

IAEA Safety Standards

for protecting people and the environment

Schedules of Provisions of the IAEA Regulations for the Safe Transport of Radioactive Material (2018 Edition)

Specific Safety Guide

No. SSG-33 (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

<https://www.iaea.org/resources/safety-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.

RELATED PUBLICATIONS

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
(2018 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. SSG-33 (Rev. 1)

SCHEDULES OF PROVISIONS
OF THE IAEA REGULATIONS
FOR THE SAFE TRANSPORT
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(2018 EDITION)

SPECIFIC SAFETY GUIDE

INTERNATIONAL ATOMIC ENERGY AGENCY
VIENNA, 2021

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FOREWORD

by Rafael Mariano Grossi
Director General

The IAEA's Statute authorizes it to "establish...standards of safety for protection of health and minimization of danger to life and property". These are standards that the IAEA must apply to its own operations, and that States can apply through their national regulations.

The IAEA started its safety standards programme in 1958 and there have been many developments since. As Director General, I am committed to ensuring that the IAEA maintains and improves upon this integrated, comprehensive and consistent set of up to date, user friendly and fit for purpose safety standards of high quality. Their proper application in the use of nuclear science and technology should offer a high level of protection for people and the environment across the world and provide the confidence necessary to allow for the ongoing use of nuclear technology for the benefit of all.

Safety is a national responsibility underpinned by a number of international conventions. The IAEA safety standards form a basis for these legal instruments and serve as a global reference to help parties meet their obligations. While safety standards are not legally binding on Member States, they are widely applied. They have become an indispensable reference point and a common denominator for the vast majority of Member States that have adopted these standards for use in national regulations to enhance safety in nuclear power generation, research reactors and fuel cycle facilities as well as in nuclear applications in medicine, industry, agriculture and research.

The IAEA safety standards are based on the practical experience of its Member States and produced through international consensus. The involvement of the members of the Safety Standards Committees, the Nuclear Security Guidance Committee and the Commission on Safety Standards is particularly important, and I am grateful to all those who contribute their knowledge and expertise to this endeavour.

The IAEA also uses these safety standards when it assists Member States through its review missions and advisory services. This helps Member States in the application of the standards and enables valuable experience and insight to be shared. Feedback from these missions and services, and lessons identified from events and experience in the use and application of the safety standards, are taken into account during their periodic revision.

I believe the IAEA safety standards and their application make an invaluable contribution to ensuring a high level of safety in the use of nuclear technology. I encourage all Member States to promote and apply these standards, and to work with the IAEA to uphold their quality now and in the future.

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 measures¹ 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.

Safety Guides

Safety Guides provide recommendations and guidance on how to comply with the safety requirements, indicating an international consensus that it

¹ See also publications issued in the IAEA Nuclear Security Series.

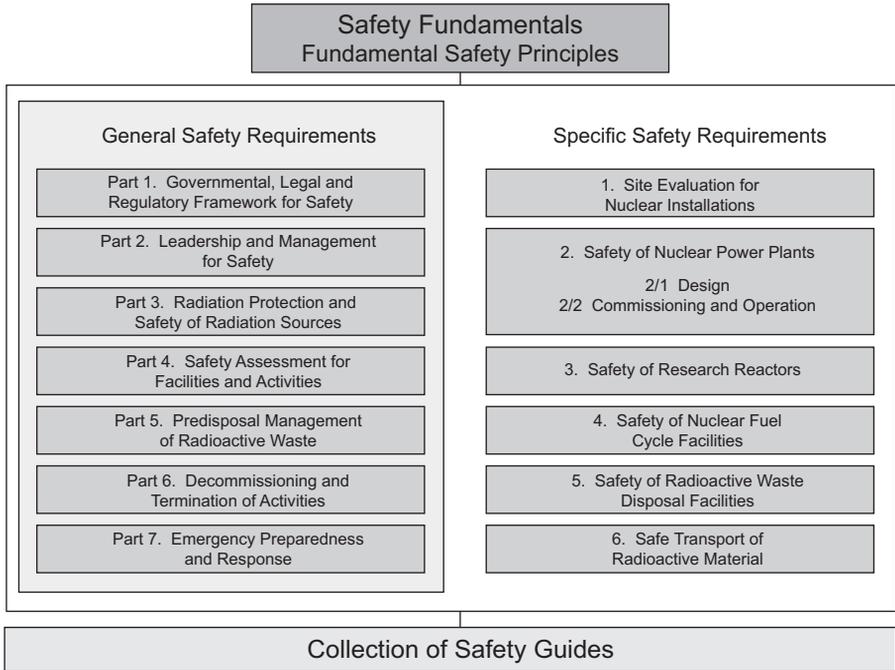


FIG. 1. The long term structure of the IAEA Safety Standards Series.

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 five Safety Standards Committees, for emergency preparedness and response (EPreSC) (as of 2016), 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 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.

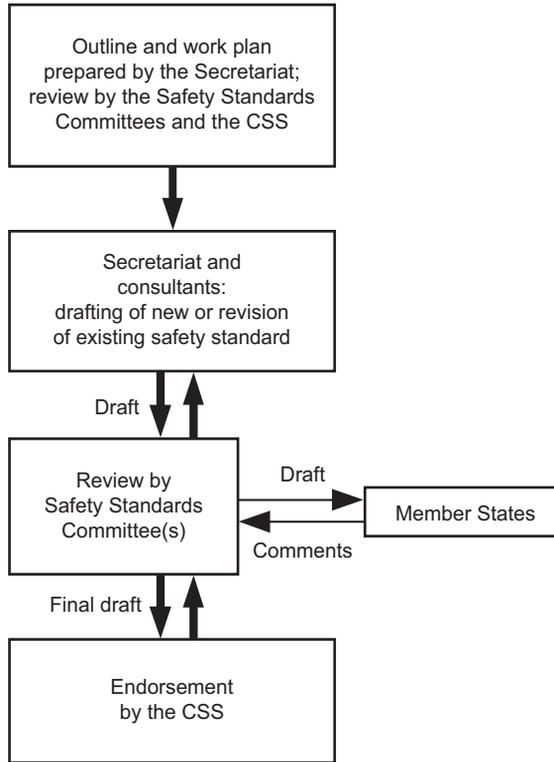


FIG. 2. The process for developing a new safety standard or revising an existing standard.

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 <https://www.iaea.org/resources/safety-standards/safety-glossary>). 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.

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1. INTRODUCTION

BACKGROUND

1.1. IAEA Safety Standards Series No. SSR-6 (Rev. 1), Regulations for the Safe Transport of Radioactive Material, 2018 Edition [1], henceforth called ‘the Transport Regulations’, establish standards of safety that provide an acceptable level of control of the radiation, criticality and thermal hazards to people, 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 Transport Regulations concern administrative controls (e.g. the requirement for the carrier to apply segregation to limit the dose rate in occupied areas), the main reliance is placed on provisions relating to the package, the responsibility for which rests primarily with the consignor of the package.

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

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

1.5. This Safety Guide is prepared on the basis of the Transport Regulations. It reproduces certain parts of the Transport 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 intending to transport a particular type of consignment of radioactive material would need to study and comply with the relevant requirements from all sections of the Transport Regulations. This Safety Guide aims to aid such users by providing a consolidation

of certain requirements of the Transport Regulations for each type of radioactive material, package and shipment. Once a consignor has properly classified the material and the package to be shipped (following the recommendations provided in Section 2), the appropriate UN number can be assigned and the specific requirements for shipment can be found in the corresponding schedule. Cross-references are provided so that the Transport Regulations can be readily consulted when necessary.

1.7. The word 'shall' in the Transport Regulations, where it needs to be reflected in this Safety Guide, has been replaced by the words 'is required to' or 'requirements apply'. Similarly, the phrase 'shall not' in the Transport Regulations has been replaced by the words 'is not allowed'. In the event of a conflict in the interpretation of the provisions of the Transport Regulations and this Safety Guide, the requirements in the Transport Regulations apply. For regulatory purposes, reference should be made to the detailed provisions of the Transport 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 26 schedules corresponding to the UN numbers and associated proper shipping names for the radioactive material to be shipped.

1.10. There may be deviations (i.e. exceptions and additions) from the Transport Regulations, necessitated by national and modal regulations and carrier restrictions, which are not reflected in this Safety Guide.

STRUCTURE

1.11. Section 2 contains definitions of terms that are used in this Safety Guide, and describes how the radioactive material is to be classified and assigned to the appropriate UN number with the associated proper shipping name. This Safety

Guide further contains 26 schedules corresponding to the UN numbers and associated proper shipping names for the radioactive material to be shipped.

1.12. The schedules are set out in numerical order according to 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 dose rates (and transport index and criticality safety index, where applicable);
- (5) Categories of packages and overpacks;
- (6) Marking and labelling;
- (7) Requirements before shipment;
- (8) Provisions concerning transport operations.

2. DEFINITIONS AND CLASSIFICATION

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 Transport Regulations and reproduced here for the convenience of the user.

A_1 and A_2

A_1 shall mean the activity value of special form radioactive material that is listed in table 2 or derived in section IV [both of the Transport Regulations] and is used to determine the activity limits for the requirements of these [Transport] Regulations. A_2 shall mean the activity value of radioactive material, other than special form radioactive material, that is listed in table 2 or derived in section IV

[both of the Transport Regulations] and is used to determine the activity limits for the requirements of these [Transport] Regulations.

Approval

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

Unilateral approval shall mean an approval of a design that is required to be given by the competent authority of the country of origin of the design only.

Carrier

Carrier shall mean any person, organization or government undertaking the carriage of radioactive material by any means of transport. The term includes both carriers for hire or reward (known as common or contract carriers in some countries) and carriers on own account (known as private carriers in some countries).

Competent authority

Competent authority shall mean any body or authority designated or otherwise recognized as such for any purpose in connection with these [Transport] Regulations.

Confinement system

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

Consignee

Consignee shall mean any person, organization or government that is entitled to take delivery of a consignment.

Consignment

Consignment shall mean any package or packages, or load of radioactive material, presented by a consignor for transport.

Consignor

Consignor shall mean any person, organization or government that prepares a consignment for transport.

Containment system

Containment system shall mean the assembly of components of the packaging specified by the designer as intended to retain the radioactive material during transport.

Contamination

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

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

Conveyance

Conveyance shall mean:

- (a) For transport by road or rail: any vehicle;
- (b) For transport by water: any vessel, or any hold, compartment, or defined deck area of a vessel;
- (c) For transport by air: any aircraft.

Criticality safety index

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

Design

Design shall mean the description of fissile material excepted under para. 417(f) [of the Transport Regulations], special form radioactive material, low dispersible radioactive material, package or packaging that enables such an item to be fully identified. The description may include specifications, engineering drawings, reports demonstrating compliance with regulatory requirements, and other relevant documentation.

Dose rate

Dose rate shall mean the ambient dose equivalent or the directional dose equivalent, as appropriate, per unit time, measured at the point of interest.

Exclusive use

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 and shipment are carried out in accordance with the directions of the consignor or consignee, where so required by the [Transport] Regulations.

Fissile nuclides and fissile material

Fissile nuclides shall mean uranium-233, uranium-235, plutonium-239 and plutonium-241. Fissile material shall mean a material containing any of the fissile nuclides. Excluded from the definition of fissile material are the following:

- (a) Natural uranium or depleted uranium that is unirradiated;
- (b) Natural uranium or depleted uranium that has been irradiated in thermal reactors only;
- (c) Material with fissile nuclides less than a total of 0.25 g;
- (d) Any combination of (a), (b) and/or (c).

These exclusions are only valid if there is no other material with fissile nuclides in the package or in the consignment if shipped unpackaged.

Freight container — small, large

Freight container shall mean an article of transport equipment that is of a permanent character and is strong enough to be suitable for repeated use;

specially designed to facilitate the transport of goods by one or other modes of transport without intermediate reloading, designed to be secured and/or readily handled, and having fittings for these purposes. The term 'freight container' does not include the vehicle.

A small freight container shall mean a freight container that has an internal volume of not more than 3 m³. A large freight container shall mean a freight container that has an internal volume of more than 3 m³.

Intermediate bulk container

Intermediate bulk container...shall mean a portable packaging that:

- (a) Has a capacity of not more than 3 m³;
- (b) Is designed for mechanical handling;
- (c) Is resistant to the stresses produced during handling and transport, as determined by tests.

Low dispersible radioactive material

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

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

Low toxicity alpha emitters

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

Management system

Management system shall mean a set of interrelated or interacting elements for establishing policies and objectives and enabling the objectives to be achieved in an efficient and effective manner.

Overpack

Overpack shall mean an enclosure used by a single consignor to contain one or more packages, and to form one unit for convenience of handling and stowage during transport.

Package

Package shall mean the complete product of the packing operation, consisting of the packaging and its contents prepared for transport. The types of package covered by these [Transport] Regulations that are subject to the activity limits and material restrictions of section IV [of the Transport Regulations] 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.

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

Radiation protection programme

Radiation protection programme shall mean systematic arrangements that are aimed at providing adequate consideration of radiation protection measures.

Radioactive contents

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

Radioactive material

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 402–407 [of the Transport Regulations].

Shipment

Shipment shall mean the specific movement of a consignment from origin to destination.

Special arrangement

Special arrangement shall mean those provisions, approved by the competent authority, under which consignments that do not satisfy all the applicable requirements of these [Transport] Regulations may be transported.

Special form radioactive material

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

Specific activity

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

Surface contaminated object

Surface contaminated object (SCO) shall mean a solid object that is not itself radioactive but which has radioactive material distributed on its surface.

CLASSIFICATION OF MATERIAL AND PACKAGES

2.3. Radioactive material intended for transport 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 arrangement governing the transport operation.

TABLE 1. UN NUMBERS AND RELATED PARAGRAPH NUMBERS OF THE TRANSPORT REGULATIONS (2018 EDITION)

UN No.	PROPER SHIPPING NAME and description	Paragraphs in which contents limits and basic requirements are established
EXCEPTED PACKAGE		
2908	RADIOACTIVE MATERIAL, EXCEPTED PACKAGE — EMPTY PACKAGING	417, 427, 515, 516
2909	RADIOACTIVE MATERIAL, EXCEPTED PACKAGE — ARTICLES MANUFACTURED FROM NATURAL URANIUM or DEPLETED URANIUM or NATURAL THORIUM	426, 515, 516
2910	RADIOACTIVE MATERIAL, EXCEPTED PACKAGE — LIMITED QUANTITY OF MATERIAL	417, 424, 515, 516
2911	RADIOACTIVE MATERIAL, EXCEPTED PACKAGE — INSTRUMENTS or ARTICLES	417, 423, 515, 516
3507	URANIUM HEXAFLUORIDE, RADIOACTIVE MATERIAL, EXCEPTED PACKAGE, less than 0.1 kg per package, non-fissile or fissile-excepted	417, 425, 515, 516
LOW SPECIFIC ACTIVITY MATERIAL		
2912	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-I), non-fissile or fissile-excepted	409(a), 411, 417, 517, 520
3321	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-II), non-fissile or fissile-excepted	409(b), 410, 411, 417, 517
3322	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-III), non-fissile or fissile-excepted	409(c), 410, 411, 417, 517
3324	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-II), FISSILE	409(b), 410, 411, 417, 418, 517
3325	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-III), FISSILE	409(c), 410, 411, 417, 418, 517

TABLE 1. UN NUMBERS AND RELATED PARAGRAPH NUMBERS OF THE TRANSPORT REGULATIONS (2018 EDITION) (cont.)

