv/h, except when transported under exclusive use by rail or by road, or under exclusive use by sea<sup>b</sup>; and
  - (iii) The maximum radiation level at any point on any external surface of a package or overpack transported under exclusive use is not allowed to exceed 10 mSv/h.

### 5. CATEGORIES OF PACKAGES AND OVERPACKS

526, 527 The TI is required to be derived in accordance with the procedure as stated in paras 526 and 527 of the Regulations.

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<sup>b</sup> Packages or overpacks having a surface radiation level greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels in accordance with Table 9 of the Regulations, footnote a, provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel.

- 528, 529 The criticality safety index for packages containing fissile material is required to be obtained in accordance with paras 528 and 529 of the Regulations.
- 533, Table 7 Packages and overpacks are required to be assigned to category I-WHITE, category II-YELLOW or category III-YELLOW.

## 6. MARKING AND LABELLING

- 507 Packages, freight containers and overpacks containing materials having other dangerous properties (e.g. corrosiveness) are also required to be marked and labelled as required by the relevant transport regulations.
- 535 Each package is required to be marked with an identification of either the consignor or the consignee, or both.
- 535–539 All markings are required to be legible and durable, and are required to be on the outside of the packaging.
- 536, Table 8 Packages are required to bear the mark “UN 3327” and the proper shipping name “RADIOACTIVE MATERIAL, TYPE A PACKAGE, FISSILE”.
- 537 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass.
- 538(b) Each package is required to be marked with “TYPE A”.
- 538(c) Each package is required to be marked with the international vehicle registration code (VRI Code) of the country of origin of design and either the name of the manufacturer or other identification of the packaging specified by the competent authority of the country of origin of the design.

- 539 Each package is required to be marked with:
- (a) The identification mark allocated to that design by the competent authority;
  - (b) A serial number to uniquely identify each packaging which conforms to that design.
- 542 Any labels which do not relate to the radioactive contents are required to be removed or covered.
- 542, 545–547, Figs 2–5 Each package, overpack and freight container is required to bear the appropriate labels. Paragraph 547 of the Regulations sets out alternative provisions for large freight containers.
- 543 The labels are required to be fixed to two opposite sides of the outside of the package or overpack, or on all four sides of a freight container or tank. The labels are not allowed to cover the markings specified in paras 535–539 of the Regulations.
- 544(a), (b), (d), Table 1 Each label is required to be marked with the name(s) of the radionuclide(s), the maximum activity of the contents and the TI, except for category I-WHITE, for which the TI is not required. Paragraph 544(a) of the Regulations establishes requirements for labelling mixtures of radionuclides. The mass of fissile material, in grams (g), or multiples of grams, may be used instead of the activity.
- 544(c) Except for mixed loads, each label on a freight container or overpack is required to be marked with:
- (a) The radioactive contents; and
  - (b) The maximum activity of the total radioactive contents during transport.
- For mixed loads such entries may read “See Transport Documents”.
- 549 It is the consignor’s responsibility to comply with the requirements of marking, labelling and placarding.

## 7. REQUIREMENTS BEFORE SHIPMENT

- 501(a)–(c) Before the first shipment, confirmation is required that the shielding, containment, heat transfer characteristics, confinement system and neutron poisons conform to the approved design.
- 502(a)–(c), (g) Before each shipment of any package, the following requirements apply:
- (a) For any package it is required to ensure that all the requirements specified in the relevant provisions of the Regulations have been satisfied.
  - (b) It is required to ensure that lifting attachments which do not meet the requirements of para. 607 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 608 of the Regulations.
  - (c) For each package, it is required to ensure that all the requirements specified in the competent authority approval certificates have been satisfied.
  - (g) For packages containing fissile material, the measurement specified in para. 674(b) of the Regulations and the tests to demonstrate closure of each package as specified in para. 677 of the Regulations are required to be performed where applicable.
- 550 Transport documents with each consignment (consignment notes) are required to include all relevant particulars of the consignment.
- 551–554 The consignor is required to include a declaration in the transport documents.
- 556 The consignor is required to provide a statement regarding actions to be taken by the carrier.
- 557 The consignor is required to make competent authority certificates available to the carrier(s) before loading and unloading.

- 558 Before the first shipment, the consignor is required to ensure that copies of each competent authority certificate applying to that package design have been submitted to the competent authority of each country through or into which the consignment is to be transported. The consignor is not required to await an acknowledgement from the competent authority, nor is the competent authority required to make an acknowledgement of receiving the certificate.
- 820(c) Shipments — competent authority multilateral approval is required where the criticality safety index is greater than 50.
- 821, 827 Shipments — competent authority authorization of transport without shipment approval.
- 822 Information to be included in an application for shipment approval.
- 823 When a shipment has been approved, the competent authority is required to issue an approval certificate.

## 8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

### 8.1. Modal requirements

- 573(a)–(c) For transport by rail and by road: for consignments under exclusive use, the radiation level is not allowed to exceed:
- (a) 10 mSv/h at any point on the external surface of any package or overpack, and may only exceed 2 mSv/h provided that:
    - (i) The vehicle is equipped with an enclosure which prevents unauthorized access during transport; and
    - (ii) The package or overpack is secured to retain its position within the enclosure during routine transport; and
    - (iii) There are no loading or unloading operations between the beginning and the end of the shipment;

- (b) 2 mSv/h at any point on the outer surfaces of the vehicle, including the upper and lower surfaces, or, in the case of an open vehicle, at any point on the vertical planes projected from the outer edges of the vehicle, on the upper surface of the load, and on the lower external surface of the vehicle; and
- (c) 0.1 mSv/h at any point 2 m from the vertical planes represented by the outer lateral surfaces of the vehicle, or, if the load is transported in an open vehicle, at any point 2 m from the vertical planes projected from the outer edges of the vehicle.

574 For transport by road: no persons other than the driver and assistants are permitted in vehicles carrying packages, overpacks or freight containers bearing category II-YELLOW or category III-YELLOW labels.

575 For transport by vessels: packages or overpacks having a surface radiation level greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with Table 9 of the Regulations, footnote a, are not allowed to be transported.

576 For transport by vessels: the transport of consignments by means of a special use vessel is exempted from the requirements of para. 567 of the Regulations relating to TI and radiation level provided that the conditions stated in para. 576 of the Regulations are met.

579 For transport by air: packages or overpacks having a surface radiation level greater than 2 mSv/h are not allowed to be transported.

580, 581 Transport by post is not permitted.

## **8.2. Placarding**

507, 549 Placards may be required for other dangerous properties of the contents.

- 547, Fig. 6 Large freight containers are required to bear four placards in a vertical orientation on the two external side walls and the two external end walls.
- 547 Any placards which do not relate to the contents are required to be removed.
- 547, Figs 2–6 As an alternative to the use of placards on large freight containers and tanks, enlarged labels are permitted.
- 548, Figs 6, 7 Where an exclusive use consignment in a freight container is UN 3327 Type A packages, and no other UN number commodities are present, the UN number “UN 3327” is required to be displayed on all four sides of the freight container, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.
- 571, Figs 2–6 The location of placards and the use of placards with reduced dimensions on a road or rail vehicle are stipulated.
- 572, Figs 6, 7 Where an exclusive use consignment in or on a road or rail vehicle is UN 3327 Type A packages only, and no other UN number commodities are present, the UN number “UN 3327” is required to be displayed, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

### **8.3. Stowage during transport, storage in transit and segregation**

- 505 The transport of other goods together with consignments being transported under exclusive use may be permitted.

- 563 Packages, overpacks and freight containers are required to be segregated during transport and during storage in transit. The criteria for segregation are set out in paras 563(a)–563(d) and para. 506 of the Regulations:
- 563(a) Criteria for segregation from workers in regularly occupied working areas;
- 563(b) Criteria for segregation from members of the public;
- 563(c) Criteria for segregation from undeveloped photographic film; and
- 563(d), 506 Criteria for segregation from other dangerous goods.
- 564 Category II-YELLOW or category III-YELLOW packages or overpacks may be carried in compartments occupied by passengers under specific conditions.
- 565 Consignments are required to be securely stowed.
- 566 A package or overpack may be carried or stored among packaged general cargo.
- 567(a), Table 9 Transport index limits for freight containers and conveyances.
- 567(b) Limits on the radiation levels from freight containers and conveyances. See paras 573(b) and 573(c) of the Regulations for exceptions.
- 567(c), Table 10 Criticality safety index limits for freight containers and conveyances.
- 568 Any package or overpack having a TI greater than 10, or any consignment having a criticality safety index greater than 50, is required to be transported only under exclusive use.
- 569–570, Table 10 Segregation of packages during transport and storage in transit.

576 For a special use vessel, the storage arrangements are  
excepted from the requirements of para. 567 of the  
Regulations provided that the conditions stated in para. 576 of  
the Regulations are met.

#### **8.4. Damaged or leaking packages**

510 Actions to be taken when a package has been damaged or is  
leaking, or where it is suspected that the package may have  
leaked or been damaged.

511 Movement of packages which are damaged or leaking  
radioactive contents in excess of allowable limits for normal  
conditions of transport.

#### **8.5. Decontamination**

512 Periodic checking of conveyances and equipment is required  
to determine the level of contamination.

513 Decontamination of conveyances, equipment or part thereof  
which have become contaminated.

#### **8.6. Other provisions**

309 In the event of non-compliance, appropriate actions are  
required to be taken as soon as possible, including  
communication and remedy.

582 Customs operations may be carried out only in a place where  
adequate means of controlling radiation exposure are  
provided.

583 Where a consignment is undeliverable, appropriate actions  
are required to be taken as soon as possible.

## SCHEDULE FOR UN 3328

### RADIOACTIVE MATERIAL, TYPE B(U) PACKAGE, FISSILE

<b>Paragraph number(s) of the Regulations [1]</b>	<b>Subject</b>
	1. GENERAL PROVISIONS
109, 507	Other dangerous properties of contents and transport with other dangerous goods.
301–303	General provisions for radiation protection.
304, 305, 556(c)	Emergency response.
306	Quality assurance.
311–314	Training.
501(a)–(c)	Requirements before the first shipment.
502	Requirements before each shipment.
562	Possession of package design certificates, and instructions for (a) the proper closing of the package and (b) other preparations for shipment.
602–604	Design requirements for special form radioactive material.
606–616	Design requirements for all packagings and packages.
617–619	Additional design requirements — air transport.
634–645, 646(b)	Additional design requirements for Type B (and Type A) packages.

- 647 Additional design requirements for packages containing liquids.
- 650 Design requirements for Type B(U) packages, summary.
- 651–664 Additional design requirements for Type B packages.
- 671–682 Additional design requirements for packages containing fissile material.
- 802(a), 806–808, 812–814 Package design requirements — competent authority approval.
- 816, 817 Transitional arrangements for packages approved under the 1973, 1973 (As Amended), 1985 and 1985 (As Amended 1990) Editions of the Regulations.
- 818 Transitional arrangements for special form radioactive material approved under the 1973, 1973 (As Amended), 1985 and 1985 (As Amended 1990) Editions of the Regulations.
- 819 Packaging serial numbers — informing the competent authority.