UN No.	PROPER SHIPPING NAME and description	Paragraphs in which contents limits and basic requirements are established
SURFACE CONTAMINATED OBJECTS		
2913	RADIOACTIVE MATERIAL, SURFACE CONTAMINATED OBJECTS (SCO-I, SCO-II or SCO-III), non-fissile or fissile-excepted	413, 414, 417, 517, 520
3326	RADIOACTIVE MATERIAL, SURFACE CONTAMINATED OBJECTS (SCO-I or SCO-II), FISSILE	413, 414, 417, 418, 517, 520
TYPE A PACKAGE		
2915	RADIOACTIVE MATERIAL, TYPE A PACKAGE, non-special form, non-fissile or fissile-excepted	417, 429(b), 430
3327	RADIOACTIVE MATERIAL, TYPE A PACKAGE, FISSILE, non-special form	417, 418, 429(b), 430
3332	RADIOACTIVE MATERIAL, TYPE A PACKAGE, SPECIAL FORM, non-fissile or fissile-excepted	415, 417, 429(a), 430
3333	RADIOACTIVE MATERIAL, TYPE A PACKAGE, SPECIAL FORM, FISSILE	415, 417, 418, 429(a), 430
TYPE B(U) PACKAGE		
2916	RADIOACTIVE MATERIAL, TYPE B(U) PACKAGE, non-fissile or fissile-excepted	417, 432, 433
3328	RADIOACTIVE MATERIAL, TYPE B(U) PACKAGE, FISSILE	417, 418, 432, 433
TYPE B(M) PACKAGE		
2917	RADIOACTIVE MATERIAL, TYPE B(M) PACKAGE, non-fissile or fissile-excepted	417, 432, 433

TABLE 1. UN NUMBERS AND RELATED PARAGRAPH NUMBERS OF THE TRANSPORT REGULATIONS (2018 EDITION) (cont.)

UN No.	PROPER SHIPPING NAME and description	Paragraphs in which contents limits and basic requirements are established
3329	RADIOACTIVE MATERIAL, TYPE B(M) PACKAGE, FISSILE	417, 418, 432, 433
TYPE C PACKAGE		
3323	RADIOACTIVE MATERIAL, TYPE C PACKAGE, non-fissile or fissile-excepted	417, 432
3330	RADIOACTIVE MATERIAL, TYPE C PACKAGE, FISSILE	417, 418, 432
SPECIAL ARRANGEMENT		
2919	RADIOACTIVE MATERIAL, TRANSPORTED UNDER SPECIAL ARRANGEMENT, non-fissile or fissile-excepted	310, 417
3331	RADIOACTIVE MATERIAL, TRANSPORTED UNDER SPECIAL ARRANGEMENT, FISSILE	310, 417, 418
URANIUM HEXAFLUORIDE		
2977	RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE, FISSILE	417, 418, 419(a), 420
2978	RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE, non-fissile or fissile-excepted	417, 419(b), 420

2.4. For 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.

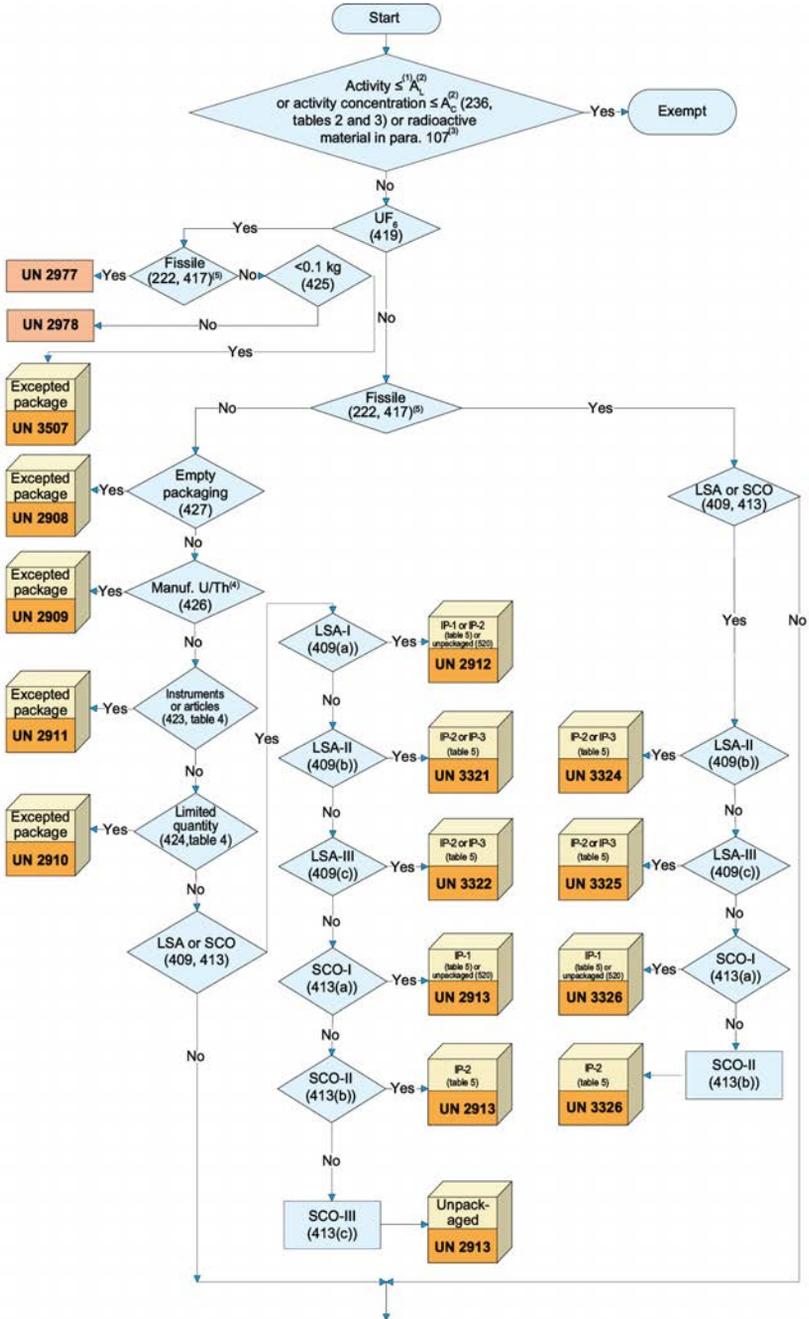
2.5. A flow diagram for classification of radioactive material to the appropriate UN number is provided in Fig. 1 to aid the assignment process. The objective of

the flow diagram is not to indicate all possible options allowed by the Transport Regulations, nor to incorporate all the detailed requirements and limits. Rather, it is a tool to indicate the most suitable option for classification.

2.6. It has to be verified that all of the requirements 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 the responsibility of the consignor. Two examples of such situations are as follows:

- (1) Some radioactive material may meet the criteria for both ‘limited quantity’ and ‘LSA or SCO’. Following the flow diagram in Fig. 1, if the radioactive material is not part of an exempt consignment, is not UF₆, is not fissile, and is not manufactured uranium or thorium, or enclosed in or included as a component part of an instrument or article, the next decision box encountered is ‘Limited Quantity’. If this option could be selected (i.e. ‘Yes’), the material is classified as UN 2910 RADIOACTIVE MATERIAL, EXCEPTED PACKAGE — LIMITED QUANTITY OF MATERIAL. 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. Instead, the choice may be made to proceed to the decision box ‘LSA or SCO’. If this option is selected, the material will be classified as LSA or SCO (depending on the case) and can be shipped unpackaged in a larger amount as LSA-I (UN 2912) or SCO-I (UN 2913) without needing to comply with the activity limit that is a requirement for excepted packages. However, the option ‘LSA or SCO’ will incur a greater administrative burden, which will need to be considered.
- (2) If the amount of LSA material is such that the dose rate at 3 m from the unshielded material exceeds 10 mSv/h, then the consignor could reduce the amount of LSA material per package accordingly and classify the package as an industrial package (IP). If this is not an option, the material will be required to be transported using a Type B package.



SCHEDULE FOR UN 2908

RADIOACTIVE MATERIAL, EXCEPTED PACKAGE — EMPTY
PACKAGING

**Paragraph(s) of
the Transport
Regulations [1]**

Subject

1. GENERAL PROVISIONS

110, 507	Transport with other dangerous goods, and other dangerous properties of contents.
301–303	General provisions for radiation protection.
304, 305	Emergency response.
306	Management system.
311–315	Training.
504	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.
515	Requirements for excepted packages.
607–618	Design requirements for all packagings and packages.
619–621	Additional design requirements — air transport.
819	Transitional arrangements for packages designed under the provisions of the 1985 or 1985 (As Amended 1990), 1996, 1996 (Revised), 1996 (As Amended 2003), 2005, 2009 and 2012 Editions of the Transport Regulations.

822 Transitional arrangement for packages whose content is excepted from classification as fissile material under the 2009 Edition of the Transport Regulations.

2. CONTENTS LIMITS FOR PACKAGES

Only contamination is allowed (see below).

417 If the package is contaminated by fissile material, one of the fissile exceptions provided by para. 417 of the Transport Regulations is required to be applied.

Fissile material excepted under para. 417(f) is required to comply with para. 606 and requires multilateral approval as specified in para. 805.

422(a), 427 Classification as an excepted package, additional requirements for empty packagings.

3. CONTAMINATION

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

508, 509 Non-fixed contamination on the external surfaces of any package and on the external and internal surfaces of overpacks, freight 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 cm² of any part of the surface:

- | | |
|---|--------------------------|
| (a) Beta, gama and low toxicity alpha emitters, | 4 Bq/cm ² ; |
| (b) All other alpha emitters, | 0.4 Bq/cm ² . |

4. MAXIMUM DOSE RATES

516 The dose rate 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 for dangerous goods.
- 515 Labelling for radioactive contents is not applicable.
- 531 Each package is required to be marked with an identification of either the consignor or the consignee, or both.
- 532, table 9 Packages are required to bear the mark “UN 2908”.
- 533 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass on the outside of the packaging.
- 531–533 All marks are required to be legible and durable, and are required to be on the outside of the packaging.
- 536A Any mark on the package made in accordance with paras 534(a) and (b) and 535(c) of the Transport Regulations that does not relate to the UN number and proper shipping name assigned to the consignment is required to be removed or covered.
- 545 It is the consignor’s responsibility to comply with the requirements of marking and labelling.

7. REQUIREMENTS BEFORE SHIPMENT

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

- 503(a), (e)
(cont.)
- (i) The content of the package is in accordance with the specifications of design regarding the radionuclide, its form and physical or chemical state.
 - (ii) All the relevant requirements of the Transport Regulations and applicable certificates of approval have been fulfilled.
 - (iii) Provisions on lifting attachments are complied with.
 - (iv) For packages intended to be used for shipment after storage, it is required to take into account ageing mechanisms.
- 546 The transport documents with each consignment (consignment notes) are required to include all relevant particulars of the consignment.
- 555 The consignor is required to retain a copy of the transport documents.

8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

8.1. Modal requirements

- 580 A consignment may be accepted for domestic movement by national postal authorities, subject to the requirements established in para. 580 of the Transport Regulations and any additional requirements prescribed by the authorities.
- 581 A consignment may be accepted for international movement by post, subject to the requirements established in para. 581 of the Transport Regulations, and any additional requirements prescribed by the Acts of the Universal Postal Union.

8.2. Placarding

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

545 Consignor's responsibilities.

8.3. Stowage during transport, storage in transit and segregation

Not applicable.

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

8.5. Decontamination

505 Freight containers, intermediate bulk containers, tanks, packagings and overpacks used for the transport of radioactive material are not allowed to be used for the storage or transport of other goods, unless decontaminated below the levels specified in the Transport Regulations.

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

513 Decontamination of conveyances and equipment, or parts thereof that have become contaminated, is required.

8.6. Other provisions

309 In the event of non-compliance with any limit in the Transport Regulations applicable to dose rate or contamination, 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 2909

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

**Paragraph(s) of
the Transport
Regulations [1]**

Subject

1. GENERAL PROVISIONS

110, 507	Transport with other dangerous goods, and other dangerous properties of contents.
301–303	General provisions for radiation protection.
304, 305	Emergency response.
306	Management system.
311–315	Training.
504	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.
515	Requirements for excepted packages.
607–618	Design requirements for all packagings and packages.
619–621	Additional design requirements — air transport.
636	Minimum dimensions of a package containing fissile-excepted material.

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

819 Transitional arrangements for packages designed under the provisions of the 1985 or 1985 (As Amended 1990), 1996, 1996 (Revised), 1996 (As Amended 2003), 2005, 2009 and 2012 Editions of the Transport Regulations.

2. CONTENTS LIMITS FOR PACKAGES

422(c), 426 Classification as an excepted package.

426 There is no limit on the quantity of material; the contents limits are on the type of material and on the outer surface of the material.

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 and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over 300 cm² of any part of the surface:

- | | |
|--|--------------------------|
| (a) Beta, gamma and low toxicity alpha emitters, | 4 Bq/cm ² ; |
| (b) All other alpha emitters, | 0.4 Bq/cm ² . |

4. MAXIMUM DOSE RATES

516 The dose rate 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 for dangerous goods.
- 515 Labelling for radioactive contents is not applicable.
- 531 Each package is required to be marked with an identification of either the consignor or the consignee, or both.
- 532, table 9 Packages are required to bear the mark “UN 2909”.
- 533 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass on the outside of the packaging.
- 531–533 All marks are required to be legible and durable, and are required to be on the outside of the packaging.
- 545 It is the consignor’s responsibility to comply with the requirements of marking and labelling.
- 581(c)–(e) Specific marking requirements for consignments shipped by post.

7. REQUIREMENTS BEFORE SHIPMENT

- 503(a), (e) Before each shipment of any package, the following requirements apply:
- (i) The content of the package is in accordance with the specifications of design regarding the radionuclide, its form and physical or chemical state.

- 503(a), (e)
(cont.)
- (ii) All the relevant requirements of the Transport Regulations and applicable certificates of approval have been fulfilled.
 - (iii) Provisions on lifting attachments are complied with.
 - (iv) For packages intended to be used for shipment after storage, it is required to take into account ageing mechanisms.

546 The transport documents with each consignment (consignment notes) are required to include all relevant particulars of the consignment.

8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

8.1. Modal requirements

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

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

8.2. Placarding

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

545 Consignor's responsibilities.

8.3. Stowage during transport, storage in transit and segregation

Not applicable.

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

8.5. Decontamination

- 505 Freight containers, intermediate bulk containers, tanks, packagings and overpacks used for the transport of radioactive material are not allowed to be used for the storage or transport of other goods, unless decontaminated below the levels specified in the Transport Regulations.
- 512 Periodic checking of conveyances and equipment is required to determine the level of contamination.
- 513 Decontamination of conveyances and equipment, or parts thereof that have become contaminated, is required.