## 2. CONTENTS LIMITS FOR PACKAGES

- 415<sup>a</sup>, 416 The quantity of radioactive material is not allowed to exceed the limits specified in paras 415 and 416 of the Regulations.
- 418 Fissile material.
- 503 A package is not allowed to contain any items other than those that are necessary for the use of the radioactive material. The interaction between these items and the package, under the conditions of transport applicable to the design, is not allowed to reduce the safety of the package.

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<sup>a</sup> The electronic version of the 2005 Edition of the Regulations, available on [www.iaea.org](http://www.iaea.org), should be used when referring to paras 405–419; in the printed version of the 2005 Edition of the Regulations, paras 405–419 are incorrectly numbered as 406–420.

### 3. CONTAMINATION

508, 509 Non-fixed contamination on the external surfaces of any package and on the external and internal surfaces of overpacks, freight containers, tanks, intermediate bulk containers and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over any area of 300 cm<sup>2</sup> of any part of the surface:

- (a) Beta, gamma and low toxicity alpha emitters, 4.0 Bq/cm<sup>2</sup>;
- (b) All other alpha emitters, 0.4 Bq/cm<sup>2</sup>.

### 4. MAXIMUM RADIATION LEVELS

- 530–532, 575
- (i) The radiation level for a package or overpack is required to be such that the TI of the package or overpack does not exceed 10, and the criticality safety index is not allowed to exceed 50, except when transported under exclusive use; and
  - (ii) The maximum radiation level at any point on any external surface of the package or overpack is not allowed to exceed 2 mSv/h, except when transported under exclusive use by rail or by road, or under exclusive use by sea<sup>b</sup>; and
  - (iii) The maximum radiation level at any point on any external surface of a package or overpack transported under exclusive use is not allowed to exceed 10 mSv/h.

### 5. CATEGORIES OF PACKAGES AND OVERPACKS

526, 527 The TI is required to be derived in accordance with the procedure as stated in paras 526 and 527 of the Regulations.

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<sup>b</sup> Packages or overpacks having a surface radiation level greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels in accordance with Table 9 of the Regulations, footnote a, provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel.

528, 529 The criticality safety index for packages containing fissile material is required to be obtained in accordance with paras 528 and 529 of the Regulations.

533, Table 7 Packages and overpacks are required to be assigned to category I-WHITE, category II-YELLOW or category III-YELLOW.

## 6. MARKING AND LABELLING

507 Packages, freight containers and overpacks containing materials having other dangerous properties (e.g. corrosiveness) are also required to be marked and labelled as required by the relevant transport regulations.

535 Each package is required to be marked with an identification of either the consignor or the consignee, or both.

535–537, 539 All markings are required to be legible and durable, and are required to be on the outside of the packaging.

536, Table 8 Packages are required to bear the mark “UN 3328” and the proper shipping name “RADIOACTIVE MATERIAL, TYPE B(U) PACKAGE, FISSIONABLE”.

537 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass.

539 Each package is required to be marked with:

- (a) The identification mark allocated to that design by the competent authority;
- (b) A serial number to uniquely identify each packaging which conforms to that design;
- (c) “TYPE B(U)”.

- 540, Fig. 1            The outside of the outermost receptacle which is resistant to the effects of fire and water is required to be plainly marked by embossing, stamping, or other means resistant to the effects of fire and water, with the trefoil symbol shown in Fig. 1 of the Regulations.
- 542                    Any labels which do not relate to the radioactive contents are required to be removed or covered.
- 542, 545–547,  
Figs 2–5              Each package, overpack and freight container is required to bear the appropriate labels. Paragraph 547 of the Regulations sets out alternative provisions for large freight containers and tanks.
- 543                    The labels are required to be fixed to two opposite sides of the outside of the package or overpack, or to all four sides of a freight container or tank. The labels are not allowed to cover the markings specified in paras 535–537, para. 539 and para. 540 of the Regulations.
- 544(a), (b), (d),  
Table 1                Each label is required to be marked with the name(s) of the radionuclide(s), the maximum activity of the contents and the TI. Paragraph 544(a) of the Regulations establishes requirements for labelling mixtures of radionuclides. The mass of fissile material, in grams (g), or multiples of grams, may be used instead of the activity.
- 544(c)                Except for mixed loads, each label on a freight container or overpack is required to be marked with:
- (a) The radioactive contents; and  
(b) The maximum activity of the total radioactive contents during transport.
- For mixed loads such entries may read “See Transport Documents”.
- 549                    It is the consignor’s responsibility to comply with the requirements of marking, labelling and placarding.

## 7. REQUIREMENTS BEFORE SHIPMENT

- 501(a)–(c) Before the first shipment, confirmation is required that the shielding, containment, heat transfer characteristics, confinement system and neutron poisons conform to the approved design.
- 502(a)–(g) Before each shipment of any package, the following requirements apply:
- (a) For any package it is required to ensure that all the requirements specified in the relevant provisions of the Regulations have been satisfied.
  - (b) It is required to ensure that lifting attachments which do not meet the requirements of para. 607 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 608 of the Regulations.
  - (c) For each package, it is required to ensure that all the requirements specified in the competent authority approval certificates have been satisfied.
  - (d) Each package is required to 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 package, it is required to ensure 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 paras 657 and 669 of the Regulations were made.
  - (f) For each special form radioactive material, it is required to ensure that all the requirements specified in the approval certificate and the relevant provisions of the Regulations have been satisfied.

- (g) For packages containing fissile material, the measurement specified in para. 674(b) of the Regulations and the tests to demonstrate closure of each package as specified in para. 677 of the Regulations are required to be performed where applicable.
- 550 Transport documents with each consignment (consignment notes) are required to include all relevant particulars of the consignment.
- 551–554 The consignor is required to include a declaration in the transport documents.
- 556 The consignor is required to provide a statement regarding actions to be taken by the carrier.
- 557 The consignor is required to make competent authority certificates available to the carrier(s) before loading and unloading.
- 558 Before the first shipment, the consignor is required to ensure that copies of each competent authority certificate applying to that package design have been submitted to the competent authority of each country through or into which the consignment is to be transported. The consignor is not required to await an acknowledgement from the competent authority, nor is the competent authority required to make an acknowledgement of receiving the certificate.
- 559(b) For each shipment containing radioactive material with an activity greater than  $3000A_1$  or  $3000A_2$ , as appropriate, or 1000 TBq, whichever is the lower, the consignor is required to notify the competent authority of each country through or into which the consignment is to be transported. This notification is required to have been received by each competent authority prior to the commencement of the shipment, and preferably at least 7 days in advance. See also para. 560 of the Regulations.

560 The notification referred to in para. 559 of the Regulations is required to include:

- (a) Clear identification of the package, including all applicable certificate numbers and identification marks;
- (b) The date of shipment, the expected date of arrival and the proposed routing;
- (c) The names of the radioactive materials or nuclides;
- (d) Descriptions of the physical and chemical forms of the radioactive material, or whether it is special form radioactive material or low dispersible radioactive material;
- (e) The maximum activity of the radioactive contents during transport, expressed in becquerels (Bq) with the appropriate SI prefix symbol (see Annex II of the Regulations). The mass of fissile material in grams (g), or multiples of grams, may be used in place of activity.

561 Separate notification is not required if the information has been included in the application for shipment approval (see para. 822 of the Regulations).

820(c) Shipments — competent authority multilateral approval is required where the criticality safety index is greater than 50.

821, 827 Shipments — competent authority authorization of transport without shipment approval.

822 Information to be included in an application for shipment approval.

823 When a shipment has been approved, the competent authority is required to issue an approval certificate.

## 8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

### 8.1. Modal requirements

416 Conditions for air transport.

- 573(a)–(c) For transport by rail and by road: for consignments under exclusive use, the radiation level is not allowed to exceed:
- (a) 10 mSv/h at any point on the external surface of any package or overpack, and may only exceed 2 mSv/h provided that:
    - (i) The vehicle is equipped with an enclosure which prevents unauthorized access during transport; and
    - (ii) The package or overpack is secured to retain its position within the enclosure during routine transport; and
    - (iii) There are no loading or unloading operations between the beginning and the end of the shipment;
  - (b) 2 mSv/h at any point on the outer surfaces of the vehicle, including the upper and lower surfaces, or, in the case of an open vehicle, at any point on the vertical planes projected from the outer edges of the vehicle, on the upper surface of the load, and on the lower external surface of the vehicle; and
  - (c) 0.1 mSv/h at any point 2 m from the vertical planes represented by the outer lateral surfaces of the vehicle, or, if the load is transported in an open vehicle, at any point 2 m from the vertical planes projected from the outer edges of the vehicle.
- 574 For transport by road: no persons other than the driver and assistants are permitted in vehicles carrying packages, overpacks or freight containers bearing category II-YELLOW or category III-YELLOW labels.
- 575 For transport by vessels: packages or overpacks having a surface radiation level greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with Table 9 of the Regulations, footnote a, are not allowed to be transported.

576 For transport by vessels: the transport of consignments by means of a special use vessel is excepted from the requirements of para. 567 of the Regulations relating to TI, criticality safety index and radiation level provided that the conditions stated in para. 576 of the Regulations are met.

579 For transport by air: packages or overpacks having a surface radiation level greater than 2 mSv/h are not allowed to be transported.

580, 581 Transport by post is not permitted.

## **8.2. Placarding**

507, 549 Placards may be required for other dangerous properties of the contents.

547, Fig. 6 Large freight containers and tanks are required to bear four placards in a vertical orientation on the two external side walls and the two external end walls.

547 Any placards which do not relate to the contents are required to be removed.

547, Figs 2–6 As an alternative to the use of placards on large freight containers and tanks, enlarged labels are permitted.

548, Figs 6, 7 Where an exclusive use consignment in a freight container is UN 3328 Type B(U) packages, and no other UN number commodities are present, the UN number “UN 3328” is required to be displayed on all four sides of the freight container, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

571, Figs 2–6 The location of placards and the use of placards with reduced dimensions on a road or rail vehicle are stipulated.

572, Figs 6, 7      Where an exclusive use consignment in or on a road or rail vehicle is UN 3328 Type B(U) packages only, and no other UN number commodities are present, the UN number “UN ” is required to be displayed, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

### **8.3. Stowage during transport, storage in transit and segregation**

505      The transport of other goods together with consignments being transported under exclusive use may be permitted.

563      Packages, overpacks and freight containers are required to be segregated during transport and during storage in transit. The criteria for segregation are set out in paras 563(a)–563(d) and para. 506 of the Regulations:

563(a)      Criteria for segregation from workers in regularly occupied working areas;

563(b)      Criteria for segregation from members of the public;

563(c)      Criteria for segregation from undeveloped photographic film;

563(d), 506      Criteria for segregation from other dangerous goods.

564      Category II-YELLOW or category III-YELLOW packages or overpacks may be carried in compartments occupied by passengers under specific conditions.

565      Consignments are required to be securely stowed.

566      A package or overpack may be carried or stored among packaged general cargo.

567(a), Table 9      Transport index limits for freight containers and conveyances.

567(b)      Limits on the radiation levels from freight containers and conveyances. See paras 573(b) and 573(c) of the Regulations for exceptions.

567(c), Table10      Criticality safety index limits for freight containers and conveyances.

568                      Any package or overpack having a TI greater than 10, or any consignment having a criticality safety index greater than 50, is required to be transported only under exclusive use.

569, 570,  
Table 10                Segregation of packages during transport and storage in transit.

576                      For a special use vessel, the storage arrangements are excepted from the requirements of para. 567 of the Regulations provided that the conditions stated in para. 576 of the Regulations are met.

#### **8.4. Damaged or leaking packages**

510                      Actions to be taken when a package has been damaged or is leaking, or where it is suspected that the package may have leaked or been damaged.

511                      Movement of packages which are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport.

#### **8.5. Decontamination**

512                      Periodic checking of conveyances and equipment is required to determine the level of contamination.

513                      Decontamination of conveyances, equipment or part thereof which have become contaminated.

#### **8.6. Other provisions**

309                      In the event of non-compliance, appropriate actions are required to be taken as soon as possible, including communication and remedy.

- 582 Customs operations may be carried out only in a place where adequate means of controlling radiation exposure are provided.
- 583 Where a consignment is undeliverable, appropriate actions are required to be taken as soon as possible.

## SCHEDULE FOR UN 3329

### RADIOACTIVE MATERIAL, TYPE B(M) PACKAGE, FISSILE

<b>Paragraph number(s) of the Regulations [1]</b>	<b>Subject</b>
	1. GENERAL PROVISIONS
109, 507	Other dangerous properties of contents and transport with other dangerous goods.
301–303	General provisions for radiation protection.
304, 305, 556(c)	Emergency response.
306	Quality assurance.
311–314	Training.
501(a)–(c)	Requirements before the first shipment.
502	Requirements before each shipment.
562	Possession of package design approval certificates, and possession of instructions for (a) the proper closing of the package and (b) other preparations for shipment.
602–604	Design requirements for special form radioactive material.
606–616	Design requirements for all packagings and packages.
617–619	Additional design requirements — air transport.
634–645, 646(b)	Additional design requirements for Type A and Type B packages.

- 647 Additional design requirements for packages containing liquids.
- 651–664 Additional design requirements for Type B packages.
- 665 Design requirements for Type B(M) packages, summary and exceptions.
- 671–682 Additional design requirements for packages containing fissile material.
- 802(a), 809–814 Package design requirements — competent authority approval.
- 816, 817 Transitional arrangements for packages approved under the 1973, 1973 (As Amended), 1985 and 1985 (As Amended 1990) Editions of the Regulations.
- 818 Transitional arrangements for special form radioactive material approved under the 1973, 1973 (As Amended), 1985 and 1985 (As Amended 1990) Editions of the Regulations.
- 819 Packaging serial numbers — informing the competent authority.

## 2. CONTENTS LIMITS FOR PACKAGES

- 415<sup>a</sup>, 416 The quantity of radioactive material is not allowed to exceed the limits specified in paras 415 and 416 of the Regulations.
- 418 Fissile material.

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<sup>a</sup> The electronic version of the 2005 Edition of the Regulations, available on [www.iaea.org](http://www.iaea.org), should be used when referring to paras 405–419; in the printed version of the 2005 Edition of the Regulations, paras 405–419 are incorrectly numbered as 406–420.

503 A package is not allowed to contain any items other than those that are necessary for the use of the radioactive material. The interaction between these items and the package, under the conditions of transport applicable to the design, is not allowed to reduce the safety of the package.

### 3. CONTAMINATION

508, 509 Non-fixed contamination on the external surfaces of any package and on the external and internal surfaces of overpacks, freight containers, tanks, intermediate bulk containers and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over any area of 300 cm<sup>2</sup> of any part of the surface:

- (a) Beta, gamma and low toxicity alpha emitters, 4.0 Bq/cm<sup>2</sup>;
- (b) All other alpha emitters, 0.4 Bq/cm<sup>2</sup>.

### 4. MAXIMUM RADIATION LEVELS

- 530–532, 575
- (i) The radiation level for a package or overpack is required to be such that the TI of the package or overpack does not exceed 10, and the criticality safety index is not allowed to exceed 50, except when transported under exclusive use; and
  - (ii) The maximum radiation level at any point on any external surface of the package or overpack is not allowed to exceed 2 mSv/h, except when transported under exclusive use by rail or by road, or under exclusive use by sea<sup>b</sup>; and
  - (iii) The maximum radiation level at any point on any external surface of a package or overpack transported under exclusive use is not allowed to exceed 10 mSv/h.

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<sup>b</sup> Packages or overpacks having a surface radiation level greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels in accordance with Table 9 of the Regulations, footnote a, provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel.

## 5. CATEGORIES OF PACKAGES AND OVERPACKS

- 526, 527 The TI is required to be derived in accordance with the procedure as stated in paras 526 and 527 of the Regulations.
- 528, 529 The criticality safety index for packages containing fissile material is required to be obtained in accordance with paras 528 and 529 of the Regulations.
- 533, Table 7 Packages and overpacks are required to be assigned to category I-WHITE, category II-YELLOW or category III-YELLOW.

## 6. MARKING AND LABELLING

- 507 Packages, freight containers and overpacks containing materials having other dangerous properties (e.g. corrosiveness) are also required to be marked and labelled as required by the relevant transport regulations.
- 535 Each package is required to be marked with an identification of either the consignor or the consignee, or both.
- 535–537, 539 All markings are required to be legible and durable, and are required to be on the outside of the packaging.
- 536, Table 8 Packages are required to bear the mark “UN 3329” and the proper shipping name “RADIOACTIVE MATERIAL, TYPE B(M) PACKAGE, FISSILE”.
- 537 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass.

- 539 Each package is required to be marked with:
- (a) The identification mark allocated to that design by the competent authority;
  - (b) A serial number to uniquely identify each packaging which conforms to that design;
  - (c) “TYPE B(M)”.
- 540, Fig. 1 The outside of the outermost receptacle which is resistant to the effects of fire and water is required to be plainly marked by embossing, stamping, or other means resistant to the effects of fire and water, with the trefoil symbol shown in Fig. 1 of the Regulations.
- 542 Any labels which do not relate to the radioactive contents are required to be removed or covered.
- 542, 545–547, Figs 2–5 Each package, overpack and freight container is required to bear the appropriate labels. Paragraph 547 of the Regulations sets out alternative provisions for large freight containers and tanks.
- 543 The labels are required to be fixed to two opposite sides of the outside of the package or overpack, or on all four sides of a freight container or tank. The labels are not allowed to cover the markings specified in paras 535–537, para. 539 and para. 540 of the Regulations.
- 544(a), (b), (d), Table 1 Each label is required to be marked with the name(s) of the radionuclide(s), the maximum activity of the contents and the TI. Paragraph 544(a) of the Regulations establishes requirements for labelling mixtures of radionuclides. The mass of fissile material, in grams (g), or multiples of grams, may be used instead of the activity.
- 544(c) Except for mixed loads, each label on a freight container or overpack is required to be marked with:

- (a) The radioactive contents; and
- (b) The maximum activity of the total radioactive contents during transport.

For mixed loads such entries may read “See Transport Documents”.

549 It is the consignor’s responsibility to comply with the requirements of marking, labelling and placarding.

## 7. REQUIREMENTS BEFORE SHIPMENT

501(a)–(c) Before the first shipment, confirmation is required that the shielding, containment, heat transfer characteristics, confinement system and neutron poisons conform to the approved design.

502(a)–(g) Before each shipment of any package, the following requirements apply:

- (a) For any package it is required to ensure that all the requirements specified in the relevant provisions of the Regulations have been satisfied.
- (b) It is required to ensure that lifting attachments which do not meet the requirements of para. 607 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 608 of the Regulations.
- (c) For each package, it is required to ensure that all the requirements specified in the competent authority approval certificates have been satisfied.
- (d) Each package is required to 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 package, it is required to ensure 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 paras 657 and 669 of the Regulations were made.
- (f) For each special form radioactive material, it is required to ensure that all the requirements specified in the approval certificate and the relevant provisions of the Regulations have been satisfied.
- (g) For packages containing fissile material, the measurement specified in para. 674(b) of the Regulations and the tests to demonstrate closure of each package as specified in para. 677 of the Regulations are required to be performed where applicable.

550 Transport documents with each consignment (consignment notes) are required to include all relevant particulars of the consignment.

551–554 The consignor is required to include a declaration in the transport documents.

556 The consignor is required to provide a statement regarding actions to be taken by the carrier.

557 The consignor is required to make competent authority certificates available to the carrier(s) before loading and unloading.

558 Before the first shipment, the consignor is required to ensure that copies of each competent authority certificate applying to that package design have been submitted to the competent authority of each country through or into which the consignment is to be transported. The consignor is not required to await an acknowledgement from the competent authority, nor is the competent authority required to make an acknowledgement of receiving the certificate.

- 559(c) For each shipment, the consignor is required to notify the competent authority of each country through or into which the consignment is to be transported. This notification is required to have been received by each competent authority prior to the commencement of the shipment, and preferably at least 7 days in advance. See also para. 560 of the Regulations.
- 560 The notification referred to in para. 559 of the Regulations is required to include:
- (a) Clear identification of the package, including all applicable certificate numbers and identification marks;
  - (b) The date of shipment, the expected date of arrival and the proposed routing;
  - (c) The names of the radioactive materials or nuclides;
  - (d) Descriptions of the physical and chemical forms of the radioactive material, or whether it is special form radioactive material or low dispersible radioactive material;
  - (e) The maximum activity of the radioactive contents during transport, expressed in becquerels (Bq) with the appropriate SI prefix symbol (see Annex II of the Regulations). The mass of fissile material in grams (g), or multiples of grams, may be used in place of activity.
- 561 Separate notification is not required if the information has been included in the application for shipment approval (see para. 822 of the Regulations).
- 820(a)–(c) Shipments — competent authority approval.
- 821, 827 Shipments — competent authority authorization of transport without shipment approval.
- 822 Information to be included in an application for shipment approval.
- 823 When a shipment has been approved, the competent authority is required to issue an approval certificate.

## 8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

### 8.1. Modal requirements

- 416 Conditions for air transport.
- 573(a)–(c) For transport by rail and by road: for consignments under exclusive use, the radiation level is not allowed to exceed:
- (a) 10 mSv/h at any point on the external surface of any package or overpack, and may only exceed 2 mSv/h provided that:
    - (i) The vehicle is equipped with an enclosure which prevents unauthorized access during transport; and
    - (ii) The package or overpack is secured to retain its position within the enclosure during routine transport; and
    - (iii) There are no loading or unloading operations between the beginning and the end of the shipment;
  - (b) 2 mSv/h at any point on the outer surfaces of the vehicle, including the upper and lower surfaces, or, in the case of an open vehicle, at any point on the vertical planes projected from the outer edges of the vehicle, on the upper surface of the load, and on the lower external surface of the vehicle; and
  - (c) 0.1 mSv/h at any point 2 m from the vertical planes represented by the outer lateral surfaces of the vehicle, or, if the load is transported in an open vehicle, at any point 2 m from the vertical planes projected from the outer edges of the vehicle.
- 574 For transport by road: no persons other than the driver and assistants are permitted in vehicles carrying packages, overpacks or freight containers bearing category II-YELLOW or category III-YELLOW labels.