8.6. Other provisions

- 309 In the event of non-compliance with any limit in the Transport Regulations applicable to dose rate or contamination, 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 2910

RADIOACTIVE MATERIAL, EXCEPTED PACKAGE — LIMITED
QUANTITY OF MATERIAL

Paragraph(s) of the Transport Regulations [1]	Subject
<hr/>	
1. GENERAL PROVISIONS	
<hr/>	
110, 507	Transport with other dangerous goods, and other dangerous properties of contents.
301–303	General provisions for radiation protection.
304, 305	Emergency response.
306	Management system.
311–315	Training.
424(a)	Retention of contents under routine conditions of transport.
504	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.
515	Requirements for excepted packages.
607–618	Design requirements for all packagings and packages.
619–621	Additional design requirements — air transport.
801	The consignor is required to demonstrate on request that the package design complies with all applicable competent authority requirements.

819 Transitional arrangements for packages designed under the provisions of the 1985 or 1985 (As Amended 1990), 1996, 1996 (Revised), 1996 (As Amended 2003), 2005, 2009 and 2012 Editions of the Transport Regulations.

822 Transitional arrangement for packages excepted for fissile material under the 2009 Edition of the Transport Regulations.

2. CONTENTS LIMITS FOR PACKAGES

417 If the package contains fissile material, one of the fissile exceptions provided by para. 417 of the Transport Regulations is required to be applied.

Fissile material excepted under para. 417(f) is required to comply with para. 606 and requires multilateral approval as specified in para. 805.

422(d), 424 The activity limits in table 4 of the Transport Regulations are required to be met.

424(c) For transport by post, the total activity in each package is not allowed to exceed one tenth of the relevant limit specified in table 4 of the Transport Regulations.

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 and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over 300 cm² of any part of the surface:

(a) Beta, gamma and low toxicity alpha emitters, 4 Bq/cm²;

(b) All other alpha emitters, 0.4 Bq/cm².

4. MAXIMUM DOSE RATES

516 The dose rate at any point on the external surface of an excepted package is not allowed to exceed 5 $\mu\text{Sv/h}$.

5. CATEGORIES OF PACKAGES AND OVERPACKS

Not applicable.

6. MARKING AND LABELLING

424(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, or is on the outside of the package, where it is impractical to mark an internal surface.

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 for dangerous goods.

515 Labelling for radioactive contents is not applicable.

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

532, table 9 Packages are required to bear the mark "UN 2910".

533 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass on the outside of the packaging.

531–533 All marks are required to be legible and durable, and are required to be on the outside of the packaging.

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

581(c)–(e) Specific marking requirements for consignments shipped by post.

7. REQUIREMENTS BEFORE SHIPMENT

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

- (i) The content of the package is in accordance with the specifications of design regarding the radionuclide, its form and physical or chemical state.
- (ii) All the relevant requirements of the Transport Regulations and applicable certificates of approval have been fulfilled.
- (iii) Provisions on lifting attachments are complied with.
- (iv) For packages intended to be used for shipment after storage, it is required to take into account ageing mechanisms.

546 The transport documents with each consignment (consignment notes) are required to include all relevant particulars of the consignment.

8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

8.1. Modal requirements

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

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

8.2. Placarding

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

545 Consignor's responsibilities.

8.3. Stowage during transport, storage in transit and segregation

Not applicable.

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

8.5. Decontamination

505 Freight containers, intermediate bulk containers, tanks, packagings and overpacks used for the transport of radioactive material are not allowed to be used for the storage or transport of other goods, unless decontaminated below the levels specified in the Transport Regulations.

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

513 Decontamination of conveyances and equipment, or parts thereof that have become contaminated, is required.

8.6. Other provisions

- 309 In the event of non-compliance with any limit in the Transport Regulations applicable to dose rate or contamination, 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 2911

RADIOACTIVE MATERIAL, EXCEPTED PACKAGE —
INSTRUMENTS or ARTICLES

Paragraph(s) of the Transport Regulations [1]	Subject
<hr/>	
1. GENERAL PROVISIONS	
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110, 507	Transport with other dangerous goods, and other dangerous properties of contents.
301–303	General provisions for radiation protection.
304, 305	Emergency response.
306	Management system.
311–315	Training.
504	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.
515	Requirements for excepted packages.
607–618	Design requirements for all packagings and packages.
619–621	Additional design requirements — air transport.
801	The consignor is required to demonstrate on request that the package design complies with all applicable competent authority requirements.

819 Transitional arrangements for packages designed under the provisions of the 1985 or 1985 (As Amended 1990), 1996, 1996 (Revised), 1996 (As Amended 2003), 2005, 2009 and 2012 Editions of the Transport Regulations.

822 Transitional arrangement for packages excepted for fissile material under the 2009 Edition of the Transport Regulations.

2. CONTENTS LIMITS FOR PACKAGES

417 If the package contains fissile material, one of the fissile exceptions provided by para. 417 of the Transport Regulations is required to be applied.

Fissile material excepted under para. 417(f) is required to comply with para. 606 and requires multilateral approval as specified in para. 805.

422(b), 423 The activity limits in table 4 of the Transport Regulations are required to be met.

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, 509 Non-fixed contamination on the external surfaces of any package and on the external and internal surfaces of overpacks, freight 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 cm² of any part of the surface:

- | | | |
|-----|--|--------------------------|
| (a) | Beta, gamma and low toxicity alpha emitters, | 4 Bq/cm ² ; |
| (b) | All other alpha emitters, | 0.4 Bq/cm ² . |

4. MAXIMUM DOSE RATES

- 423(a) The dose rate 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.
- 516 The dose rate 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

- 423(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. 423(b) of the Transport Regulations.
- 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 for dangerous goods.
- 515 Labelling for radioactive contents is not applicable.
- 531 Each package is required to be marked with an identification of either the consignor or the consignee, or both.
- 532, table 9 Packages are required to bear the mark “UN 2911”.
- 533 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass on the outside of the packaging.
- 531–533 All marks are required to be legible and durable, and are required to be on the outside of the packaging.

- 545 It is the consignor's responsibility to comply with the requirements of marking and labelling.
- 581(c)–(e) Specific marking requirements for consignments shipped by post.

7. REQUIREMENTS BEFORE SHIPMENT

- 503(a), (e) Before each shipment of any package, the following requirements apply:
- (i) The content of the package is in accordance with the specifications of design regarding the radionuclide, its form and physical or chemical state.
 - (ii) All the relevant requirements of the Transport Regulations and applicable certificates of approval have been fulfilled.
 - (iii) Provisions on lifting attachments are complied with.
 - (iv) For packages intended to be used for shipment after storage, it is required to take into account ageing mechanisms.
- 546 The transport documents with each consignment (consignment notes) are required to include all relevant particulars of the consignment.

8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

8.1. Modal requirements

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

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

8.2. Placarding

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

545 Consignor's responsibilities.

8.3. Stowage during transport, storage in transit and segregation

Not applicable.

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

8.5. Decontamination

505 Freight containers, intermediate bulk containers, tanks, packagings and overpacks used for the transport of radioactive material are not allowed to be used for the storage or transport of other goods, unless decontaminated below the levels specified in the Transport Regulations.

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

513 Decontamination of conveyances and equipment, or parts thereof that have become contaminated, is required.

8.6. Other provisions

- 309 In the event of non-compliance with any limit in the Transport Regulations applicable to dose rate or contamination, 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 2912

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

Paragraph(s) of the Transport Regulations [1]	Subject
<hr/>	
1. GENERAL PROVISIONS	
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110, 507	Transport with other dangerous goods, and other dangerous properties of contents.
301–303	General provisions for radiation protection.
304, 305, 554(c)	Emergency response.
306	Management system.
311–315	Training.
504	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.
607–618	Design requirements for all packagings and packages.
619–621	Additional design requirements — air transport.
623	Design requirements for Type IP-1 packages.
624	Design requirements for Type IP-2 packages (liquid contents, not under exclusive use).
626–630	Alternative design requirements for Type IP-2 packages.

- 801 The consignor is required to demonstrate on request that the package design complies with all applicable competent authority requirements.
- 819 Transitional arrangements for packages designed under the provisions of the 1985 or 1985 (As Amended 1990), 1996, 1996 (Revised), 1996 (As Amended 2003), 2005, 2009 and 2012 Editions of the Transport Regulations.
- 822 Transitional arrangement for packages excepted for fissile material under the 2009 Edition of the Transport Regulations.

2. CONTENTS LIMITS FOR PACKAGES

- 409(a) LSA-I definition and criteria.
- 411, 517 The contents are required to be restricted such that the dose rates specified in para. 517 of the Transport Regulations will not be exceeded (see 4 below).
- 417 If the package contains fissile material, one of the fissile exceptions provided by para. 417 of the Transport Regulations is required to be applied.
- Fissile material excepted under para. 417(f) is required to comply with para. 606 and requires multilateral approval as specified in para. 805.
- 520 LSA-I is allowed to be transported unpackaged, subject to the conditions stated in para. 520 of the Transport Regulations.
- 522 No activity limits.

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 and conveyances is required to be kept as low as practicable and is not allowed to exceed the

508, 509 (cont.) following limits, when averaged over 300 cm² of any part of the surface:

- (a) Beta, gamma and low toxicity alpha emitters, 4 Bq/cm²;
- (b) All other alpha emitters, 0.4 Bq/cm².

514 A freight container or conveyance dedicated to the transport of unpackaged LSA-I material under exclusive use may be excepted from the requirements of paras 509 and 513 of the Transport Regulations with regard to the contamination on internal surfaces, for as long as it remains under that specific exclusive use.

4. MAXIMUM DOSE RATES AND TRANSPORT INDEX (TI)

517 The dose rate at 3 m from the unshielded material is not allowed to exceed 10 mSv/h.

- 526–528
- (i) The dose rate 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.
 - (ii) The maximum dose rate 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.¹
 - (iii) The maximum dose rate at any point on any external surface of a package or overpack transported under exclusive use is not allowed to exceed 10 mSv/h.

¹ Packages or overpacks having a surface dose rate greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel (see footnote to table 10 of the Transport Regulations).

5. CATEGORIES OF PACKAGES AND OVERPACKS

- 521, table 5 LSA material is required to be packaged in accordance with table 5 of the Transport Regulations.
- 523, 524, 524A The TI (including for unpackaged LSA-I) is required to be derived in accordance with paras 523, 524 and 524A of the Transport Regulations.
- 529, table 8 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 for dangerous goods.
- 531 Each package is required to be marked with an identification of either the consignor or the consignee, or both.
- 532, table 9 Packages are required to bear the mark “UN 2912” and the proper shipping name “RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-I)”.
- 533 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass on the outside of the packaging.
- 534(a) Each package that conforms to an IP-1 or IP-2 design is required to be marked with “TYPE IP-1” or “TYPE IP-2” as appropriate.

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- 534(c) Each package that 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 the 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.
- 531–534 All marks are required to be legible and durable, and are required to be on the outside of the packaging.
- 536A Any mark on the package made in accordance with paras 534(a) and (b) and 535(c) of the Transport Regulations that does not relate to the UN number and proper shipping name assigned to the consignment is required to be removed or covered.
- 537 When the material is contained in receptacles or wrapping materials and is transported under exclusive use, the outer surface of these receptacles or materials may be marked “RADIOACTIVE LSA-I”.
- 538, figs 2–4 Each package, overpack and freight container is required to bear the appropriate labels.
- Any labels that do not relate to the contents are required to be removed or covered.
- 539 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 marks specified in paras 531–536 of the Transport Regulations.
- 540(a), (b) Each label is required to be marked only with “LSA-I” and the maximum activity of the contents.
- 540(c) Except for mixed loads, each label on a freight container or overpack is required to be marked with:

- 540(c)
(cont.)
- (i) The radioactive contents;
 - (ii) The maximum activity of the total radioactive contents during transport.

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

- 540(d)
- Each label is required to show the TI, except for category I-WHITE.

- 545
- It is the consignor’s responsibility to comply with the requirements of marking and labelling.

7. REQUIREMENTS BEFORE SHIPMENT

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

- 502, 503(a), (e)
- Before each shipment of any package, the following requirements apply:

- (i) The content of the package is in accordance with the specifications of design regarding the radionuclide, its form and physical or chemical state.
- (ii) All the relevant requirements of the Transport Regulations and applicable certificates of approval have been fulfilled.
- (iii) Provisions on lifting attachments are complied with.
- (iv) For packages intended to be used for shipment after storage, it is required to take into account ageing mechanisms.

- 546
- The transport documents with each consignment (consignment notes) are required to include all relevant particulars of the consignment.

- 547–553 The consignor is required to include a declaration in the transport documents.
- 554, 555 The consignor is required to provide a statement regarding actions to be taken by the carrier.
- 825(d) Multilateral approval is required for radiation protection programmes for shipments by special use vessels.

8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

8.1. Modal requirements

- 573 For transport by rail and by road: for consignments under exclusive use, the dose rate 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 that prevents unauthorized access during transport;
 - (ii) The package or overpack is secured to retain its position within the enclosure during routine transport;
 - (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.

- 573
(cont.) (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 dose rate greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with table 10 of the Transport Regulations, footnote (a), are not allowed to be transported except under special arrangement.
- 576 For transport by vessels: the transport of consignments by means of a special use vessel is exempted from the requirements of para. 566 of the Transport Regulations relating to TI and dose rate provided that the conditions stated in para. 576 of the Transport Regulations are met.
- 579 For transport by air: packages or overpacks having a surface dose rate greater than 2 mSv/h are not allowed to be transported, except under special arrangement.
- 580, 581 Transport by post is not allowed.

8.2. Placarding

- 507 Placards may be required for other dangerous properties of the contents.
- 543, 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. Any placards that do not relate to the contents are required to be removed.

- 543, figs 2–4, 6 As an alternative to the use of placards on large freight containers and tanks, enlarged labels are permitted.
- 544, figs 6, 7 Where the consignment in a freight container or tank is unpackaged UN 2912 LSA-I only, or where an exclusive use consignment in a freight container is packaged UN 2912 LSA-I only, 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 Transport Regulations, against the white background, or on the placard shown in fig. 7 of the Transport Regulations. If the placard shown in fig. 7 of the Transport Regulations is used, it is required to be fixed immediately adjacent to each main placard.
- 545 Consignor’s responsibilities.
- 571, figs 2–4, 6 Requirements on the location of placards and the use of placards with reduced dimensions on a road or rail vehicle.
- 572, figs 6, 7 For carriage in or on a road or rail vehicle, where either the consignment is unpackaged UN 2912 LSA-I only, 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 Transport Regulations against the white background or on the placard shown in fig. 7 of the Transport Regulations. If the placard shown in fig. 7 of the Transport Regulations is used, it is required to be fixed immediately adjacent to each main placard.

8.3. Stowage during transport, storage in transit and segregation

- 506, 562 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 562(a)–(d) and 506 of the Transport Regulations.

- 563 Category II-YELLOW or category III-YELLOW packages or overpacks are not allowed to be carried in compartments occupied by passengers, except for compartments reserved for specially authorized couriers.
- 564 Consignments are required to be securely stowed.
- 565 A package or overpack may be carried or stored among packaged general cargo, subject to certain conditions.
- 566(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.
- 566(b) Limits on the dose rates from freight containers and vehicles. Different limits apply for exclusive use; see remarks on para. 573 of the Transport Regulations in 8.1 above.
- 567 Any package or overpack having a TI greater than 10 is required to be transported under exclusive use.
- 576 For a special use vessel, the storage arrangements are excepted from the requirements of para. 566 of the Transport Regulations provided that the conditions stated in para. 576 of the Transport 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 that are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport.