575 For transport by vessels: packages or overpacks having a surface radiation level greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with Table 9 of the Regulations, footnote a, are not allowed to be transported.

576 For transport by vessels: the transport of consignments by means of a special use vessel is excepted from the requirements of para. 567 of the Regulations relating to TI, criticality safety index and radiation level provided that the conditions stated in para. 576 of the Regulations are met.

577–579 Restrictions on transport by air are set out in paras 577–579 of the Regulations.

580, 581 Transport by post is not permitted.

## **8.2. Placarding**

507, 549 Placards may be required for other dangerous properties of the contents.

547, Fig. 6 Large freight containers and tanks are required to bear four placards in a vertical orientation on the two external side walls and the two external end walls.

547 Any placards which do not relate to the contents are required to be removed.

547, Figs 2–6 As an alternative to the use of placards on large freight containers and tanks, enlarged labels are permitted.

- 548, Figs 6, 7 Where an exclusive use consignment in a freight container is UN 3329 Type B(M) packages, and no other UN number commodities are present, the UN number “UN 3329” is required to be displayed on all four sides of the freight container, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.
- 571, Figs 2–6 The location of placards and the use of placards with reduced dimensions on a road or rail vehicle are stipulated.
- 572, Figs 6, 7 Where an exclusive use consignment in or on a road or rail vehicle is UN 3329 Type B(M) packages only, and no other UN number commodities are present, the UN number “UN 3329” is required to be displayed, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

### **8.3. Stowage during transport, storage in transit and segregation**

- 505 The transport of other goods together with consignments being transported under exclusive use may be permitted.
- 563 Packages, overpacks and freight containers are required to be segregated during transport and during storage in transit. The criteria for segregation are set out in paras 563(a)–563(d) and para. 506 of the Regulations:
- 563(a) Criteria for segregation from workers in regularly occupied working areas;
- 563(b) Criteria for segregation from members of the public;
- 563(c) Criteria for segregation from undeveloped photographic film; and
- 563(d), 506 Criteria for segregation from other dangerous goods.

- 564 Category II-YELLOW or category III-YELLOW packages or overpacks may be carried in compartments occupied by passengers under specific conditions.
- 565 Consignments are required to be securely stowed.
- 566 A package or overpack may be carried or stored among packaged general cargo.
- 567(a), Table 9 Transport index limits for freight containers and conveyances.
- 567(b) Limits on the radiation levels from freight containers and conveyances. See paras 573(b) and 573(c) of the Regulations for exceptions.
- 567(c), Table 10 Criticality safety index limits for freight containers and conveyances.
- 568 Any package or overpack having a TI greater than 10, or any consignment having a criticality safety index greater than 50, is required to be transported only under exclusive use.
- 569, 570, Table 10 Segregation of packages during transport and storage in transit.
- 576 For a special use vessel, the storage arrangements are excepted from the requirements of para. 567 of the Regulations provided that the conditions stated in para. 576 of the Regulations are met.

**8.4. Damaged or leaking packages**

- 510 Actions to be taken when a package has been damaged or is leaking, or where it is suspected that the package may have leaked or been damaged.
- 511 Movement of packages which are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport.

### **8.5. Decontamination**

512 Periodic checking of conveyances and equipment is required to determine the level of contamination.

513 Decontamination of conveyances, equipment or part thereof which have become contaminated.

### **8.6. Other provisions**

309 In the event of non-compliance, appropriate actions are required to be taken as soon as possible, including communication and remedy.

582 Customs operations may be carried out only in a place where adequate means of controlling radiation exposure are provided.

583 Where a consignment is undeliverable, appropriate actions are required to be taken as soon as possible.

666 Intermittent venting of Type B(M) packages may be permitted during transport under certain conditions.

## SCHEDULE FOR UN 3330

### RADIOACTIVE MATERIAL, TYPE C PACKAGE, FISSILE

<b>Paragraph number(s) of the Regulations [1]</b>	<b>Subject</b>
	1. GENERAL PROVISIONS
109, 507	Other dangerous properties of contents and transport with other dangerous goods.
301–303	General provisions for radiation protection.
304, 305, 556(c)	Emergency response.
306	Quality assurance.
311–314	Training.
501(a)–(c)	Requirements before the first shipment.
502	Requirements before each shipment.
562	Possession of package design certificates, and instructions for (a) the proper closing of the package and (b) other preparations for shipment.
602–604	Design requirements for special form radioactive material.
606–616	Design requirements for all packagings and packages.
617–619	Additional design requirements — air transport.
634–645, 646(b)	Additional design requirements for Type C (and Type A and Type B) packages.

- 647 Additional design requirements for packages containing liquids.
- 651–655,  
659–664 Additional design requirements for Type C (and Type B) packages.
- 667 Design requirements for Type C packages, summary.
- 668–670 Additional design requirements for Type C packages.
- 671–682 Additional design requirements for packages containing fissile material.
- 802(a), 806–808,  
812–814 Package design requirements — competent authority approval.
- 818 Transitional arrangements for special form radioactive material approved under the 1973, 1973 (As Amended), 1985 and 1985 (As Amended 1990) Editions of the Regulations.
- 819 Packaging serial numbers — informing the competent authority.

## 2. CONTENTS LIMITS FOR PACKAGES

- 417<sup>a</sup> The quantity of radioactive material is not allowed to exceed the limits specified in para. 417 of the Regulations.
- 418 Fissile material.
- 503 A package is not allowed to contain any items other than those that are necessary for the use of the radioactive material. The interaction between these items and the package, under the conditions of transport applicable to the design, is not allowed to reduce the safety of the package.

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<sup>a</sup> The electronic version of the 2005 Edition of the Regulations, available on [www.iaea.org](http://www.iaea.org), should be used when referring to paras 405–419; in the printed version of the 2005 Edition of the Regulations, paras 405–419 are incorrectly numbered as 406–420.

### 3. CONTAMINATION

508, 509 Non-fixed contamination on the external surfaces of any package and on the external and internal surfaces of overpacks, freight containers, tanks, intermediate bulk containers and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over any area of 300 cm<sup>2</sup> of any part of the surface:

- (a) Beta, gamma and low toxicity alpha emitters, 4.0 Bq/cm<sup>2</sup>;
- (b) All other alpha emitters, 0.4 Bq/cm<sup>2</sup>.

### 4. MAXIMUM RADIATION LEVELS

- 530–532, 575
- (i) The radiation level for a package or overpack is required to be such that the TI of the package or overpack does not exceed 10, and the criticality safety index is not allowed to exceed 50, except when transported under exclusive use; and
  - (ii) The maximum radiation level at any point on any external surface of the package or overpack is not allowed to exceed 2 mSv/h, except when transported under exclusive use by rail or by road, or under exclusive use by sea<sup>b</sup>; and
  - (iii) The maximum radiation level at any point on any external surface of a package or overpack transported under exclusive use is not allowed to exceed 10 mSv/h.

### 5. CATEGORIES OF PACKAGES AND OVERPACKS

526, 527 The TI is required to be derived in accordance with the procedure as stated in paras 526 and 527 of the Regulations.

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<sup>b</sup> Packages or overpacks having a surface radiation level greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels in accordance with Table 9 of the Regulations, footnote a, provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel.

528, 529 The criticality safety index for packages containing fissile material is required to be obtained in accordance with paras 528 and 529 of the Regulations.

533, Table 7 Packages and overpacks are required to be assigned to category I-WHITE, category II-YELLOW or category III-YELLOW.

## 6. MARKING AND LABELLING

507 Packages, freight containers and overpacks containing materials having other dangerous properties (e.g. corrosiveness) are also required to be marked and labelled as required by the relevant transport regulations.

535 Each package is required to be marked with an identification of either the consignor or the consignee, or both.

535–537, 539 All markings are required to be legible and durable, and are required to be on the outside of the packaging.

536, Table 8 Packages are required to bear the mark “UN 3330” and the proper shipping name “RADIOACTIVE MATERIAL, TYPE C PACKAGE, FISSILE”.

537 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass on the outside of the packaging.

539 Each package is required to be marked with:

- (a) The identification mark allocated to that design by the competent authority;
- (b) A serial number to uniquely identify each packaging which conforms to that design;
- (c) Not applicable;
- (d) “TYPE C”.

- 540, Fig. 1            The outside of the outermost receptacle which is resistant to the effects of fire and water is required to be plainly marked by embossing, stamping, or other means resistant to the effects of fire and water, with the trefoil symbol shown in Fig. 1 of the Regulations.
- 542                    Any labels which do not relate to the radioactive contents are required to be removed or covered.
- 542, 545–547,  
Figs 2–5              Each package, overpack and freight container is required to bear the appropriate labels. Paragraph 547 of the Regulations sets out alternative provisions for large freight containers and tanks.
- 543                    The labels are required to be fixed to two opposite sides of the outside of the package or overpack, or to all four sides of a freight container or tank. The labels are not allowed to cover the markings specified in paras 535–537, para. 539 and para. 540 of the Regulations.
- 544(a), (b), (d),  
Table 1                Each label is required to be marked with the name(s) of the radionuclide(s), the maximum activity of the contents and the TI. Paragraph 544(a) of the Regulations establishes requirements for labelling mixtures of radionuclides. The mass of fissile material, in grams (g), or multiples of grams, may be used instead of the activity.
- 544(c)                Except for mixed loads, each label on a freight container or overpack is required to be marked with
- (a) The radioactive contents; and
- (b) The maximum activity of the total radioactive contents during transport.
- For mixed loads such entries may read “See Transport Documents”.
- 549                    It is the consignor’s responsibility to comply with the requirements of marking, labelling and placarding.

## 7. REQUIREMENTS BEFORE SHIPMENT

- 501(a)–(c) Before the first shipment, confirmation is required that the shielding, containment, heat transfer characteristics, confinement system and neutron poisons conform to the approved design.
- 502(a)–(g) Before each shipment of any package, the following requirements apply:
- (a) For any package it is required to ensure that all the requirements specified in the relevant provisions of the Regulations have been satisfied.
  - (b) It is required to ensure that lifting attachments which do not meet the requirements of para. 607 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 608 of the Regulations.
  - (c) For each package, it is required to ensure that all the requirements specified in the competent authority approval certificates have been satisfied.
  - (d) Each package is required to 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 package, it is required to ensure 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 paras 657 and 669 of the Regulations were made.
  - (f) For each special form radioactive material, it is required to ensure that all the requirements specified in the approval certificate and the relevant provisions of the Regulations have been satisfied.

- (g) For packages containing fissile material, the measurement specified in para. 674(b) of the Regulations and the tests to demonstrate closure of each package as specified in para. 677 of the Regulations are required to be performed where applicable.
- 550 Transport documents with each consignment (consignment notes) are required to include all relevant particulars of the consignment.
- 551–554 The consignor is required to include a declaration in the transport documents.
- 556 The consignor is required to provide a statement regarding actions to be taken by the carrier.
- 557 The consignor is required to make competent authority certificates available to the carrier(s) before loading and unloading.
- 558 Before the first shipment, the consignor is required to ensure that copies of each competent authority certificate applying to that package design have been submitted to the competent authority of each country through or into which the consignment is to be transported. The consignor is not required to await an acknowledgement from the competent authority, nor is the competent authority required to make an acknowledgement of receiving the certificate.
- 559(a) For each shipment containing radioactive material with an activity greater than  $3000A_1$  or  $3000A_2$ , as appropriate, or 1000 TBq, whichever is the lower, the consignor is required to notify the competent authority of each country through or into which the consignment is to be transported. This notification is required to have been received by each competent authority prior to the commencement of the shipment, and preferably at least 7 days in advance. See also para. 560 of the Regulations.

- 560 The notification referred to in para. 559 of the Regulations is required to include:
- (a) Clear identification of the package, including all applicable certificate numbers and identification marks;
  - (b) The date of shipment, the expected date of arrival and the proposed routing;
  - (c) The names of the radioactive materials or nuclides;
  - (d) Descriptions of the physical and chemical forms of the radioactive material, or whether it is special form radioactive material or low dispersible radioactive material;
  - (e) The maximum activity of the radioactive contents during transport, expressed in becquerels (Bq) with the appropriate SI prefix symbol (see Annex II of the Regulations). The mass of fissile material in grams (g), or multiples of grams, may be used in place of activity.

561 Separate notification is not required if the information has been included in the application for shipment approval (see para. 822 of the Regulations).

820(c) Shipments — competent authority multilateral approval is required where the criticality safety index is greater than 50.

821, 827 Shipments — competent authority authorization of transport without shipment approval.

822 Information to be included in an application for shipment approval.

823 When a shipment has been approved, the competent authority is required to issue an approval certificate.

## 8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

### 8.1. Modal requirements

573(a)–(c) For transport by rail and by road: for consignments under exclusive use, the radiation level is not allowed to exceed:

- (a) 10 mSv/h at any point on the external surface of any package or overpack, and may only exceed 2 mSv/h provided that:
  - (i) The vehicle is equipped with an enclosure which prevents unauthorized access during transport; and
  - (ii) The package or overpack is secured to retain its position within the enclosure during routine transport; and
  - (iii) There are no loading or unloading operations between the beginning and the end of the shipment;
- (b) 2 mSv/h at any point on the outer surfaces of the vehicle, including the upper and lower surfaces, or, in the case of an open vehicle, at any point on the vertical planes projected from the outer edges of the vehicle, on the upper surface of the load, and on the lower external surface of the vehicle; and
- (c) 0.1 mSv/h at any point 2 m from the vertical planes represented by the outer lateral surfaces of the vehicle, or, if the load is transported in an open vehicle, at any point 2 m from the vertical planes projected from the outer edges of the vehicle.

574 For transport by road: no persons other than the driver and assistants are permitted in vehicles carrying packages, overpacks or freight containers bearing category II-YELLOW or category III-YELLOW labels.

575 For transport by vessels: packages or overpacks having a surface radiation level greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with Table 9 of the Regulations, footnote a, are not allowed to be transported.

576 For transport by vessels: the transport of consignments by means of a special use vessel is exempted from the requirements of para. 567 of the Regulations relating to TI, criticality safety index and radiation level provided that the conditions stated in para. 576 of the Regulations are met.

579 For transport by air: packages or overpacks having a surface radiation level greater than 2 mSv/h are not allowed to be transported.

580, 581 Transport by post is not permitted.

## **8.2. Placarding**

507, 549 Placards may be required for other dangerous properties of the contents.

547, Fig. 6 Large freight containers and tanks are required to bear four placards in a vertical orientation on the two external side walls and the two external end walls.

547 Any placards which do not relate to the contents are required to be removed.

547, Figs 2–6 As an alternative to the use of placards on large freight containers and tanks, enlarged labels are permitted.

548, Figs 6, 7 Where an exclusive use consignment in a freight container is UN 3330 Type C packages, and no other UN number commodities are present, the UN number “UN 3330” is required to be displayed on all four sides of the freight container, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

571, Figs 2–6 The location of placards and the use of placards with reduced dimensions on a road or rail vehicle are stipulated.

572, Figs 6, 7      Where an exclusive use consignment in or on a road or rail vehicle is UN 3330 Type C packages only, and no other UN number commodities are present, the UN number “UN 3330” is required to be displayed, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

### **8.3. Stowage during transport, storage in transit and segregation**

505      The transport of other goods together with consignments being transported under exclusive use may be permitted.

563      Packages, overpacks and freight containers are required to be segregated during transport and during storage in transit. The criteria for segregation are set out in paras 563(a)–563(d) and para. 506 of the Regulations:

563(a)      Criteria for segregation from workers in regularly occupied working areas;

563(b)      Criteria for segregation from members of the public;

563(c)      Criteria for segregation from undeveloped photographic film;

563(d), 506      Criteria for segregation from other dangerous goods.

564      Category II-YELLOW or category III-YELLOW packages or overpacks may be carried in compartments occupied by passengers under specific conditions.

565      Consignments are required to be securely stowed.

566      A package or overpack may be carried or stored among packaged general cargo.

567(a), Table 9      Transport index limits for freight containers and conveyances.

- 567(b) Limits on the radiation levels from freight containers and conveyances. See paras 573(b) and 573(c) of the Regulations for exceptions.
- 567(c), Table 10 Criticality safety index limits for freight containers and conveyances.
- 568 Any package or overpack having a TI greater than 10, or any consignment having a criticality safety index greater than 50, is required to be transported only under exclusive use.
- 569, 570, Table 10 Segregation of packages during transport and storage in transit.
- 576 For a special use vessel, the storage arrangements are excepted from the requirements of para. 567 of the Regulations provided that the conditions stated in para. 576 of the Regulations are met.

#### **8.4. Damaged or leaking packages**

- 510 Actions to be taken when a package has been damaged or is leaking, or where it is suspected that the package may have leaked or been damaged.
- 511 Movement of packages which are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport.

#### **8.5. Decontamination**

- 512 Periodic checking of conveyances and equipment is required to determine the level of contamination.
- 513 Decontamination of conveyances, equipment or part thereof which have become contaminated.

#### **8.6. Other provisions**

- 309 In the event of non-compliance, appropriate actions are required to be taken as soon as possible, including communication and remedy.

- 582 Customs operations may be carried out only in a place where adequate means of controlling radiation exposure are provided.
- 583 Where a consignment is undeliverable, appropriate actions are required to be taken as soon as possible.

## SCHEDULE FOR UN 3331

### RADIOACTIVE MATERIAL, TRANSPORTED UNDER SPECIAL ARRANGEMENT, FISSILE

<b>Paragraph number(s) of the Regulations [1]</b>	<b>Subject</b>
	1. GENERAL PROVISIONS
109, 507	Other dangerous properties of contents and transport with other dangerous goods.
301–303	General provisions for radiation protection.
304, 305, 556(c)	Emergency response.
306	Quality assurance.
310	Special arrangement.
311–314	Training.
501(a)–(c)	Requirements before the first shipment.
502	Requirements before each shipment.
562	Possession of package design approval certificates, and possession of instructions for (a) the proper closing of the package and (b) other preparations for shipment.
602–604	Additional design requirements for special form radioactive material.
605	Additional design requirements for low dispersible radioactive material.

606–616	Design requirements for all packagings and packages.
617–619	Additional design requirements — air transport.
634–645, 646(b)	Additional design requirements for Type A and Type B packages.
647	Additional design requirements for packages containing liquids.
651–664	Additional design requirements for Type B packages.
665	Design requirements for Type B(M) packages, summary and exceptions.
667	Design requirements for Type C packages, summary.
671–682	Additional design requirements for packages containing fissile material.
802(b)	Special arrangements — competent authority approval.
803, 804	Design requirements for special form radioactive material and low dispersible radioactive material — competent authority approval.
806–814	Package design requirements — competent authority approval.
816, 817	Transitional arrangements for packages approved under the 1973, 1973 (As Amended), 1985 and 1985 (As Amended 1990) Editions of the Regulations.
818	Transitional arrangements for special form radioactive material approved under the 1973, 1973 (As Amended), 1985 and 1985 (As Amended 1990) Editions of the Regulations.

819 Packaging serial numbers — informing the competent authority.

## 2. CONTENTS LIMITS FOR PACKAGES

503 A package is not allowed to contain any items other than those that are necessary for the use of the radioactive material. The interaction between these items and the package, under the conditions of transport applicable to the design, is not allowed to reduce the safety of the package.

831(j), (k) The quantity of radioactive material is not allowed to exceed the limit given in the competent authority approval certificate.

## 3. CONTAMINATION

508, 509 Non-fixed contamination on the external surfaces of any package and on the external and internal surfaces of overpacks, freight containers, tanks, intermediate bulk containers and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over any area of 300 cm<sup>2</sup> of any part of the surface:

- (a) Beta, gamma and low toxicity alpha emitters, 4.0 Bq/cm<sup>2</sup>;
- (b) All other alpha emitters, 0.4 Bq/cm<sup>2</sup>.

## 4. MAXIMUM RADIATION LEVELS

- 530–532, 575, 579
- (i) The radiation level for a package or overpack is required to be such that the TI of the package or overpack does not exceed 10, and the criticality safety index is not allowed to exceed 50, except when transported under exclusive use; and
  - (ii) The maximum radiation level at any point on any external surface of the package or overpack, except when transported under exclusive use by rail or by road is not allowed to exceed 2 mSv/h, or under special arrangement by air or by sea; and

- (iii) The maximum radiation level at any point on any external surface of a package or overpack transported under exclusive use is not allowed to exceed 10 mSv/h.

## 5. CATEGORIES OF PACKAGES AND OVERPACKS

- 526, 527 The TI is required to be derived in accordance with the procedure as stated in paras 526 and 527 of the Regulations.
- 528, 529 The criticality safety index for packages containing fissile material is required to be obtained in accordance with paras 528 and 529 of the Regulations.
- 533, 534 A package or an overpack containing packages transported under special arrangement is required to be assigned to category III-YELLOW, except under certain provisions stated in para. 534 of the Regulations.

## 6. MARKING AND LABELLING

- 507 Packages, freight containers and overpacks containing materials having other dangerous properties (e.g. corrosiveness) are also required to be marked and labelled as required by the relevant transport regulations.
- 535 Each package is required to be marked with an identification of either the consignor or the consignee, or both.
- 535–537, 539, 540 All markings are required to be legible and durable, and are required to be on the outside of the packaging.
- 536, Table 8 Packages are required to bear the mark “UN 3331” and the proper shipping name “RADIOACTIVE MATERIAL, TRANSPORTED UNDER SPECIAL ARRANGEMENT, FISSILE”.
- 537 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass.