8.5. Decontamination

- 505 Freight containers, intermediate bulk containers, tanks, packagings and overpacks used for the transport of radioactive material are not allowed to be used for the storage or transport of other goods, unless decontaminated below the levels specified in the Transport Regulations.
- 512 Periodic checking of conveyances and equipment is required to determine the level of contamination.
- 513 Decontamination of conveyances and equipment, or parts thereof that have become contaminated, is required.

8.6. Other provisions

- 309 In the event of non-compliance with any limit in the Transport Regulations applicable to dose rate or contamination, 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, SCO-II or SCO-III), non-fissile or fissile-excepted

**Paragraph(s) of
the Transport
Regulations [1]**

Subject

1. GENERAL PROVISIONS

110, 507	Transport with other dangerous goods, and other dangerous properties of contents.
301–303	General provisions for radiation protection.
304, 305, 554(c)	Emergency response.
306	Management system.
311–315	Training.
504	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.
607–618	Design requirements for all packagings and packages.
619–621	Additional design requirements — air transport.
623	Design requirements for Type IP-1 packages.
624	Design requirements for Type IP-2 packages.
626–630	Alternative design requirements for Type IP-2 packages.

- 801 The consignor is required to demonstrate on request that the package design complies with all applicable competent authority requirements.
- 819 Transitional arrangements for packages designed under the provisions of the 1985 or 1985 (As Amended 1990), 1996, 1996 (Revised), 1996 (As Amended 2003), 2005, 2009 and 2012 Editions of the Transport Regulations.
- 822 Transitional arrangement for packages excepted for fissile material under the 2009 Edition of the Transport Regulations.

2. CONTENTS LIMITS FOR PACKAGES

- 413 SCO-I, SCO-II and SCO-III definitions and surface contamination limits.
- 414, 517 The contents are required to be restricted such that the dose rates specified in para. 517 of the Transport Regulations will not be exceeded (see 4 below).
- 417 If the package contains fissile material, one of the fissile exceptions provided by para. 417 of the Transport Regulations is required to be applied.
- Fissile material excepted under para. 417(f) is required to comply with para. 606 and requires multilateral approval as specified in para. 805.
- 520 SCO-I and SCO-III is allowed to be transported unpackaged, subject to the conditions stated in para. 520 of the Transport Regulations.
- 522 The activity limits for conveyances carrying SCO are stated in table 6 of the Transport Regulations. Exceptions are allowed for SCO-III, subject to the conditions specified in para. 522.

3. CONTAMINATION

- 508, 509 Non-fixed contamination on the external surfaces of any package

508, 509
(cont.) and on the external and internal surfaces of overpacks, freight 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 cm² of any part of the surface:

- (a) Beta, gamma and low toxicity alpha emitters, 4 Bq/cm²;
- (b) All other alpha emitters, 0.4 Bq/cm².

514 A freight container or conveyance dedicated to the transport of unpackaged SCO material under exclusive use may be excepted from the requirements of paras 509 and 513 of the Transport Regulations with regard to the contamination on internal surfaces, for as long as it remains under that specific exclusive use.

4. MAXIMUM DOSE RATES AND TRANSPORT INDEX (TI)

517 The dose rate at 3 m from the unshielded material is not allowed to exceed 10 mSv/h.

526–528 (i) The dose rate 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.

(ii) The maximum dose rate 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.¹

¹ Packages or overpacks having a surface dose rate greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel (see footnote to table 10 of the Transport Regulations).

- 526–528
(cont.) (iii) The maximum dose rate 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

- 521, table 5 SCO are required to be packaged in accordance with table 5 of the Transport Regulations.
- 523, 524, 524A The TI (including for unpackaged SCO-I or SCO-III) is required to be derived in accordance with paras 523, 524 and 524A of the Transport Regulations.
- 529, table 8 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 for dangerous goods.
- 531 Each package is required to be marked with an identification of either the consignor or the consignee, or both.
- 532, table 9 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)” or “RADIOACTIVE MATERIAL, SURFACE CONTAMINATED OBJECTS (SCO-III)”, depending on the contents.
- 533 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass on the outside of the packaging.

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- 534(a) Each package that conforms to an IP-1 or IP-2 design is required to be marked with “TYPE IP-1” or “TYPE IP-2” as appropriate.
- 534(c) Each package that 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 the 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.
- 531–534 All marks are required to be legible and durable, and are required to be on the outside of the packaging.
- 536A Any mark on the package made in accordance with paras 534(a) and (b) and 535(c) of the Transport Regulations that does not relate to the UN number and proper shipping name assigned to the consignment is required to be removed or covered.
- 537 When the SCO-I object is contained in receptacles or wrapping materials and is transported under exclusive use, as permitted by para. 520, the outer surface of these receptacles or materials may be marked “RADIOACTIVE SCO-I”.
- 538, figs 2–4 Each package, overpack and freight container is required to bear the appropriate labels.
- Any labels that do not relate to the contents are required to be removed or covered.
- 539 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 marks specified in paras 531–536 of the Transport Regulations.

540(a), (b) 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, and the maximum activity of the contents. Paragraph 540(a) of the Transport Regulations also establishes requirements for labelling mixtures of radionuclides.

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

- (i) The radioactive contents;
- (ii) The maximum activity of the total radioactive contents during transport.

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

540(d) Each label is required to show the TI, except for category I-WHITE.

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

7. REQUIREMENTS BEFORE SHIPMENT

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

502, 503(a), (e) Before each shipment of any package, the following requirements apply:

- (i) The content of the package is in accordance with the specifications of design regarding the radionuclide, its form and physical or chemical state.
- (ii) All the relevant requirements of the Transport Regulations and applicable certificates of approval have been fulfilled.

- 502, 503(a), (e) (cont.) (iii) Provisions on lifting attachments are complied with.
(iv) For packages intended to be used for shipment after storage, it is required to take into account ageing mechanisms.
- 546 The transport documents with each consignment (consignment notes) are required to include all relevant particulars of the consignment.
- 547–553 The consignor is required to include a declaration in the transport documents.
- 554, 555 The consignor is required to provide a statement regarding actions to be taken by the carrier.
- 825(d), (e) Multilateral approval is required for radiation protection programmes for shipments by special use vessels, and for the shipment of SCO-III.
- 826 Competent authority authorization of transport without shipment approval.
- 827A Information to be included in an application for approval of shipment of SCO-III.
- 828 Shipment approval certificate (as applicable).

8. PROVISIONS CONCERNING
TRANSPORT OPERATIONS

8.1. Modal requirements

- 573 For transport by rail and by road: for consignments under exclusive use, the dose rate 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:

573
(cont.)

- (i) The vehicle is equipped with an enclosure that prevents unauthorized access during transport;
 - (ii) The package or overpack is secured to retain its position within the enclosure during routine transport;
 - (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.
- (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.

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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 dose rate greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with table 10 of the Transport Regulations, footnote (a), are not allowed to be transported except 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. 566 of the Transport Regulations relating to TI and dose rate provided that the conditions stated in para. 576 of the Transport Regulations are met.

579 For transport by air: packages or overpacks having a surface dose rate greater than 2 mSv/h are not allowed to be transported, except under special arrangement.

580, 581 Transport by post is not allowed.

8.2. Placarding

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

543, fig. 6 Large freight containers carrying unpackaged SCO-I or packages containing SCO are required to bear four placards in a vertical orientation on the two external side walls and the two external end walls. Any placards that do not relate to the contents are required to be removed.

543, figs 2–4, 6 As an alternative to the use of placards on large freight containers, enlarged labels are permitted.

544, figs 6, 7 Where the consignment in the freight container is unpackaged SCO-I only, 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 Transport Regulations against the white background, or on the placard shown in fig. 7 of the Transport Regulations. If the placard shown in fig. 7 of the Transport Regulations is used, it is required to be fixed immediately adjacent to each main placard.

545 Consignor’s responsibilities.

571, figs 2–4, 6 Requirements on the location of placards and the use of placards with reduced dimensions on a road or rail vehicle.

572, figs 6, 7 Where the consignment in or on a road or rail vehicle is unpackaged UN 2913 SCO-I or SCO-III 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 Transport Regulations against the white background or on the placard shown in fig. 7 of the Transport Regulations. If the placard shown in fig. 7 of the Transport Regulations is used, it is required to be fixed immediately adjacent to each main placard.

8.3. Stowage during transport, storage in transit and segregation

- 506, 562 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 562(a)–(d) and 506 of the Transport Regulations.
- 563 Category II-YELLOW or category III-YELLOW packages or overpacks are not allowed to be carried in compartments occupied by passengers, except for compartments reserved for specially authorized couriers.
- 564 Consignments are required to be securely stowed.
- 565 A package or overpack may be carried or stored among packaged general cargo, subject to certain conditions.
- 566(a), table 10 TI limits for freight containers and conveyances.
- 566(b) Limits on the dose rates from freight containers and vehicles. Different limits apply for exclusive use; see remarks on para. 573 of the Transport Regulations in 8.1 above.
- 567 Any package or overpack having a TI greater than 10 is required to be transported under exclusive use.

- 576 For a special use vessel, the storage arrangements are excepted from the requirements of para. 566 of the Transport Regulations provided that the conditions stated in para. 576 of the Transport 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 that are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport.

8.5. Decontamination

- 505 Freight containers, intermediate bulk containers, tanks, packagings and overpacks used for the transport of radioactive material are not allowed to be used for the storage or transport of other goods, unless decontaminated below the levels specified in the Transport Regulations.
- 512 Periodic checking of conveyances and equipment is required to determine the level of contamination.
- 513 Decontamination of conveyances and equipment, or parts thereof that have become contaminated, is required.

8.6. Other provisions

- 309 In the event of non-compliance with any limit in the Transport Regulations applicable to dose rate or contamination, 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.

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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

**Paragraph(s) of
the Transport
Regulations [1]****Subject**

1. GENERAL PROVISIONS

110, 507	Transport with other dangerous goods, and other dangerous properties of contents.
301–303	General provisions for radiation protection.
304, 305, 554(c)	Emergency response.
306	Management system.
311–315	Training.
504	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.
607–618	Design requirements for all packagings and packages.
619–621	Additional design requirements — air transport.
635–648	Design requirements for Type A packages.
649, 650	Additional design requirements for Type A packages containing liquids.
651	Additional design requirements for Type A packages containing gases.

- 801 The consignor is required to demonstrate on request that the package design complies with all applicable competent authority requirements.
- 819 Transitional arrangements for packages designed under the provisions of the 1985 or 1985 (As Amended 1990), 1996, 1996 (Revised), 1996 (As Amended 2003), 2005, 2009 and 2012 Editions of the Transport Regulations.
- 822 Transitional arrangement for packages excepted for fissile material under the 2009 Edition of the Transport Regulations.

2. CONTENTS LIMITS FOR PACKAGES

- 417 If the package contains fissile material, one of the fissile exceptions provided by para. 417 of the Transport Regulations is required to be applied.

Fissile material excepted under para. 417(f) is required to comply with para. 606 and requires multilateral approval as specified in para. 805.

- 429(b), 430 The quantity of radioactive material is not allowed to exceed the limits specified in paras 429(b) and 430 of the Transport Regulations.

When special form radioactive material and non-special form radioactive material are packed in the same Type A package, the quantity of radioactive material is not allowed to exceed the limits specified in para. 430 of the Transport Regulations. In that case, the schedule for UN 3332 is also applicable.

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 and conveyances is required to

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508, 509
(cont.) be kept as low as practicable and is not allowed to exceed the following limits, when averaged over 300 cm² of any part of the surface:

- (a) Beta, gamma and low toxicity alpha emitters, 4 Bq/cm²;
- (b) All other alpha emitters, 0.4 Bq/cm².

4. MAXIMUM DOSE RATES AND TRANSPORT INDEX (TI)

- 526–528
- (i) The dose rate 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.
 - (ii) The maximum dose rate 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.¹
 - (iii) The maximum dose rate 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

523, 524, 524A The TI is required to be derived in accordance with paras 523, 524 and 524A of the Transport Regulations.

529, table 8 Packages and overpacks are required to be assigned to category I-WHITE, category II-YELLOW or category III-YELLOW.

¹ Packages or overpacks having a surface dose rate greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel (see footnote to table 10 of the Transport 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 for dangerous goods.
- 531 Each package is required to be marked with an identification of either the consignor or the consignee, or both.
- 532, table 9 Packages are required to bear the mark “UN 2915” and the proper shipping name “RADIOACTIVE MATERIAL, TYPE A PACKAGE”.
- 533 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass on the outside of the packaging.
- 534(b) Each package is required to be marked with “TYPE A”.
- 534(c) Each package is required to be marked with the international vehicle registration code (VRI Code) of the country of origin of the 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.
- 531–534 All marks are required to be legible and durable, and are required to be on the outside of the packaging.
- 536A Any mark on the package made in accordance with paras 534(a) and (b) and 535(c) of the Transport Regulations that does not relate to the UN number and proper shipping name assigned to the consignment is required to be removed or covered.

538, figs 2–4 Each package, overpack and freight container is required to bear the appropriate labels.

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

539 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 marks specified in paras 531–536 of the Transport Regulations.

540(a), (b) Each label is required to be marked with the name(s) of the radionuclide(s) and the maximum activity of the contents. Paragraph 540(a) of the Transport Regulations also establishes requirements for labelling mixtures of radionuclides.

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

- (i) The radioactive contents;
- (ii) The maximum activity of the total radioactive contents during transport.

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

540(d) Each label is required to show the TI, except for category I-WHITE.

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

7. REQUIREMENTS BEFORE SHIPMENT

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

- 502, 503(a), (e) Before each shipment of any package, the following requirements apply:
- (i) The content of the package is in accordance with the specifications of design regarding the radionuclide, its form and physical or chemical state.
 - (ii) All the relevant requirements of the Transport Regulations and applicable certificates of approval have been fulfilled.
 - (iii) Provisions on lifting attachments are complied with.
 - (iv) For packages intended to be used for shipment after storage, it is required to take into account ageing mechanisms.
- 546 The transport documents with each consignment (consignment notes) are required to include all relevant particulars of the consignment.
- 547–553 The consignor is required to include a declaration in the transport documents.
- 554, 555 The consignor is required to provide a statement regarding actions to be taken by the carrier.
- 825(d) Multilateral approval is required for radiation protection programmes for shipments by special use vessels.
- 826 Competent authority authorization of transport without shipment approval.

8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

8.1. Modal requirements

- 573 For transport by rail and by road: for consignments under exclusive use, the dose rate is not allowed to exceed:

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(cont.)

- (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 that prevents unauthorized access during transport;
 - (ii) The package or overpack is secured to retain its position within the enclosure during routine transport;
 - (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.
- (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.

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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.

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For transport by vessels: packages or overpacks having a surface dose rate greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with table 10 of the Transport Regulations, footnote (a), are not allowed to be transported except 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. 566 of the Transport Regulations relating to TI and dose rate provided that the conditions stated in para. 576 of the Transport Regulations are met.
- 579 For transport by air: packages or overpacks having a surface dose rate greater than 2 mSv/h are not allowed to be transported, except under special arrangement.
- 580, 581 Transport by post is not allowed.