- 539 Each package is required to be marked, if appropriate, with:
- (a) The identification mark allocated to that design by the competent authority;
  - (b) A serial number to uniquely identify each packaging which conforms to that design;
  - (c) In the case of a Type B(U) or Type B(M) package design, with “TYPE B(U)” or “TYPE B(M)”;
  - (d) In the case of a Type C package design, with “TYPE C”.
- 540, Fig. 1 For Type B(U), Type B(M) or TYPE (C) packages, the outside of the outermost receptacle which is resistant to the effects of fire and water is required to be plainly marked by embossing, stamping, or other means resistant to the effects of fire and water, with the trefoil symbol shown in Fig. 1 of the Regulations.
- 542 Any labels which do not relate to the radioactive contents are required to be removed or covered.
- 542, 545–547, Figs 2–5 Each package, overpack and freight container is required to bear the appropriate labels. Paragraph 547 of the Regulations sets out alternative provisions for large freight containers and tanks.
- 543 The labels are required to be fixed to two opposite sides of the outside of the package or overpack, or on all four sides of a freight container or tank. The labels are not allowed to cover the markings specified in paras 535–537, para. 539 and para. 540 of the Regulations.
- 544(a), (b), (d), Table 1 Each label is required to be marked with the name(s) of the radionuclide(s), the maximum activity of the contents and the TI. Paragraph 544(a) of the Regulations establishes requirements for labelling mixtures of radionuclides. For fissile materials, the mass of fissile material, in grams (g), or multiples of grams, may be used instead of the activity.

544(c) Except for mixed loads, each label on a freight container or overpack is required to be marked with:

- (a) The radioactive contents; and
- (b) The maximum activity of the total radioactive contents during transport.

For mixed loads such entries may read “See Transport Documents”.

549 It is the consignor’s responsibility to comply with the requirements of marking, labelling and placarding.

## 7. REQUIREMENTS BEFORE SHIPMENT

501(a)–(c) Before the first shipment, confirmation is required that the shielding, containment, heat transfer characteristics, confinement system and neutron poisons conform to the approved design.

502(a)–(h) Before each shipment of any package, the following requirements apply:

- (a) For any package it is required to ensure that all the requirements specified in the relevant provisions of the Regulations have been satisfied.
- (b) It is required to ensure that lifting attachments which do not meet the requirements of para. 607 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 608 of the Regulations.
- (c) For each package, it is required to ensure that all the requirements specified in the competent authority approval certificates have been satisfied.
- (d) Each package is required to 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 package, it is required to ensure 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 paras 657 and 669 of the Regulations were made.
- (f) For each special form radioactive material, it is required to ensure that all the requirements specified in the approval certificate and the relevant provisions of the Regulations have been satisfied.
- (g) For packages containing fissile material, the measurement specified in para. 674(b) of the Regulations and the tests to demonstrate closure of each package as specified in para. 677 of the Regulations are required to be performed where applicable.
- (h) For each low dispersible radioactive material, it is required to ensure that all of the requirements specified in the approval certificate and the relevant provisions of the Regulations have been satisfied.

- 550                   Transport documents with each consignment (consignment notes) are required to include all relevant particulars of the consignment.
  
- 551–554             The consignor is required to include a declaration in the transport documents.
  
- 556                   The consignor is required to provide a statement regarding actions to be taken by the carrier.
  
- 557                   The consignor is required to make competent authority certificates available to the carrier(s) before loading and unloading.

559(d) For each shipment, the consignor is required to notify the competent authority of each country through or into which the consignment is to be transported. This notification is required to have been received by each competent authority prior to the commencement of the shipment, and preferably at least 7 days in advance. See also para. 560 of the Regulations.

560 The notification referred to in para. 559 of the Regulations is required to include:

- (a) Clear identification of the package, including all applicable certificate numbers and identification marks;
- (b) The date of shipment, the expected date of arrival and the proposed routing;
- (c) The names of the radioactive materials or nuclides;
- (d) Descriptions of the physical and chemical forms of the radioactive material, or whether it is special form radioactive material or low dispersible radioactive material;
- (e) The maximum activity of the radioactive contents during transport, expressed in becquerels (Bq) with the appropriate SI prefix symbol (see Annex II of the Regulations). For fissile material, the mass of fissile material in grams (g), or multiples of grams, may be used in place of activity.

561 Separate notification is not required if the information has been included in the application for shipment approval.

824–826 Approval of shipments under special arrangement.

831 Competent authority approval certificates.

## 8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

### 8.1. Modal requirements

573(a)–(c) For transport by rail and by road: for consignments under exclusive use, the radiation level is not allowed to exceed:

- (a) 10 mSv/h at any point on the external surface of any package or overpack, and may only exceed 2 mSv/h provided that:
  - (i) The vehicle is equipped with an enclosure which prevents unauthorized access during transport; and
  - (ii) The package or overpack is secured to retain its position within the enclosure during routine transport; and
  - (iii) There are no loading or unloading operations between the beginning and the end of the shipment;
- (b) 2 mSv/h at any point on the outer surfaces of the vehicle, including the upper and lower surfaces, or, in the case of an open vehicle, at any point on the vertical planes projected from the outer edges of the vehicle, on the upper surface of the load, and on the lower external surface of the vehicle; and
- (c) 0.1 mSv/h at any point 2 m from the vertical planes represented by the outer lateral surfaces of the vehicle, or, if the load is transported in an open vehicle, at any point 2 m from the vertical planes projected from the outer edges of the vehicle.

574 For transport by road: no persons other than the driver and assistants are permitted in vehicles.

575 For transport by vessels: packages or overpacks having a surface radiation level greater than 2 mSv/h may be transported under special arrangement.

576 For transport by vessels: the transport of consignments by means of a special use vessel is excepted from the requirements of para. 567 of the Regulations relating to TI, criticality safety index and radiation level provided that the conditions stated in para. 576 of the Regulations are met.

577–579 Restrictions on transport by air are set out in paras 577–579 of the Regulations.

580, 581 Transport by post is not permitted.

## 8.2. Placarding

- 507, 549 Placards may be required for other dangerous properties of the contents.
- 547, Fig. 6 Large freight containers and tanks are required to bear four placards in a vertical orientation on the two external side walls and the two external end walls.
- 547 Any placards which do not relate to the contents are required to be removed.
- 547, Figs 2–6 As an alternative to the use of placards on large freight containers and tanks, enlarged labels are permitted.
- 548, Figs 6, 7 Where an exclusive use consignment in a freight container is a UN 3331 Special Arrangement, and no other UN number commodities are present, the UN number “UN 3331” is required to be displayed on all four sides of the freight container, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.
- 571, Figs 2–6 The location of placards and the use of placards with reduced dimensions on a road or rail vehicle are stipulated.
- 572, Figs 6, 7 Where an exclusive use consignment in or on a road or rail vehicle is a UN 3331 Special Arrangement only, and no other UN number commodities are present, the UN number “UN 3331” is required to be displayed, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

### **8.3. Stowage during transport, storage in transit and segregation**

- 505 The transport of other goods together with consignments being transported under exclusive use may be permitted.
- 563 Packages, overpacks and freight containers are required to be segregated during transport and during storage in transit. The criteria for segregation are set out in paras 563(a)–563(d) and para. 506 of the Regulations:
- 563(a) Criteria for segregation from workers in regularly occupied working areas;
- 563(b) Criteria for segregation from members of the public;
- 563(c) Criteria for segregation from undeveloped photographic film; and
- 563(d), 506 Criteria for segregation from other dangerous goods.
- 564 Category II-YELLOW or category III-YELLOW packages or overpacks may be carried in compartments occupied by passengers under specific conditions.
- 565 Consignments are required to be securely stowed.
- 566 A package or overpack may be carried or stored among packaged general cargo.
- 567(a), Table 9 Transport index limits for freight containers and conveyances.
- 567(b) Limits on the radiation levels from freight containers and conveyances. See para. 573 of the Regulations for exceptions.
- 567(c), Table 10 Critical safety index limits for freight containers and conveyances.
- 568 Any package or overpack having a TI greater than 10, or any consignment having a criticality safety index greater than 50, is required to be transported only under exclusive use.
- 569, 570,  
Table 10 Segregation of packages during transport and storage in transit.

576 For a special use vessel, the storage arrangements are  
excepted from the requirements of para. 567 of the  
Regulations provided that the conditions stated in para. 576 of  
the Regulations are met.

#### **8.4. Damaged or leaking packages**

510 Actions to be taken when a package has been damaged or is  
leaking, or where it is suspected that the package may have  
leaked or been damaged.

511 Movement of packages which are damaged or leaking  
radioactive contents in excess of allowable limits for normal  
conditions of transport.

#### **8.5. Decontamination**

512 Periodic checking of conveyances and equipment is required  
to determine the level of contamination.

513 Decontamination of conveyances, equipment or part thereof  
which have become contaminated.

#### **8.6. Other provisions**

309 In the event of non-compliance, appropriate actions are  
required to be taken as soon as possible, including  
communication and remedy.

582 Customs operations may be carried out only in a place where  
adequate means of controlling radiation exposure are  
provided.

583 Where a consignment is undeliverable, appropriate actions  
are required to be taken as soon as possible.

666 Intermittent venting of Type B(M) packages may be  
permitted during transport under certain conditions.

## SCHEDULE FOR UN 3332

### RADIOACTIVE MATERIAL, TYPE A PACKAGE, SPECIAL FORM, non-fissile or fissile-excepted

<b>Paragraph number(s) of the Regulations [1]</b>	<b>Subject</b>
	1. GENERAL PROVISIONS
109, 507	Other dangerous properties of contents and transport with other dangerous goods.
301–303	General provisions for radiation protection.
304, 305, 556(c)	Emergency response.
306	Quality assurance.
311–314	Training.
501(a)	Requirements before the first shipment.
502	Requirements before each shipment.
562	Possession of special form material certificates, and instructions for (a) the proper closing of the package and (b) other preparations for shipment.
602–604	Design requirements for special form radioactive material.
606–616	Design requirements for all packagings and packages.
617–619	Additional design requirements — air transport.
633	Design requirements for Type A packages, summary.

- 634–646 Additional design requirements for Type A packages.
- 647, 648 Additional design requirements for packages containing liquids.
- 649 Additional design requirements for packages containing gases.
- 672 If the package contains fissile material, one of the fissile exceptions provided by para. 672 of the Regulations is required to be applied.
- 801 The consignor is required to demonstrate on request that the package design complies with all applicable competent authority requirements.
- 802(a), 803, 804 Design requirements for special form radioactive material — competent authority approval.
- 815 Transitional arrangements for packages designed under the provisions of the 1985 or 1985 (As Amended 1990) Editions of the Regulations.
- 818 Transitional arrangements for special form radioactive material approved under the 1973, 1973 (As Amended), 1985 and 1985 (As Amended 1990) Editions of the Regulations.

## 2. CONTENTS LIMITS FOR PACKAGES

- 413(a)<sup>a</sup>, 414 The quantity of radioactive material is not allowed to exceed the limits specified in paras 413(a) and 414 of the Regulations.