8.2. Placarding

- 507 Placards may be required for other dangerous properties of the contents.
- 543, 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. Any placards that do not relate to the contents are required to be removed.
- 543, figs 2–4, 6 As an alternative to the use of placards on large freight containers and tanks, enlarged labels are permitted.
- 544, figs 6, 7 Where an exclusive use consignment in a freight container 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 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 Transport Regulations against the white background, or on the placard shown in fig. 7 of the Transport Regulations. If the placard shown in fig. 7 of the Transport Regulations is used, it is required to be fixed immediately adjacent to each main placard.
- 545 Consignor’s responsibilities.

- 571, figs 2–4, 6 Requirements on the location of placards and the use of placards with reduced dimensions on a road or rail vehicle.
- 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 Transport Regulations against the white background or on the placard shown in fig. 7 of the Transport Regulations. If the placard shown in fig. 7 of the Transport Regulations is used, it is required to be fixed immediately adjacent to each main placard.

8.3. Stowage during transport, storage in transit and segregation

- 506, 562 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 562(a)–(d) and 506 of the Transport Regulations.
- 563 Category II-YELLOW or category III-YELLOW packages or overpacks are not allowed to be carried in compartments occupied by passengers, except for compartments reserved for specially authorized couriers.
- 564 Consignments are required to be securely stowed.
- 565 A package or overpack may be carried or stored among packaged general cargo, subject to certain conditions.
- 566(a), table 10 TI limits for freight containers and conveyances.
- 566(b) Limits on the dose rates from freight containers and vehicles. Different limits apply for exclusive use; see remarks on para. 573 of the Transport Regulations in 8.1 above.
- 567 Any package or overpack having a TI greater than 10 is required to be transported under exclusive use.

- 576 For a special use vessel, the storage arrangements are excepted from the requirements of para. 566 of the Transport Regulations provided that the conditions stated in para. 576 of the Transport 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 that are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport.

8.5. Decontamination

- 505 Freight containers, intermediate bulk containers, tanks, packagings and overpacks used for the transport of radioactive material are not allowed to be used for the storage or transport of other goods, unless decontaminated below the levels specified in the Transport Regulations.
- 512 Periodic checking of conveyances and equipment is required to determine the level of contamination.
- 513 Decontamination of conveyances and equipment, or parts thereof that have become contaminated, is required.

8.6. Other provisions

- 309 In the event of non-compliance with any limit in the Transport Regulations applicable to dose rate or contamination, 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.

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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

Paragraph(s) of the Transport Regulations [1]	Subject
<hr/>	
1. GENERAL PROVISIONS	
<hr/>	
110, 507	Transport with other dangerous goods, and other dangerous properties of contents.
301–303	General provisions for radiation protection.
304, 305, 554(c)	Emergency response.
306	Management system.
311–315	Training.
504	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.
561	Possession of package design approval certificates, and possession of instructions for the proper closing of the package and other preparations for shipment.
602–604	Design requirements for special form radioactive material.
605	Design requirements for low dispersible radioactive material.
607–618	Design requirements for all packagings and packages.
619–621	Additional design requirements — air transport.

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- 635–650 Design requirements for Type A packages (also apply to Type B(U) packages).
- 652–666 Design requirements for Type B(U) packages.
- 802(a),
803–806,
808–810 Special form radioactive material, low dispersible radioactive material, exception from fissile classification, as applicable, and package design — requirements for competent authority approval.
- 820 Transitional arrangements for packages approved under the 1985, 1985 (As Amended 1990), 1996, 1996 (Revised), 1996 (As Amended 2003), 2005, 2009 and 2012 Editions of the Transport Regulations.
- 822 Transitional arrangement for packages excepted for fissile material under the 2009 Edition of the Transport Regulations.
- 823 Transitional arrangements for special form radioactive material approved under the 1985, 1985 (As Amended 1990), 1996, 1996 (Revised), 1996 (As Amended 2003), 2005, 2009 and 2012 Editions of the Transport Regulations.
- 824 Packaging serial numbers — informing the competent authority.

2. CONTENTS LIMITS FOR PACKAGES

- 417 If the package contains fissile material, one of the fissile exceptions provided by para. 417 of the Transport Regulations is required to be applied.
- Fissile material excepted under para. 417(f) is required to comply with para. 606 and requires multilateral approval as specified in para. 805.
- 432 The quantity of radioactive material is not allowed to exceed the limits specified in para. 432 of the Transport Regulations.

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 and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over 300 cm² of any part of the surface:

- | | |
|--|--------------------------|
| (a) Beta, gamma and low toxicity alpha emitters, | 4 Bq/cm ² ; |
| (b) All other alpha emitters, | 0.4 Bq/cm ² . |

4. MAXIMUM DOSE RATES AND TRANSPORT INDEX (TI)

- 526–528
- (i) The dose rate 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.
 - (ii) The maximum dose rate 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.¹
 - (iii) The maximum dose rate at any point on any external surface of a package or overpack transported under exclusive use is not allowed to exceed 10 mSv/h.

¹ Packages or overpacks having a surface dose rate greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel (see footnote to table 10 of the Transport Regulations).

5. CATEGORIES OF PACKAGES AND OVERPACKS

- 523, 524, 524A The TI is required to be derived in accordance with paras 523, 524 and 524A of the Transport Regulations.
- 529, table 8 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 for dangerous goods.
- 531 Each package is required to be marked with an identification of either the consignor or the consignee, or both.
- 532, table 9 Packages are required to bear the mark “UN 2916” and the proper shipping name “RADIOACTIVE MATERIAL, TYPE B(U) PACKAGE”.
- 533 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass on the outside of the packaging.
- 535 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 that conforms to that design;
 - (c) “TYPE B(U)”.
- 531–533, 535 All marks are required to be legible and durable, and are required to be on the outside of the packaging.

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- 536, fig. 1 The outside of the outermost receptacle that is resistant to the effects of fire and water is required to be plainly marked by embossing or stamping, or by other means resistant to the effects of fire and water, with the trefoil symbol shown in fig. 1 of the Transport Regulations.
- 536A Any mark on the package made in accordance with paras 534(a) and (b) and 535(c) of the Transport Regulations that does not relate to the UN number and proper shipping name assigned to the consignment is required to be removed or covered.
- 538, figs 2–4 Each package, overpack and freight container is required to bear the appropriate labels.
- Any labels that do not relate to the contents are required to be removed or covered.
- 539 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 marks specified in paras 531–536 of the Transport Regulations.
- 540(a), (b) Each label is required to be marked with the name(s) of the radionuclide(s) and the maximum activity of the contents. Paragraph 540(a) of the Transport Regulations also establishes requirements for labelling mixtures of radionuclides.
- 540(c) Except for mixed loads, each label on a freight container or overpack is required to be marked with:
- (i) The radioactive contents;
- (ii) The maximum activity of the total radioactive contents during transport.
- For mixed loads, such entries may read “See Transport Documents”.

540(d) Each label is required to show the TI, except for category I-WHITE.

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

7. REQUIREMENTS BEFORE SHIPMENT

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

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

- (i) The content of the package is in accordance with the specifications of design regarding the radionuclide, its form and physical or chemical state.
- (ii) All the relevant requirements of the Transport Regulations and applicable certificates of approval have been fulfilled.
- (iii) Provisions on lifting attachments are complied with.
- (iv) 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.
- (v) 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 659 and 671 of the Transport Regulations were made.

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- 502,
503(a)–(c), (e)
(cont.) (vi) For packages intended to be used for shipment after storage, it is required to take into account ageing mechanisms.
- 546 The transport documents with each consignment (consignment notes) are required to include all relevant particulars of the consignment.
- 547–553 The consignor is required to include a declaration in the transport documents.
- 554, 555 The consignor is required to provide a statement regarding actions to be taken by the carrier.
- 556 The consignor is required to make competent authority certificates available to the carrier(s) before loading and unloading.
- 557 Delivery of the approval certificate before the first shipment of any package requiring competent authority approval to all competent authorities involved in the shipment, i.e. the competent authority of the country of origin and of each country through or into which the consignment is to be transported.
- 558(b) Consignor's notification to the competent authority of the country of origin of the shipment and of each country through or into which the consignment is to be transported for each shipment whose contents exceeds $3000A_1$ or $3000A_2$, as appropriate, or 1000 TBq, whichever is the lower.
- 559 Details of the notification referred to in para. 558 of the Transport Regulations.
- 825(d) Multilateral approval is required for radiation protection programmes for shipments by special use vessels.
- 826 Competent authority authorization of transport without shipment approval.

8. PROVISIONS CONCERNING
TRANSPORT OPERATIONS

8.1. Modal requirements

- 433 Type B(U) package contents limits for air transport.
- 573 For transport by rail and by road: for consignments under exclusive use, the dose rate 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 that prevents unauthorized access during transport;
 - (ii) The package or overpack is secured to retain its position within the enclosure during routine transport;
 - (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.
 - (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 dose rate greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with table 10 of the Transport Regulations, footnote (a), are not allowed to be transported except 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. 566 of the Transport Regulations relating to TI and dose rate provided that the conditions stated in para. 576 of the Transport Regulations are met.
- 579 For transport by air: packages or overpacks having a surface dose rate greater than 2 mSv/h are not allowed to be transported, except under special arrangement.
- 580, 581 Transport by post is not allowed.

8.2. Placarding

- 507 Placards may be required for other dangerous properties of the contents.
- 543, 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. Any placards that do not relate to the contents are required to be removed.
- 543, figs 2–4, 6 As an alternative to the use of placards on large freight containers and tanks, enlarged labels are permitted.

- 544, figs 6, 7 Where an exclusive use consignment in a freight container 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 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 Transport Regulations against the white background, or on the placard shown in fig. 7 of the Transport Regulations. If the placard shown in fig. 7 of the Transport Regulations is used, it is required to be fixed immediately adjacent to each main placard.
- 545 Consignor’s responsibilities.
- 571, figs 2–4, 6 Requirements on the location of placards and the use of placards with reduced dimensions on a road or rail vehicle.
- 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 Transport Regulations against the white background or on the placard shown in fig. 7 of the Transport Regulations. If the placard shown in fig. 7 of the Transport Regulations is used, it is required to be fixed immediately adjacent to each main placard.

8.3. Stowage during transport, storage in transit and segregation

- 506, 562 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 562(a)–(d) and 506 of the Transport Regulations.
- 563 Category II-YELLOW or category III-YELLOW packages or overpacks are not allowed to be carried in compartments occupied by passengers, except for compartments reserved for specially authorized couriers.

- 564 Consignments are required to be securely stowed.
- 565 A package or overpack may be carried or stored among packaged general cargo, subject to certain conditions.
- 566(a), table 10 TI limits for freight containers and conveyances.
- 566(b) Limits on the dose rates from freight containers and vehicles. Different limits apply for exclusive use; see remarks on para. 573 of the Transport Regulations in 8.1 above.
- 567 Any package or overpack having a TI greater than 10 is required to be transported under exclusive use.
- 576 For a special use vessel, the storage arrangements are excepted from the requirements of para. 566 of the Transport Regulations provided that the conditions stated in para. 576 of the Transport 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 that are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport.

8.5. Decontamination

- 505 Freight containers, intermediate bulk containers, tanks, packagings and overpacks used for the transport of radioactive material are not allowed to be used for the storage or transport of other goods, unless decontaminated below the levels specified in the Transport Regulations.
- 512 Periodic checking of conveyances and equipment is required to determine the level of contamination.

513 Decontamination of conveyances and equipment, or parts thereof that have become contaminated, is required.

8.6. Other provisions

309 In the event of non-compliance with any limit in the Transport Regulations applicable to dose rate or contamination, 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

Paragraph(s) of the Transport Regulations [1]	Subject
<hr/>	
1. GENERAL PROVISIONS	
<hr/>	
110, 507	Transport with other dangerous goods, and other dangerous properties of contents.
301–303	General provisions for radiation protection.
304, 305, 554(c)	Emergency response.
306	Management system.
311–315	Training.
504	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.
561	Possession of package design approval certificates, and possession of instructions for the proper closing of the package and other preparations for shipment.
602–604	Design requirements for special form radioactive material.
605	Design requirements for low dispersible radioactive material.
607–618	Design requirements for all packagings and packages.
619–621	Additional design requirements — air transport.

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- 635–648 Design requirements for Type A packages (also apply to Type B(M) packages).
- 649 Additional design requirements for packages containing liquids.
- 652–666 Design requirements for Type B(U) packages (also apply to Type B(M) packages).
- 667, 668 Design requirements for Type B(M) packages.
- 802(a), 803–806, 811–813 Special form radioactive material, low dispersible radioactive material, exception from fissile classification, as applicable, and package design — requirements for competent authority approval.
- 820 Transitional arrangements for packages approved under the 1985, 1985 (As Amended 1990), 1996, 1996 (Revised), 1996 (As Amended 2003), 2005, 2009 and 2012 Editions of the Transport Regulations.
- 822 Transitional arrangement for packages excepted for fissile material under the 2009 Edition of the Transport Regulations.
- 823 Transitional arrangements for special form radioactive material approved under the 1985, 1985 (As Amended 1990), 1996, 1996 (Revised), 1996 (As amended 2003), 2005, 2009 and 2012 Editions of the Transport Regulations.
- 824 Packaging serial numbers — informing the competent authority.

2. CONTENTS LIMITS FOR PACKAGES

- 417 If the package contains fissile material, one of the fissile exceptions provided by para. 417 of the Transport Regulations is required to be applied. Fissile material excepted under para. 417(f) is required to comply with para. 606 and requires multilateral approval as specified in para. 805.
- 432 The quantity of radioactive material is not allowed to exceed the limits specified in para. 432 of the Transport Regulations.

3. CONTAMINATION

508, 509	<p>Non-fixed contamination on the external surfaces of any package and on the external and internal surfaces of overpacks, freight 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 cm² of any part of the surface:</p> <p>(a) Beta, gamma and low toxicity alpha emitters, 4 Bq/cm²;</p> <p>(b) All other alpha emitters, 0.4 Bq/cm².</p>
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4. MAXIMUM DOSE RATES AND
TRANSPORT INDEX (TI)

526–528	<p>(i) The dose rate 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.</p> <p>(ii) The maximum dose rate 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.¹</p> <p>(iii) The maximum dose rate at any point on any external surface of a package or overpack transported under exclusive use is not allowed to exceed 10 mSv/h.</p>
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¹ Packages or overpacks having a surface dose rate greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel (see footnote to table 10 of the Transport Regulations).

5. CATEGORIES OF PACKAGES AND OVERPACKS

- 523, 524, 524A The TI is required to be derived in accordance with paras 523, 524 and 524A of the Transport Regulations.
- 529, table 8 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 for dangerous goods.
- 531 Each package is required to be marked with an identification of either the consignor or the consignee, or both.
- 532, table 9 Packages are required to bear the mark “UN 2917” and the proper shipping name “RADIOACTIVE MATERIAL, TYPE B(M) PACKAGE”.
- 533 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass on the outside of the packaging.
- 535 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 that conforms to that design;
 - (c) “TYPE B(M)”.
- 531–533, 535 All marks are required to be legible and durable, and are required to be on the outside of the packaging.

- 536, fig. 1 The outside of the outermost receptacle that is resistant to the effects of fire and water is required to be plainly marked by embossing or stamping, or by other means resistant to the effects of fire and water, with the trefoil symbol shown in fig. 1 of the Transport Regulations.
- 536A Any mark on the package made in accordance with paras 534(a) and (b) and 535(c) of the Transport Regulations that does not relate to the UN number and proper shipping name assigned to the consignment is required to be removed or covered.
- 538, figs 2–4 Each package, overpack and freight container is required to bear the appropriate labels.
- Any labels that do not relate to the contents are required to be removed or covered.
- 539 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 marks specified in paras 531–536 of the Transport Regulations.
- 540(a), (b) Each label is required to be marked with the name(s) of the radionuclide(s), and the maximum activity of the contents. Paragraph 540(a) of the Transport Regulations also establishes requirements for labelling mixtures of radionuclides.
- 540(c) Except for mixed loads, each label on a freight container or overpack is required to be marked with:
- (i) The radioactive contents;
- (ii) The maximum activity of the total radioactive contents during transport.
- For mixed loads, such entries may read “See Transport Documents”.
- 540(d) Each label is required to show the TI, except for category I-WHITE.

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

7. REQUIREMENTS BEFORE SHIPMENT

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

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

- (i) The content of the package is in accordance with the specifications of design regarding the radionuclide, its form and physical or chemical state.
- (ii) All the relevant requirements of the Transport Regulations and applicable certificates of approval have been fulfilled.
- (iii) Provisions on lifting attachments are complied with.
- (iv) 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.
- (v) 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 659 and 671 of the Transport Regulations were made.
- (vi) For packages intended to be used for shipment after storage, it is required to take into account ageing mechanisms.

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- 546 The transport documents with each consignment (consignment notes) are required to include all relevant particulars of the consignment.
- 547–553 The consignor is required to include a declaration in the transport documents.
- 554, 555 The consignor is required to provide a statement regarding actions to be taken by the carrier.
- 556 The consignor is required to make competent authority certificates available to the carrier(s) before loading and unloading.
- 557 Delivery of the approval certificate before the first shipment of any package requiring competent authority approval to all competent authorities involved in the shipment, i.e. the competent authority of the country of origin and of each country through or into which the consignment is to be transported.
- 558(c) Consignor's notification to the competent authority of the country of origin of the shipment and of each country through or into which the consignment is to be transported.
- 559 Details of the notification referred to in para. 558 of the Transport Regulations.
- 560 Separate notification is not required if the information has been included in the application for shipment approval (see para. 827 of the Transport Regulations).
- 825(a), (b), (d) Multilateral approval is required for shipments of certain Type B(M) packages, and for radiation protection programmes for shipments by special use vessels.
- 826 Competent authority authorization of transport without shipment approval.
- 827 Information to be included in an application for shipment approval.

828 Shipment approval certificate (as applicable).

8. PROVISIONS CONCERNING
TRANSPORT OPERATIONS

8.1. Modal requirements

433 Type B(M) package contents limits for air transport.

573 For transport by rail and by road: for consignments under exclusive use, the dose rate 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 that prevents unauthorized access during transport;
 - (ii) The package or overpack is secured to retain its position within the enclosure during routine transport;
 - (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.
- (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 dose rate greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with table 10 of the Transport Regulations, footnote (a), are not allowed to be transported except 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. 566 of the Transport Regulations relating to TI and dose rate provided that the conditions stated in para. 576 of the Transport Regulations are met.
- 577–579 Additional requirements relating to transport by air are established in paras 577–579 of the Transport Regulations.
- 580, 581 Transport by post is not allowed.

8.2. Placarding

- 507 Placards may be required for other dangerous properties of the contents.
- 543, 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. Any placards that do not relate to the contents are required to be removed.
- 543, figs 2–4, 6 As an alternative to the use of placards on large freight containers and tanks, enlarged labels are permitted.

- 544, figs 6, 7 Where an exclusive use consignment in a freight container 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 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 Transport Regulations against the white background, or on the placard shown in fig. 7 of the Transport Regulations. If the placard shown in fig. 7 of the Transport Regulations is used, it is required to be fixed immediately adjacent to each main placard.
- 545 Consignor’s responsibilities.
- 571, figs 2–4, 6 Requirements on the location of placards and the use of placards with reduced dimensions on a road or rail vehicle.
- 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 Transport Regulations against the white background or on the placard shown in fig. 7 of the Transport Regulations. If the placard shown in fig. 7 of the Transport Regulations is used, it is required to be fixed immediately adjacent to each main placard.

8.3. Stowage during transport, storage in transit and segregation

- 506, 562 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 562(a)–(d) and 506 of the Transport Regulations.
- 563 Category II-YELLOW or category III-YELLOW packages or overpacks are not allowed to be carried in compartments occupied by passengers, except for compartments reserved for specially authorized couriers.

- 564 Consignments are required to be securely stowed.
- 565 A package or overpack may be carried or stored among packaged general cargo, subject to certain conditions.
- 566(a), table 10 TI limits for freight containers and conveyances.
- 566(b) Limits on the dose rates from freight containers and vehicles. Different limits apply for exclusive use; see remarks on para. 573 of the Transport Regulations in 8.1 above.
- 567 Any package or overpack having a TI greater than 10 is required to be transported under exclusive use.
- 576 For a special use vessel, the storage arrangements are excepted from the requirements of para. 566 of the Transport Regulations provided that the conditions stated in para. 576 of the Transport 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 that are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport.

8.5. Decontamination

- 505 Freight containers, intermediate bulk containers, tanks, packagings and overpacks used for the transport of radioactive material are not allowed to be used for the storage or transport of other goods, unless decontaminated below the levels specified in the Transport Regulations.
- 512 Periodic checking of conveyances and equipment is required to determine the level of contamination.

513 Decontamination of conveyances and equipment, or parts thereof that have become contaminated, is required.

8.6. Other provisions

309 In the event of non-compliance with any limit in the Transport Regulations applicable to dose rate or contamination, 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 2919

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

Paragraph(s) of the Transport Regulations [1]	Subject
<hr/>	
1. GENERAL PROVISIONS	
<hr/>	
110, 507	Transport with other dangerous goods, and other dangerous properties of contents.
301–303	General provisions for radiation protection.
304, 305, 554(c)	Emergency response.
306	Management system.
310	Special arrangement.
311–315	Training.
504	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.
561	Possession of package design approval certificates, and possession of instructions for the proper closing of the package and other preparations for shipment.
602–604	Design requirements for special form radioactive material.
605	Design requirements for low dispersible radioactive material.
607–618	Design requirements for all packagings and packages.

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- 619–621 Additional design requirements — air transport.
- 635–648 Design requirements for Type A packages.
- 649, 650 Additional design requirements for packages containing liquids.
- 651 Additional design requirements for packages containing gases.
- 652–666 Design requirements for Type B(U) packages.
- 667, 668 Design requirements for Type B(M) packages.
- 669–672 Design requirements for Type C packages.
- 802(a), (b),
803–806,
807–813 Special form radioactive material, low dispersible radioactive material, exception from fissile classification, package design, as applicable, and special arrangements — requirements for competent authority approval.
- 820 Transitional arrangements for packages approved under the 1985, 1985 (As Amended 1990), 1996, 1996 (Revised), 1996 (As Amended 2003), 2005, 2009 and 2012 Editions of the Transport Regulations.
- 822 Transitional arrangement for packages excepted for fissile material under the 2009 Edition of the Transport Regulations.
- 823 Transitional arrangements for special form radioactive material approved under the 1985, 1985 (As Amended 1990), 1996, 1996 (Revised), 1996 (As Amended 2003), 2005, 2009 and 2012 Editions of the Transport Regulations.
- 824 Packaging serial numbers — informing the competent authority.

2. CONTENTS LIMITS FOR PACKAGES

- 417 If the package contains fissile material, one of the fissile exceptions provided by para. 417 of the Transport Regulations

417
(cont.) is required to be applied. Fissile material excepted under para. 417(f) is required to comply with para. 606 and requires multilateral approval as specified in para. 805.

836(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 and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over 300 cm² of any part of the surface:

- | | |
|--|--------------------------|
| (a) Beta, gamma and low toxicity alpha emitters, | 4 Bq/cm ² ; |
| (b) All other alpha emitters, | 0.4 Bq/cm ² . |

4. MAXIMUM DOSE RATES AND TRANSPORT INDEX (TI)

526–528 (i) The dose rate 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.

(ii) The maximum dose rate 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.¹

¹ Packages or overpacks having a surface dose rate greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel (see footnote to table 10 of the Transport Regulations).

- 526–528
(cont.)
- (iii) The maximum dose rate 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

- 523, 524, 524A
- The TI is required to be derived in accordance with paras 523, 524 and 524A of the Transport Regulations.
- 529
- A package, or an overpack containing packages, transported under special arrangement is required to be assigned to 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 for dangerous goods.
- 530, 532, table 9
- Except under certain provisions stated in para. 530 of the Transport Regulations, and except in case of uranium hexafluoride where the provisions in para. 419 of the Transport Regulations apply, packages are required to bear the mark “UN 2919” and the proper shipping name “RADIOACTIVE MATERIAL, TRANSPORTED UNDER SPECIAL ARRANGEMENT”.
- 531
- Each package is required to be marked with an identification of either the consignor or the consignee, or both.
- 533
- Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass on the outside of the packaging.

- 535 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 that conforms to that design;
 - (c) In the case of a Type B(U), Type B(M) or a Type C package design, with “TYPE B(U)”, “TYPE B(M)” or “TYPE C”.
- 531–533, 535 All marks are required to be legible and durable, and are required to be on the outside of the packaging.
- 536, fig. 1 For Type B(U), Type B(M) and Type C packages, the outside of the outermost receptacle that is resistant to the effects of fire and water is required to be plainly marked by embossing or stamping, or by other means resistant to the effects of fire and water, with the trefoil symbol shown in fig. 1 of the Transport Regulations.
- 536A Any mark on the package made in accordance with paras 534(a) and (b) and 535(c) of the Transport Regulations that does not relate to the UN number and proper shipping name assigned to the consignment is required to be removed or covered.
- 538, figs 2–4 Each package, overpack and freight container is required to bear the appropriate labels.
- Any labels that do not relate to the contents are required to be removed or covered.
- 539 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 marks specified in paras 531–536 of the Transport Regulations.

540(a), (b) Each label is required to be marked with the name(s) of the radionuclide(s), and the maximum activity of the contents. Paragraph 540(a) of the Transport Regulations also establishes requirements for labelling mixtures of radionuclides.

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

- (i) The radioactive contents;
- (ii) The maximum activity of the total radioactive contents during transport.

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

540(d) Each label is required to show the TI.

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

7. REQUIREMENTS BEFORE SHIPMENT

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

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

- (i) The content of the package is in accordance with the specifications of design regarding the radionuclide, its form and physical or chemical state.
- (ii) All the relevant requirements of the Transport Regulations and applicable certificates of approval have been fulfilled.
- (iii) Provisions on lifting attachments are complied with.

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502,
503(a)–(c), (e)
(cont.)

- (iv) 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.
- (v) 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 Transport Regulations were made.
- (vi) For packages intended to be used for shipment after storage, it is required to take into account ageing mechanisms.

546

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

547–553

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

554, 555

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

556

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

558(d)

Consignor's notification to the competent authority of the country of origin of the shipment and of each country through or into which the consignment is to be transported.

- 559 Details of the notification referred to in para. 558 of the Transport Regulations.
- 560 Separate notification is not required if the information has been included in the application for shipment approval.
- 825(d) Multilateral approval is required for radiation protection programmes for shipments by special use vessels.
- 826 Competent authority authorization of transport without shipment approval.
- 829–831 Shipments under special arrangement — requirements for competent authority approval.
- 831 Shipment under special arrangement approval certificate.

8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

8.1. Modal requirements

- 573 For transport by rail and by road: for consignments under exclusive use, the dose rate 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 that prevents unauthorized access during transport;
 - (ii) The package or overpack is secured to retain its position within the enclosure during routine transport;
 - (iii) There are no loading or unloading operations between the beginning and the end of the shipment.

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- 573
(cont.)
- (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.
 - (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 dose rate greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with table 10 of the Transport Regulations, footnote (a), are not allowed to be transported except 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. 566 of the Transport Regulations relating to TI and dose rate provided that the conditions stated in para. 576 of the Transport Regulations are met.
- 577–579
- Additional requirements relating to transport by air are established in paras 577–579 of the Transport Regulations.
- 580, 581
- Transport by post is not allowed.

8.2. Placarding

- 507 Placards may be required for other dangerous properties of the contents.
- 543, 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. Any placards that do not relate to the contents are required to be removed.
- 543, figs 2–4, 6 As an alternative to the use of placards on large freight containers and tanks, enlarged labels are permitted.
- 544, figs 6, 7 Where an exclusive use consignment in a freight container is a UN 2919 Special Arrangement only, 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 Transport Regulations against the white background, or on the placard shown in fig. 7 of the Transport Regulations. If the placard shown in fig. 7 of the Transport Regulations is used, it is required to be fixed immediately adjacent to each main placard.
- 545 Consignor’s responsibilities.
- 571, figs 2–4, 6 Requirements on the location of placards and the use of placards with reduced dimensions on a road or rail vehicle.
- 572, figs 6, 7 Where an exclusive use consignment in or on a road or rail vehicle is a UN 2919 Special Arrangement only, 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 Transport Regulations against the white background or on the placard shown in fig. 7 of the Transport Regulations. If the placard shown in fig. 7 of the Transport Regulations is used, it is required to be fixed immediately adjacent to each main placard.

8.3. Stowage during transport, storage in transit and segregation

- 506, 562 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 562(a)–(d) and 506 of the Transport Regulations.
- 563 Category II-YELLOW or category III-YELLOW packages or overpacks are not allowed to be carried in compartments occupied by passengers, except for compartments reserved for specially authorized couriers.
- 564 Consignments are required to be securely stowed.
- 565 A package or overpack may be carried or stored among packaged general cargo, subject to certain conditions.
- 566(a), table 10 TI limits for freight containers and conveyances.
- 566(b) Limits on the dose rates from freight containers and vehicles. Different limits apply for exclusive use; see remarks on para. 573 of the Transport Regulations in 8.1 above.
- 567 Any package or overpack having a TI greater than 10 is required to be transported under exclusive use.
- 576 For a special use vessel, the storage arrangements are excepted from the requirements of para. 566 of the Transport Regulations provided that the conditions stated in para. 576 of the Transport 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 that are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport.

8.5. Decontamination

- 505 Freight containers, intermediate bulk containers, tanks, packagings and overpacks used for the transport of radioactive material are not allowed to be used for the storage or transport of other goods, unless decontaminated below the levels specified in the Transport Regulations.
- 512 Periodic checking of conveyances and equipment is required to determine the level of contamination.
- 513 Decontamination of conveyances and equipment, or parts thereof that have become contaminated, is required.