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<sup>a</sup> The electronic version of the 2005 Edition of the Regulations, available on [www.iaea.org](http://www.iaea.org), should be used when referring to paras 405–419; in the printed version of the 2005 Edition of the Regulations, paras 405–419 are incorrectly numbered as 406–420.

503 A package is not allowed to contain any items other than those that are necessary for the use of the radioactive material. The interaction between these items and the package, under the conditions of transport applicable to the design, is not allowed to reduce the safety of the package.

### 3. CONTAMINATION

508, 509 Non-fixed contamination on the external surfaces of any package and on the external and internal surfaces of overpacks, freight containers, tanks, intermediate bulk containers and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over any area of 300 cm<sup>2</sup> of any part of the surface:

- (a) Beta, gamma and low toxicity alpha emitters, 4.0 Bq/cm<sup>2</sup>;
- (b) All other alpha emitters 0.4 Bq/cm<sup>2</sup>.

### 4. MAXIMUM RADIATION LEVELS

- 530–532, 575
- (i) The radiation level for a package or overpack is required to be such that the TI of the package or overpack does not exceed 10, except when transported under exclusive use; and
  - (ii) The maximum radiation level at any point on any external surface of the package or overpack is not allowed to exceed 2 mSv/h, except when transported under exclusive use by rail or by road, or under exclusive use by sea<sup>b</sup>; and
  - (iii) The maximum radiation level at any point on any external surface of a package or overpack transported under exclusive use is not allowed to exceed 10 mSv/h.

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<sup>b</sup> Packages or overpacks having a surface radiation level greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels in accordance with Table 9 of the Regulations, footnote a, provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel.

## 5. CATEGORIES OF PACKAGES AND OVERPACKS

- 526, 527 The TI is required to be derived in accordance with the procedure as stated in paras 526 and 527 of the Regulations.
- 533, Table 7 Packages and overpacks are required to be assigned to category I-WHITE, category II-YELLOW or category III-YELLOW.

## 6. MARKING AND LABELLING

- 507 Packages, freight containers and overpacks containing materials having other dangerous properties (e.g. corrosiveness) are also required to be marked and labelled as required by the relevant transport regulations.
- 535 Each package is required to be marked with an identification of either the consignor or the consignee, or both.
- 535–538 All markings are required to be legible and durable, and are required to be on the outside of the packaging.
- 536, Table 8 Packages are required to bear the mark “UN 3332” and the proper shipping name “RADIOACTIVE MATERIAL, TYPE A PACKAGE, SPECIAL FORM”.
- 537 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass.
- 538(b) Each package is required to be marked with “TYPE A”.
- 538(c) Each package is required to be marked with the international vehicle registration code (VRI Code) of the country of origin of design and either the name of the manufacturer or other identification of the packaging specified by the competent authority of the country of origin of the design.
- 542 Any labels which do not relate to the radioactive contents are required to be removed or covered.

542, 547,  
Figs 2–4

Each package, overpack and freight container is required to bear the appropriate labels. Paragraph 547 of the Regulations sets out alternative provisions for large freight containers.

543

The labels are required to be fixed to two opposite sides of the outside of the package or overpack, or on all four sides of a freight container. The labels are not allowed to cover the markings specified in paras 535–538 of the Regulations.

544(a), (b), (d),  
Table 1

Each label is required to be marked with the name(s) of the radionuclide(s), the maximum activity of the contents and the TI, except for category I-WHITE, for which the TI is not required. Paragraph 544(a) of the Regulations establishes requirements for labelling mixtures of radionuclides.

544(c)

Except for mixed loads, each label on a freight container or overpack is required to be marked with:

- (a) The radioactive contents; and
- (b) The maximum activity of the total radioactive contents during transport.

For mixed loads such entries may read “See Transport Documents”.

549

It is the consignor’s responsibility to comply with the requirements of marking, labelling and placarding.

## 7. REQUIREMENTS BEFORE SHIPMENT

501(a)

Before the first shipment of any package for which the design pressure exceeds 35 kPa, confirmation is required that the confinement system conforms to the approved design.

502(a), (b), (f)

Before each shipment of any package, the following requirements apply:

- (a) For any package it is required to ensure that all the requirements specified in the relevant provisions of the Regulations have been satisfied.

- (b) It is required to ensure that lifting attachments which do not meet the requirements of para. 607 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 608 of the Regulations.
- (f) For each special form radioactive material, it is required to ensure that all the requirements specified in the approval certificate and the relevant provisions of the Regulations have been satisfied.

550 Transport documents with each consignment (consignment notes) are required to include all relevant particulars of the consignment.

551–554 The consignor is required to include a declaration in the transport documents.

556 The consignor is required to provide a statement regarding actions to be taken by the carrier.

557 The consignor is required to make competent authority certificates available to the carrier(s) before loading and unloading.

## 8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

### 8.1. Modal requirements

573(a)–(c) For transport by rail and by road: for consignments under exclusive use, the radiation level is not allowed to exceed:

- (a) 10 mSv/h at any point on the external surface of any package or overpack, and may only exceed 2 mSv/h provided that:
  - (i) The vehicle is equipped with an enclosure which prevents unauthorized access during transport; and
  - (ii) The package or overpack is secured to retain its position within the enclosure during routine transport; and
  - (iii) There are no loading or unloading operations between the beginning and the end of the shipment;

- (b) 2 mSv/h at any point on the outer surfaces of the vehicle, including the upper and lower surfaces, or, in the case of an open vehicle, at any point on the vertical planes projected from the outer edges of the vehicle, on the upper surface of the load, and on the lower external surface of the vehicle; and
- (c) 0.1 mSv/h at any point 2 m from the vertical planes represented by the outer lateral surfaces of the vehicle, or, if the load is transported in an open vehicle, at any point 2 m from the vertical planes projected from the outer edges of the vehicle.

574 For transport by road: no persons other than the driver and assistants are permitted in vehicles carrying packages, overpacks or freight containers bearing category II-YELLOW or category III-YELLOW labels.

575 For transport by vessels: packages or overpacks having a surface radiation level greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with Table 9 of the Regulations, footnote a, are not allowed to be transported.

576 For transport by vessels: the transport of consignments by means of a special use vessel is exempted from the requirements of para. 567 of the Regulations relating to TI and radiation level provided that the conditions stated in para. 576 of the Regulations are met.

579 For transport by air: packages or overpacks having a surface radiation level greater than 2 mSv/h are not allowed to be transported.

580, 581 Transport by post is not permitted.

## **8.2. Placarding**

507, 549 Placards may be required for other dangerous properties of the contents.

- 547, Fig. 6 Large freight containers are required to bear four placards in a vertical orientation on the two external side walls and the two external end walls.
- 547 Any placards which do not relate to the contents are required to be removed.
- 547, Figs 2–4, Fig. 6 As an alternative to the use of placards on large freight containers, enlarged labels are permitted.
- 548, Figs 6, 7 Where an exclusive use consignment in a freight container is UN 3332 Type A packages, and no other UN number commodities are present, the UN number “UN 3332” is required to be displayed on all four sides of the freight container, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.
- 571, Figs 2–4, Fig 6 The location of placards and the use of placards with reduced dimensions on a road or rail vehicle are stipulated.
- 572, Figs 6, 7 Where an exclusive use consignment in or on a road or rail vehicle is UN 3332 Type A packages only, and no other UN number commodities are present, the UN number “UN 3332” is required to be displayed, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

### **8.3. Stowage during transport, storage in transit and segregation**

- 505 The transport of other goods together with consignments being transported under exclusive use may be permitted.

- 563 Packages, overpacks and freight containers are required to be segregated during transport and during storage in transit. The criteria for segregation are set out in paras 563(a)–563(d) and para. 506 of the Regulations:
- 563(a) Criteria for segregation from workers in regularly occupied working areas;
- 563(b) Criteria for segregation from members of the public;
- 563(c) Criteria for segregation from undeveloped photographic film; and
- 563(d), 506 Criteria for segregation from other dangerous goods.
- 564 Category II-YELLOW or category III-YELLOW packages or overpacks may be carried in compartments occupied by passengers under specific conditions.
- 565 Consignments are required to be securely stowed.
- 566 A package or overpack may be carried or stored among packaged general cargo.
- 567(a), Table 9 Transport index limits for freight containers and conveyances.
- 567(b) Limits on the radiation levels from freight containers and conveyances. See paras 573(b) and 573(c) of the Regulations for exceptions.
- 568 Any package or overpack having a TI greater than 10 is required to be transported only under exclusive use.
- 576 For a special use vessel, the storage arrangements are excepted from the requirements of para. 567 of the Regulations provided that the conditions stated in para. 576 of the Regulations are met.

#### **8.4. Damaged or leaking packages**

- 510 Actions to be taken when a package has been damaged or is leaking, or where it is suspected that the package may have leaked or been damaged.

511 Movement of packages which are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport.

### **8.5. Decontamination**

512 Periodic checking of conveyances and equipment is required to determine the level of contamination.

513 Decontamination of conveyances, equipment or part thereof which have become contaminated.

### **8.6. Other provisions**

309 In the event of non-compliance, appropriate actions are required to be taken as soon as possible, including communication and remedy.

582 Customs operations may be carried out only in a place where adequate means of controlling radiation exposure are provided.

583 Where a consignment is undeliverable, appropriate actions are required to be taken as soon as possible.

## SCHEDULE FOR UN 3333

### RADIOACTIVE MATERIAL, TYPE A PACKAGE, SPECIAL FORM, FISSILE

<b>Paragraph number(s) of the Regulations [1]</b>	<b>Subject</b>
	1. GENERAL PROVISIONS
109, 507	Other dangerous properties of contents and transport with other dangerous goods.
301–303	General provisions for radiation protection.
304, 305, 556(c)	Emergency response.
306	Quality assurance.
311–314	Training.
501(a)–(c)	Requirements before the first shipment.
502	Requirements before each shipment.
562	Possession of special form radioactive material certificates, and instructions for (a) the proper closing of the package and (b) other preparations for shipment.
602–604	Design requirements for special form radioactive material.
606–616	Design requirements for all packagings and packages.
617–619	Additional design requirements — air transport.
633	Design requirements for Type A packages, summary.

- 634–646 Additional design requirements for Type A packages.
- 647, 648 Additional design requirements for packages containing liquids.
- 649 Additional design requirements for packages containing gases.
- 671–682 Additional design requirements for packages containing fissile material.
- 802(a), 812–814 Package design requirements — competent authority approval.
- 803, 804 Design requirements for special form radioactive material — competent authority approval.
- 816, 817 Transitional arrangements for packages approved under the 1973, 1973 (As Amended), 1985 and 1985 (As Amended 1990) Editions of the Regulations.
- 818 Transitional arrangements for special form radioactive material approved under the 1973, 1973 (As Amended), 1985 and 1985 (As Amended 1990) Editions of the Regulations.
- 819 Packaging serial numbers — informing the competent authority.

## 2. CONTENTS LIMITS FOR PACKAGES

- 413(a)<sup>a</sup>, 414 The quantity of radioactive material is not allowed to exceed the limits specified in paras 413(a) and 414 of the Regulations.
- 418 Fissile material.