8.6. Other provisions

- 309 In the event of non-compliance with any limit in the Transport Regulations applicable to dose rate or contamination, 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 2977

RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE, FISSILE

Paragraph(s) of the Transport Regulations [1]	Subject
<hr/>	
1. GENERAL PROVISIONS	
<hr/>	
110, 507	Transport with other dangerous goods, and other dangerous properties of contents. Uranium hexafluoride has toxic and corrosive properties (Class 8), and these are required to be taken into account during transport.
301–303	General provisions for radiation protection.
304, 305, 554(c)	Emergency response.
306	Management system.
311–315	Training.
419(a)	Classification as uranium hexafluoride, fissile.
504	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.
561	Possession of package design approval certificates, and possession of instructions for the proper closing of the package and other preparations for shipment.
607–618	Design requirements for all packagings and packages.
619–621	Additional design requirements — air transport.

624–626, 635, 652, 667, 669	Uranium hexafluoride, fissile, is required to be transported, as appropriate, in: <ul style="list-style-type: none"> (i) Industrial packages of Type IP-2 or Type IP-3, as applicable (paras 624–626); (ii) Type A packages (paras 635–651); (iii) Type B(U) packages (paras 652–664, 666); (iv) Type B(M) packages (paras 667–668); (v) Type C packages (paras 669–672).
631–634	Requirements for packages designed to transport 0.1 kg or more of uranium hexafluoride.
673–685	Additional design requirements for packages containing fissile material.
802(a), 807–816	Package design (including package designs to contain fissile material) — requirements for competent authority approval (as applicable).
820	Transitional arrangements for packages approved under the 1985, 1985 (As Amended 1990), 1996, 1996 (Revised), 1996 (As Amended 2003), 2005, 2009 and 2012 Editions of the Transport Regulations.
824	Packaging serial numbers — informing the competent authority.

2. CONTENTS LIMITS FOR PACKAGES

417, 418	Classification and contents limits for fissile material.
420	Contents limits for a package containing uranium hexafluoride.
421	The quantity of uranium hexafluoride is not allowed to exceed the relevant limits specified in the Transport Regulations for each type of package (see below).

- 429, 430 Activity limits for a Type A package.
- 432 The quantity of radioactive material is not allowed to exceed the limits specified in para. 432 of the Transport Regulations.
- 522 The activity limits for conveyances carrying LSA are stated in table 6 of the Transport Regulations.

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 and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over 300 cm² of any part of the surface:

- (a) Beta, gamma and low toxicity alpha emitters, 4 Bq/cm²;
- (b) All other alpha emitters, 0.4 Bq/cm².

4. MAXIMUM DOSE RATES, TRANSPORT INDEX (TI) AND CRITICALITY SAFETY INDEX (CSI)

- 526–528
- (i) The dose rate for a package or overpack is required to be such that the transport index (TI) of the package or overpack does not exceed 10. The criticality safety index (CSI) is not allowed to exceed 50, except when transported under exclusive use.
 - (ii) The maximum dose rate 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.¹

¹ Packages or overpacks having a surface dose rate greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel (see footnote to table 10 of the Transport Regulations).

- 526–528
(cont.) (iii) The maximum dose rate 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

- 521, table 5 LSA material is required to be packaged in accordance with table 5 of the Transport Regulations.
- 523, 524, 524A The TI is required to be derived in accordance with paras 523, 524 and 524A of the Transport Regulations.
- 525, 686 Determination of the CSI for packages containing fissile material, and for overpacks and freight containers.
- 529, table 8 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 for dangerous goods. For uranium hexafluoride, Class 8 labels are required because of its corrosive properties.
- 531 Each package is required to be marked with an identification of either the consignor or the consignee, or both.
- 532, table 9 Packages are required to bear the mark “UN 2977” and the proper shipping name “RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE, FISSILE”.
- 533 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass on the outside of the packaging.

- 534 Each package that conforms to:
- (i) An IP-2 or an IP-3 design is required to be marked with “TYPE IP-2” or “TYPE IP-3” as appropriate;
 - (ii) A Type A package design is required to be marked with “TYPE A”;
 - (iii) 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 the 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.
- 535 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 that conforms to that design;
 - (c) In the case of a Type B(U), Type B(M) or a Type C package design, with “TYPE B(U)”, “TYPE B(M)” or TYPE C”.
- 531–535 All marks are required to be legible and durable, and are required to be on the outside of the packaging.
- 536, fig. 1 For Type B(U), Type B(M) and Type C packages, the outside of the outermost receptacle that is resistant to the effects of fire and water is required to be plainly marked by embossing or stamping, or by other means resistant to the effects of fire and water, with the trefoil symbol shown in fig. 1 of the Transport Regulations.
- 536A Any mark on the package made in accordance with paras 534(a) and (b) and 535(c) of the Transport Regulations that does not relate to the UN number and proper shipping name assigned to the consignment is required to be removed or covered.

538, 541, 542,
figs 2–5

Each package, overpack and freight container is required to bear the appropriate labels.

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

539

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 marks specified in paras 531–536 of the Transport Regulations.

540(a), (b)

Each label is required to be marked with the name(s) of the radionuclide(s), and the maximum activity of the contents. The mass of fissile nuclides may be used instead of the activity.

540(c)

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

- (i) The radioactive contents;
- (ii) The maximum activity of the total radioactive contents during transport.

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

540(d)

Each label is required to show the TI, except for category I-WHITE.

545

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

7. REQUIREMENTS BEFORE SHIPMENT

501

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

502, 503

Before each shipment of any package, the following requirements apply:

- (i) The content of the package is in accordance with the specifications of design regarding the radionuclide, its form and physical or chemical state.
- (ii) All the relevant requirements of the Transport Regulations and applicable certificates of approval have been fulfilled.
- (iii) Provisions on lifting attachments are complied with.
- (iv) 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.
- (v) 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 659 and 671 of the Transport Regulations were made.
- (vi) For packages containing fissile material, the measurement specified in para. 677(b) of the Transport Regulations and the tests to demonstrate closure of each package as specified in para. 680 of the Transport Regulations are required to be performed where applicable.
- (vii) For packages intended to be used for shipment after storage, it is required to take into account ageing mechanisms.

- 546 The transport documents with each consignment (consignment notes) are required to include all relevant particulars of the consignment.
- 547–553 The consignor is required to include a declaration in the transport documents.
- 554, 555 The consignor is required to provide a statement regarding actions to be taken by the carrier.
- 556 The consignor is required to make competent authority certificates available to the carrier(s) before loading and unloading.
- 557 Delivery of the approval certificate before the first shipment of any package requiring competent authority approval to all competent authorities involved in the shipment, i.e. the competent authority of the country of origin and of each country through or into which the consignment is to be transported.
- 558 Consignor's notification to the competent authority of the country of origin of the shipment and of each country through or into which the consignment is to be transported, for shipments specified in para. 558 (a)–(d).
- 559 Details of the notification referred to in para. 558 of the Transport Regulations.
- 560 Separate notification is not required if the information has been included in the application for shipment approval.
- 825(a), (b) Multilateral approval is required for shipments of certain Type B(M) packages.
- 825(c) Multilateral approval is required for shipments where the sum of the CSIs of the packages in a single freight container or in a single conveyance is greater than 50.
- 825(d) Multilateral approval is required for radiation protection programmes for shipments by special use vessels.

- 826 Competent authority authorization of transport without shipment approval.
- 827 Information to be included in an application for shipment approval.
- 828 Shipment approval certificate (as applicable).

8. PROVISIONS CONCERNING
TRANSPORT OPERATIONS

8.1. Modal requirements

- 433 Type B package contents limits for air transport.
- 573 For transport by rail and by road: for consignments under exclusive use, the dose rate 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 that prevents unauthorized access during transport;
 - (ii) The package or overpack is secured to retain its position within the enclosure during routine transport;
 - (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.

- 573
(cont.) (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 dose rate greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with table 10 of the Transport Regulations, footnote (a), are not allowed to be transported except under special arrangement.
- 576 For transport by vessels: the transport of consignments by means of a special use vessel is exempted from the requirements of para. 566 of the Transport Regulations relating to TI, CSI and dose rate provided that the conditions stated in para. 576 of the Transport Regulations are met.
- 577–579 Additional requirements relating to transport by air are established in paras 577–579 of the Transport Regulations.
- 580, 581 Transport by post is not allowed.

8.2. Placarding

- 507 Class 8 placards are also required because of the corrosive properties of the contents.
- 543, 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. Any placards that do not relate to the contents are required to be removed.
- 543, figs 2–6 As an alternative to the use of placards on large freight containers and tanks, enlarged labels are permitted.

544, figs 6, 7 Where an exclusive use consignment in a freight container is UN 2977 packaged fissile uranium hexafluoride only, 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 Transport Regulations against the white background, or on the placards shown in fig. 7 of the Transport Regulations. If the placard shown in fig. 7 of the Transport Regulations is used, it is required to be fixed immediately adjacent to each main placard.

545 Consignor’s responsibilities.

571, figs 2–6 Requirements on the location of placards and the use of placards with reduced dimensions on a road or rail vehicle.

572, figs 6, 7 Where an exclusive use consignment in or on a road or rail vehicle is UN 2977 packaged fissile uranium hexafluoride only, 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 Transport Regulations against the white background or on the placard shown in fig. 7 of the Transport Regulations. If the placard shown in fig. 7 of the Transport Regulations is used, it is required to be fixed immediately adjacent to each main placard.

8.3. Stowage during transport, storage in transit and segregation

506, 562 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 562(a)–(d) and 506 of the Transport Regulations.

563 Category II-YELLOW or category III-YELLOW packages or overpacks are not allowed to be carried in compartments occupied by passengers, except for compartments reserved for specially authorized couriers.

- 564 Consignments are required to be securely stowed.
- 565 A package or overpack may be carried or stored among packaged general cargo, subject to certain conditions.
- 566(a), table 10 TI limits for freight containers and conveyances.
- 566(b) Limits on the dose rates from freight containers and vehicles. Different limits apply for exclusive use; see remarks on para. 573 of the Transport Regulations in 8.1 above.
- 566(c), table 11 CSI limits for freight containers and conveyances.
- 567 Any package or overpack having a TI greater than 10, or any consignment having a CSI greater than 50, is required to be transported under exclusive use.
- 568,
569, table 11 Segregation of packages containing fissile material during transport and during storage in transit.
- 576 For a special use vessel, the storage arrangements are excepted from the requirements of para. 566 of the Transport Regulations provided that the conditions stated in para. 576 of the Transport 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 that are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport.

8.5. Decontamination

- 505 Freight containers, intermediate bulk containers, tanks, packagings and overpacks used for the transport of radioactive

- 505 material are not allowed to be used for the storage or
(cont.) transport of other goods, unless decontaminated below the
levels specified in the Transport Regulations.
- 512 Periodic checking of conveyances and equipment is required
to determine the level of contamination.
- 513 Decontamination of conveyances and equipment, or parts
thereof that have become contaminated, is required.

8.6. Other provisions

- 309 In the event of non-compliance with any limit in
the Transport Regulations applicable to dose rate or
contamination, 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.
- 668 Intermittent venting of Type B(M) packages may be
permitted during transport under certain conditions.

SCHEDULE FOR UN 2978

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

**Paragraph(s) of
the Transport
Regulations [1]**

Subject

1. GENERAL PROVISIONS

110, 507	Transport with other dangerous goods, and other dangerous properties of contents. 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, 554(c)	Emergency response.
306	Management system.
311–315	Training.
419(b)	Classification as uranium hexafluoride, non-fissile or fissile-excepted.
504	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.
561	Possession of package design approval certificates, and possession of instructions for the proper closing of the package and other preparations for shipment.
607–618	Design requirements for all packagings and packages.

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619–621	Additional design requirements — air transport.
623–626, 635, 652, 667, 669	Uranium hexafluoride is required to be transported, as appropriate, in: <ul style="list-style-type: none">(a) Industrial packages of Type IP-1, Type IP-2 or Type IP-3, as applicable (paras 623–626);(b) Type A packages (paras 635–648);(c) Type B(U) packages (paras 652–664, 666);(d) Type B(M) packages (paras 667, 668);(e) Type C packages (paras 669–672).
631–634	Requirements for packages designed to transport 0.1 kg or more of uranium hexafluoride.
636	Minimum dimensions of a package containing fissile-excepted material.
801	The consignor is required to demonstrate on request that the package design complies with all applicable competent authority requirements.
802(a), 807–813	Package design — requirements for competent authority approval (as applicable).
820	Transitional arrangements for packages approved under the 1985, 1985 (As Amended 1990), 1996, 1996 (Revised), 1996 (As Amended 2003), 2005, 2009 and 2012 Editions of the Transport Regulations.
822	Transitional arrangement for packages excepted for fissile material under the 2009 Edition of the Transport Regulations.
824	Packaging serial numbers — informing the competent authority.

2. CONTENTS LIMITS FOR PACKAGES

- 417 If the package contains fissile material, one of the fissile exceptions provided by para. 417 of the Transport Regulations is required to be applied.
- Fissile material excepted under para. 417(f) is required to comply with para. 606 and requires multilateral approval as specified in para. 805.
- 420 Contents limits for a package containing uranium hexafluoride.
- 421 The quantity of uranium hexafluoride is not allowed to exceed the relevant limits specified in the Transport Regulations for each type of package (see below).
- 429, 430 Activity limits for a Type A package.
- 432 The quantity of radioactive material is not allowed to exceed the limits specified in para. 432 of the Transport Regulations.
- 522 The activity limits for conveyances carrying LSA are stated in table 6 of the Transport Regulations.

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 and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over 300 cm² of any part of the surface:
- | | | |
|-----|--|--------------------------|
| (a) | Beta, gamma and low toxicity alpha emitters, | 4 Bq/cm ² ; |
| (b) | All other alpha emitters, | 0.4 Bq/cm ² . |

4. MAXIMUM DOSE RATES AND TRANSPORT INDEX (TI)

- 526–528
- (i) The dose rate 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.
 - (ii) The maximum dose rate 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.¹
 - (iii) The maximum dose rate 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

- 521, table 5 LSA material is required to be packaged in accordance with table 5 of the Transport Regulations.
- 523, 524, 524A The TI is required to be derived in accordance with paras 523, 524 and 524A of the Transport Regulations.
- 529, table 8 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

¹ Packages or overpacks having a surface dose rate greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel (see footnote to table 10 of the Transport Regulations).

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- 507
(cont.) transport regulations for dangerous goods. For uranium hexafluoride, Class 8 labels are required because of its corrosive properties.
- 531 Each package is required to be marked with an identification of either the consignor or the consignee, or both.
- 532, table 9 Packages are required to bear the mark “UN 2978” and for packages, other than excepted packages, the proper shipping name “RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE”.
- 533 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass on the outside of the packaging.
- 534 Each package that 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”;
 - (c) 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 the 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.
- 535 Each package is required to be marked with:
- (a) The identification mark allocated to that design by the competent authority;

- 535
(cont.)
- (b) A serial number to uniquely identify each packaging that conforms to that design;
 - (c) In the case of a Type B(U), Type B(M) or Type C package design, with “TYPE B(U)”, “TYPE B(M)” or “TYPE C”.
- 531–535
- All marks are required to be legible and durable, and are required to be on the outside of the packaging.
- 536, fig. 1
- The outside of the outermost receptacle that is resistant to the effects of fire and water is required to be plainly marked by embossing or stamping, or by other means resistant to the effects of fire and water, with the trefoil symbol shown in fig. 1 of the Transport Regulations.
- 536A
- Any mark on the package made in accordance with paras 534(a) and (b) and 535(c) of the Transport Regulations that does not relate to the UN number and proper shipping name assigned to the consignment is required to be removed or covered.
- 538, figs 2–4
- Each package, overpack and freight container is required to bear the appropriate labels.
- Any labels that do not relate to the contents are required to be removed or covered.
- 539
- 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 marks specified in paras 531–536 of the Transport Regulations.
- 540(a), (b)
- Each label is required to be marked with the name(s) of the radionuclide(s) and the maximum activity of the contents. The mass of fissile nuclides may be used instead of the activity.