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<sup>a</sup> The electronic version of the 2005 Edition of the Regulations, available on [www.iaea.org](http://www.iaea.org), should be used when referring to paras 405–419; in the printed version of the 2005 Edition of the Regulations, paras 405–419 are incorrectly numbered as 406–420.

503 A package is not allowed to contain any items other than those that are necessary for the use of the radioactive material. The interaction between these items and the package, under the conditions of transport applicable to the design, is not allowed to reduce the safety of the package.

### 3. CONTAMINATION

508, 509 Non-fixed contamination on the external surfaces of any package and on the external and internal surfaces of overpacks, freight containers, tanks, intermediate bulk containers and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over any area of 300 cm<sup>2</sup> of any part of the surface:

- (a) Beta, gamma and low toxicity alpha emitters, 4.0 Bq/cm<sup>2</sup>;
- (b) All other alpha emitters, 0.4 Bq/cm<sup>2</sup>.

### 4. MAXIMUM RADIATION LEVELS

- 530–532, 575
- (i) The radiation level for a package or overpack is required to be such that the TI of the package or overpack does not exceed 10, and the criticality safety index is not allowed to exceed 50, except when transported under exclusive use; and
  - (ii) The maximum radiation level at any point on any external surface of the package or overpack is not allowed to exceed 2 mSv/h, except when transported under exclusive use by rail or by road, or under exclusive use by sea<sup>b</sup>; and
  - (iii) The maximum radiation level at any point on any external surface of a package or overpack transported under exclusive use is not allowed to exceed 10 mSv/h.

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<sup>b</sup> Packages or overpacks having a surface radiation level greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels in accordance with Table 9 of the Regulations, footnote a, provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel.

## 5. CATEGORIES OF PACKAGES AND OVERPACKS

- 526, 527 The TI is required to be derived in accordance with the procedure as stated in paras 526 and 527 of the Regulations.
- 528, 529 The criticality safety index for packages containing fissile material is required to be obtained in accordance with paras 528 and 529 of the Regulations.
- 533, Table 7 Packages and overpacks are required to be assigned to category I-WHITE, category II-YELLOW or category III-YELLOW.

## 6. MARKING AND LABELLING

- 507 Packages, freight containers and overpacks containing materials having other dangerous properties (e.g. corrosiveness) are also required to be marked and labelled as required by the relevant transport regulations.
- 535 Each package is required to be marked with an identification of either the consignor or the consignee, or both.
- 535–538 All markings are required to be legible and durable, and are required to be on the outside of the packaging.
- 536, Table 8 Packages are required to bear the mark “UN 3333” and the proper shipping name “RADIOACTIVE MATERIAL, TYPE A PACKAGE, SPECIAL FORM, FISSILE”.
- 537 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass.
- 538(b) Each package is required to be marked with “TYPE A”.
- 538(c) Each package is required to be marked with the international vehicle registration code (VRI Code) of the country of origin of design and either the name of the manufacturer or other identification of the packaging specified by the competent authority of the country of origin of the design.

- 539 Each package is required to be marked on the outside of the packaging with:
- (a) The identification mark allocated to that design by the competent authority;
  - (b) A serial number to uniquely identify each packaging which conforms to that design.
- 542 Any labels which do not relate to the radioactive contents are required to be removed or covered.
- 542, 545–547, Figs 2–5 Each package, overpack and freight container is required to bear the appropriate labels. Paragraph 547 of the Regulations sets out alternative provisions for large freight containers.
- 543 The labels are required to be fixed to two opposite sides of the outside of the package or overpack, or to all four sides of a freight container. The labels are not allowed to cover the markings specified in paras 535–539 of the Regulations.
- 544(a), (b), (d), Table 1 Each label is required to be marked with the name(s) of the radionuclide(s), the maximum activity of the contents and the TI, except for category I-WHITE, for which the TI is not required. Paragraph 544(a) of the Regulations establishes requirements for labelling mixtures of radionuclides. The mass of fissile material, in grams (g), or multiples of grams, may be used instead of the activity.
- 544(c) Except for mixed loads, each label on a freight container or overpack is required to be marked with:
- (a) The radioactive contents; and
  - (b) The maximum activity of the total radioactive contents during transport.
- For mixed loads such entries may read “See Transport Documents”.
- 549 It is the consignor’s responsibility to comply with the requirements of marking, labelling and placarding.

## 7. REQUIREMENTS BEFORE SHIPMENT

- 501(a)–(c) Before the first shipment, confirmation is required that the shielding, containment, heat transfer characteristics, confinement system and neutron poisons conform to the approved design.
- 502(a)–(c), (f), (g) Before each shipment of any package, the following requirements apply:
- (a) For any package it is required to ensure that all the requirements specified in the relevant provisions of the Regulations have been satisfied.
  - (b) It is required to ensure that lifting attachments which do not meet the requirements of para. 607 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 608 of the Regulations.
  - (c) For each package, it is required to ensure that all the requirements specified in the competent authority approval certificates have been satisfied.
  - (f) For each special form radioactive material, it is required to ensure that all the requirements specified in the approval certificate and the relevant provisions of the Regulations have been satisfied.
  - (g) For packages containing fissile material, the measurement specified in para. 674(b) of the Regulations and the tests to demonstrate closure of each package as specified in para. 677 of the Regulations are required to be performed where applicable.
- 550 Transport documents with each consignment (consignment notes) are required to include all relevant particulars of the consignment.
- 551–554 The consignor is required to include a declaration in the transport documents.
- 556 The consignor is required to provide a statement regarding actions to be taken by the carrier.

- 557 The consignor is required to make competent authority certificates available to the carrier(s) before loading and unloading.
- 558 Before the first shipment, the consignor is required to ensure that copies of each competent authority certificate applying to that package design have been submitted to the competent authority of each country through or into which the consignment is to be transported. The consignor is not required to await an acknowledgement from the competent authority, nor is the competent authority required to make an acknowledgement of receiving the certificate.
- 820(c) Shipments — competent authority multilateral approval is required where the criticality safety index is greater than 50.
- 821, 827 Shipments — competent authority authorization of transport without shipment approval.
- 822 Information to be included in an application for shipment approval.
- 823 When a shipment has been approved, the competent authority is required to issue an approval certificate.

## 8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

### 8.1. Modal requirements

- 573(a)–(c) For transport by rail and by road: for consignments under exclusive use, the radiation level is not allowed to exceed:
- (a) 10 mSv/h at any point on the external surface of any package or overpack, and may only exceed 2 mSv/h provided that:

- (i) The vehicle is equipped with an enclosure which prevents unauthorized access during transport; and
  - (ii) The package or overpack is secured to retain its position within the enclosure during routine transport; and
  - (iii) There are no loading or unloading operations between the beginning and the end of the shipment;
- (b) 2 mSv/h at any point on the outer surfaces of the vehicle, including the upper and lower surfaces, or, in the case of an open vehicle, at any point on the vertical planes projected from the outer edges of the vehicle, on the upper surface of the load, and on the lower external surface of the vehicle; and
- (c) 0.1 mSv/h at any point 2 m from the vertical planes represented by the outer lateral surfaces of the vehicle, or, if the load is transported in an open vehicle, at any point 2 m from the vertical planes projected from the outer edges of the vehicle.

574 For transport by road: no persons other than the driver and assistants are permitted in vehicles carrying packages, overpacks or freight containers bearing category II-YELLOW or category III-YELLOW labels.

575 For transport by vessels: packages or overpacks having a surface radiation level greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with Table 9 of the Regulations, footnote a, are not allowed to be transported.

576 For transport by vessels: the transport of consignments by means of a special use vessel is excepted from the requirements of para. 567 of the Regulations relating to TI, criticality safety index and radiation level provided that the conditions stated in para. 576 of the Regulations are met.

579 For transport by air: packages or overpacks having a surface radiation level greater than 2 mSv/h are not allowed to be transported.

580, 581 Transport by post is not permitted.

## **8.2. Placarding**

507, 549 Placards may be required for other dangerous properties of the contents.

547, Fig. 6 Large freight containers are required to bear four placards in a vertical orientation on the two external side walls and the two external end walls.

547 Any placards which do not relate to the contents are required to be removed.

547, Figs 2–6 As an alternative to the use of placards on large freight containers, enlarged labels are permitted.

548, Figs 6, 7 Where an exclusive use consignment in a freight container is UN 3333 Type A packages, and no other UN number commodities are present, the UN number “UN 3333” is required to be displayed on all four sides of the freight container, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

571, Figs 2–6 The location of placards and the use of placards with reduced dimensions on a road or rail vehicle are stipulated.

572, Figs 6, 7 Where an exclusive use consignment in or on a road or rail vehicle is UN 3333 Type A packages only, and no other UN number commodities are present, the UN number “UN 3333” is required to be displayed, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

### **8.3. Stowage during transport, storage in transit and segregation**

- 505 The transport of other goods together with consignments being transported under exclusive use may be permitted.
- 563 Packages, overpacks and freight containers are required to be segregated during transport and during storage in transit. The criteria for segregation are set out in paras 563(a)–563(d) and para. 506 of the Regulations:
- 563(a) Criteria for segregation from workers in regularly occupied working areas;
- 563(b) Criteria for segregation from members of the public;
- 563(c) Criteria for segregation from undeveloped photographic film; and
- 563(d), 506 Criteria for segregation from other dangerous goods.
- 564 Category II-YELLOW or category III-YELLOW packages or overpacks may be carried in compartments occupied by passengers under specific conditions.
- 565 Consignments are required to be securely stowed.
- 566 A package or overpack may be carried or stored among packaged general cargo.
- 567(a), Table 9 Transport index limits for freight containers and conveyances.
- 567(b) Limits on the radiation levels from freight containers and conveyances. See paras 573(b) and 573(c) of the Regulations for exceptions.
- 567(c), Table 10 Criticality safety index limits for freight containers and conveyances.
- 568 Any package or overpack having a TI greater than 10, or any consignment having a criticality safety index greater than 50, is required to be transported only under exclusive use.

569, 570,  
Table 10 Segregation of packages during transport and storage in transit.

576 For a special use vessel, the storage arrangements are excepted from the requirements of para. 567 of the Regulations provided that the conditions stated in para. 576 of the Regulations are met.

#### **8.4. Damaged or leaking packages**

510 Actions to be taken when a package has been damaged or is leaking, or where it is suspected that the package may have leaked or been damaged.

511 Movement of packages which are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport.

#### **8.5. Decontamination**

512 Periodic checking of conveyances and equipment is required to determine the level of contamination.

513 Decontamination of conveyances, equipment or part thereof which have become contaminated.

#### **8.6. Other provisions**

309 In the event of non-compliance, appropriate actions are required to be taken as soon as possible, including communication and remedy.

582 Customs operations may be carried out only in a place where adequate means of controlling radiation exposure are provided.

583 Where a consignment is undeliverable, appropriate actions are required to be taken as soon as possible.



## REFERENCE

- [1] INTERNATIONAL ATOMIC ENERGY AGENCY, Regulations for the Safe Transport of Radioactive Material, 2005 Edition, IAEA Safety Standards Series No. TS-R-1, IAEA, Vienna (2005).



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