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

- (i) The radioactive contents;
- (ii) The maximum activity of the total radioactive contents during transport.

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

540(d) Each label is required to show the TI, except for category I-WHITE.

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

7. REQUIREMENTS BEFORE SHIPMENT

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

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

- (i) The content of the package is in accordance with the specifications of design regarding the radionuclide, its form and physical or chemical state.
- (ii) All the relevant requirements of the Transport Regulations and applicable certificates of approval have been fulfilled.
- (iii) Provisions on lifting attachments are complied with.

502,
503(a)–(c), (e)
(cont.)

- (iv) 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.
- (v) 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 659 and 671 of the Transport Regulations were made.
- (vi) For packages intended to be used for shipment after storage, it is required to take into account ageing mechanisms.

546

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

547–553

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

554, 555

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

556

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

557

Delivery of the approval certificate before the first shipment of any package requiring competent authority approval to all competent authorities involved in the shipment, i.e. the competent authority of the country of origin and of each country through or into which the consignment is to be transported.

- 558 Consignor's notification to the competent authority of the country of origin of the shipment and of each country through or into which the consignment is to be transported, for shipments specified in subparagraphs (a)–(d).
- 559 Details of the notification referred to in para. 558 of the Transport Regulations.
- 560 Separate notification is not required if the information has been included in the application for shipment approval (see para. 827 of the Transport Regulations).
- 825(d) Multilateral approval is required for radiation protection programmes for shipments by special use vessels.
- 826 Competent authority authorization of transport without shipment approval.
- 827 Information to be included in an application for shipment approval.
- 828 Shipment approval certificate (as applicable).

8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

8.1. Modal requirements

- 433 Type B package contents limits for air transport.
- 573 For transport by rail and by road: for consignments under exclusive use, the dose rate 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 that prevents unauthorized access during transport;

- 573
(cont.)
- (ii) The package or overpack is secured to retain its position within the enclosure during routine transport;
 - (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.
- (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 dose rate greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with table 10 of the Transport Regulations, footnote (a), are not allowed to be transported except 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. 566 of the Transport Regulations relating to TI and dose rate provided that the conditions stated in para. 576 of the Transport Regulations are met.
- 577–579 Additional requirements relating to transport by air are established in paras 577–579 of the Transport Regulations.

580, 581 Transport by post is not allowed.

8.2. Placarding

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

543, 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. Any placards that do not relate to the contents are required to be removed.

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

544, figs 6, 7 Where an exclusive use consignment in a freight container 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 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 Transport Regulations against the white background, or on the placards shown in fig. 7 of the Transport Regulations. If the placard shown in fig. 7 of the Transport Regulations is used, it is required to be fixed immediately adjacent to each main placard.

545 Consignor’s responsibilities.

571, figs 2–4, fig. 6 Requirements on the location of placards and the use of placards with reduced dimensions on a road or rail vehicle.

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

572, figs 6, 7
(cont.) high, either in the lower half of the placard shown in fig. 6 of the Transport Regulations against the white background or on the placard shown in fig. 7 of the Transport Regulations. If the placard shown in fig. 7 of the Transport Regulations is used, it is required to be fixed immediately adjacent to each main placard.

8.3. Stowage during transport, storage in transit and segregation

506, 562 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 562(a)–(d) and 506 of the Transport Regulations.

563 Category II-YELLOW or category III-YELLOW packages or overpacks are not allowed to be carried in compartments occupied by passengers, except for compartments reserved for specially authorized couriers.

564 Consignments are required to be securely stowed.

565 A package or overpack may be carried or stored among packaged general cargo, subject to certain conditions.

566(a), table 10 TI limits for freight containers and conveyances.

566(b) Limits on the dose rates from freight containers and vehicles. Different limits apply for exclusive use; see remarks on para. 573 of the Transport Regulations in 8.1 above.

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

576 For a special use vessel, the storage arrangements are excepted from the requirements of para. 566 of the Transport Regulations provided that the conditions stated in para. 576 of the Transport 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 that are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport.

8.5. Decontamination

- 505 Freight containers, intermediate bulk containers, tanks, packagings and overpacks used for the transport of radioactive material are not allowed to be used for the storage or transport of other goods, unless decontaminated below the levels specified in the Transport Regulations.
- 512 Periodic checking of conveyances and equipment is required to determine the level of contamination.
- 513 Decontamination of conveyances and equipment, or parts thereof that have become contaminated, is required.

8.6. Other provisions

- 309 In the event of non-compliance with any limit in the Transport Regulations applicable to dose rate or contamination, 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

Paragraph(s) of the Transport Regulations [1]	Subject
<hr/>	
1. GENERAL PROVISIONS	
<hr/>	
110, 507	Transport with other dangerous goods, and other dangerous properties of contents.
301–303	General provisions for radiation protection.
304, 305, 554(c)	Emergency response.
306	Management system.
311–315	Training.
504	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.
607–618	Design requirements for all packagings and packages.
619–621	Additional design requirements — air transport.
624	Design requirements for Type IP-2 packages.
625	Design requirements for Type IP-3 packages (LSA-II material, liquids and gases, not under exclusive use).
626–630	Alternative design requirements for Type IP-2 and Type IP-3 packages.

- 801 The consignor is required to demonstrate on request that the package design complies with all applicable competent authority requirements.
- 819 Transitional arrangements for packages designed under the provisions of the 1985 or 1985 (As Amended 1990), 1996, 1996 (Revised), 1996 (As Amended 2003), 2005, 2009 and 2012 Editions of the Transport Regulations.
- 822 Transitional arrangement for packages excepted for fissile material under the 2009 Edition of the Transport Regulations.

2. CONTENTS LIMITS FOR PACKAGES

- 409(b) LSA-II activity concentration and activity limits.
- 411, 517 The contents are required to be restricted such that the dose rates specified in para. 517 of the Transport Regulations will not be exceeded (see 4 below).
- 417 If the package contains fissile material, one of the fissile exceptions provided by para. 417 of the Transport Regulations is required to be applied.
- Fissile material excepted under para. 417(f) is required to comply with para. 606 and requires multilateral approval as specified in para. 805.
- 522 The activity limits for conveyances carrying LSA-II are stated in table 6 of the Transport Regulations.

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 and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over 300 cm² of any part of the surface:

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508, 509 (cont.)	(a) Beta, gamma and low toxicity alpha emitters,	4 Bq/cm ² ;
	(b) All other alpha emitters,	0.4 Bq/cm ² .

4. MAXIMUM DOSE RATES AND
TRANSPORT INDEX (TI)

517	The dose rate at 3 m from the unshielded material is not allowed to exceed 10 mSv/h.
526–528	(i) The dose rate 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.
	(ii) The maximum dose rate 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. ¹
	(iii) The maximum dose rate 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

521, table 5	LSA material is required to be packaged in accordance with table 5 of the Transport Regulations.
523, 524, 524A	The TI is required to be derived in accordance with paras 523, 524 and 524A of the Transport Regulations.

¹ Packages or overpacks having a surface dose rate greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel (see footnote to table 10 of the Transport Regulations).

529, table 8 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 for dangerous goods.

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

532, table 9 Packages are required to bear the mark “UN 3321” and the proper shipping name “RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-II)”.

533 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass on the outside of the packaging.

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

534(c) Each package that 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 the 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.

531–534 All marks are required to be legible and durable, and are required to be on the outside of the packaging.

- 536A Any mark on the package made in accordance with paras 534(a) and (b) and 535(c) of the Transport Regulations that does not relate to the UN number and proper shipping name assigned to the consignment is required to be removed or covered.
- 538, figs 2–4 Each package, overpack and freight container is required to bear the appropriate labels.
- Any labels that do not relate to the contents are required to be removed or covered.
- 539 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 marks specified in paras 531–536 of the Transport Regulations.
- 540(a), (b) Each label is required to be marked with the name(s) of the radionuclide(s), followed by “LSA-II”, and the maximum activity of the contents. Paragraph 540(a) of the Transport Regulations also establishes requirements for labelling mixtures of radionuclides.
- 540(c) Except for mixed loads, each label on a freight container or overpack is required to be marked with:
- (i) The radioactive contents;
 - (ii) The maximum activity of the total radioactive contents during transport.
- For mixed loads, such entries may read “See Transport Documents”.
- 540(d) Each label is required to show the TI, except for category I-WHITE.
- 545 It is the consignor’s responsibility to comply with the requirements of marking and labelling.

7. REQUIREMENTS BEFORE SHIPMENT

- 501(a) Before the first shipment of any package for which the design pressure exceeds 35 kPa, confirmation that the containment system conforms to the approved design is required.
- 502, 503(a), (e) Before each shipment of any package, the following requirements apply:
- (i) The content of the package is in accordance with the specifications of design regarding the radionuclide, its form and physical or chemical state.
 - (ii) All the relevant requirements of the Transport Regulations and applicable certificates of approval have been fulfilled.
 - (iii) Provisions on lifting attachments are complied with.
 - (iv) For packages intended to be used for shipment after storage, it is required to take into account ageing mechanisms.
- 546 The transport documents with each consignment (consignment notes) are required to include all relevant particulars of the consignment.
- 547–553 The consignor is required to include a declaration in the transport documents.
- 554, 555 The consignor is required to provide a statement regarding actions to be taken by the carrier.
- 825(d) Multilateral approval is required for radiation protection programmes for shipments by special use vessels.
- 826 Competent authority authorization of transport without shipment approval.

8. PROVISIONS CONCERNING
TRANSPORT OPERATIONS

8.1. Modal requirements

- 410 LSA-II material activity limit for air transport.
- 573 For transport by rail and by road: for consignments under exclusive use, the dose rate 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 that prevents unauthorized access during transport;
 - (ii) The package or overpack is secured to retain its position within the enclosure during routine transport;
 - (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.
 - (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 dose rate greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with table 10 of the Transport Regulations, footnote (a), are not allowed to be transported except 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. 566 of the Transport Regulations relating to TI and dose rate provided that the conditions stated in para. 576 of the Transport Regulations are met.
- 579 For transport by air: packages or overpacks having a surface dose rate greater than 2 mSv/h are not allowed to be transported, except under special arrangement.
- 580, 581 Transport by post is not allowed.

8.2. Placarding

- 507 Placards may be required for other dangerous properties of the contents.
- 543, 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. Any placards that do not relate to the contents are required to be removed.
- 543, figs 2–4, 6 As an alternative to the use of placards on large freight containers and tanks, enlarged labels are permitted.

- 544, figs 6, 7 Where an exclusive use consignment in a freight container 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 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 Transport Regulations against the white background, or on the placard shown in fig. 7 of the Transport Regulations. If the placard shown in fig. 7 of the Transport Regulations is used, it is required to be fixed immediately adjacent to each main placard.
- 545 Consignor’s responsibilities.
- 571, figs 2–4, 6 Requirements on the location of placards and the use of placards with reduced dimensions on a road or rail vehicle.
- 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 Transport Regulations against the white background or on the placard shown in fig. 7 of the Transport Regulations. If the placard shown in fig. 7 of the Transport Regulations is used, it is required to be fixed immediately adjacent to each main placard.

8.3. Stowage during transport, storage in transit and segregation

- 506, 562 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 562(a)–(d) and 506 of the Transport Regulations.
- 563 Category II-YELLOW or category III-YELLOW packages or overpacks are not allowed to be carried in compartments occupied by passengers, except for compartments reserved for specially authorized couriers.

- 564 Consignments are required to be securely stowed.
- 565 A package or overpack may be carried or stored among packaged general cargo, subject to certain conditions.
- 566(a), table 10 TI limits for freight containers and conveyances.
- 566(b) Limits on the dose rates from freight containers and vehicles. Different limits apply for exclusive use; see remarks on para. 573 of the Transport Regulations in 8.1 above.
- 567 Any package or overpack having a TI greater than 10 is required to be transported under exclusive use.
- 576 For a special use vessel, the storage arrangements are excepted from the requirements of para. 566 of the Transport Regulations provided that the conditions stated in para. 576 of the Transport 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 that are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport.

8.5. Decontamination

- 505 Freight containers, intermediate bulk containers, tanks, packagings and overpacks used for the transport of radioactive material are not allowed to be used for the storage or transport of other goods, unless decontaminated below the levels specified in the Transport Regulations.
- 512 Periodic checking of conveyances and equipment is required to determine the level of contamination.

513 Decontamination of conveyances and equipment, or parts thereof that have become contaminated, is required.

8.6. Other provisions

309 In the event of non-compliance with any limit in the Transport Regulations applicable to dose rate or contamination, 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

Paragraph(s) of the Transport Regulations [1]	Subject
<hr/>	
1. GENERAL PROVISIONS	
<hr/>	
110, 507	Transport with other dangerous goods, and other dangerous properties of contents.
301–303	General provisions for radiation protection.
304, 305, 554(c)	Emergency response.
306	Management system.
311–315	Training.
504	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.
607–618	Design requirements for all packagings and packages.
619–621	Additional design requirements — air transport.
624	Design requirements for Type IP-2 packages (LSA-III material, under exclusive use).
625	Design requirements for Type IP-3 packages (LSA-III material, not under exclusive use).

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- 626, 627, 629, 630 Alternative design requirements for Type IP-2 and Type IP-3 packages.
- 801 The consignor is required to demonstrate on request that the package design complies with all applicable competent authority requirements.
- 819 Transitional arrangements for packages designed under the provisions of the 1985 or 1985 (As Amended 1990), 1996, 1996 (Revised), 1996 (As Amended 2003), 2005, 2009 and 2012 Editions of the Transport Regulations.
- 822 Transitional arrangement for packages excepted for fissile material under the 2009 Edition of the Transport Regulations.

2. CONTENTS LIMITS FOR PACKAGES

- 409(c) LSA-III activity concentration and activity limits.
- 411, 517 The contents are required to be restricted such that the dose rates specified in para. 517 of the Transport Regulations will not be exceeded (see 4 below).
- 417 If the package contains fissile material, one of the fissile exceptions provided by para. 417 of the Transport Regulations is required to be applied.
- Fissile material excepted under para. 417(f) is required to comply with para. 606 and requires multilateral approval as specified in para. 805.
- 522 The activity limits for conveyances carrying LSA-III are stated in table 6 of the Transport Regulations.

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 and conveyances is required to

508, 509
(cont.) be kept as low as practicable and is not allowed to exceed the following limits, when averaged over 300 cm² of any part of the surface:

- (a) Beta, gamma and low toxicity alpha emitters, 4 Bq/cm²;
- (b) All other alpha emitters, 0.4 Bq/cm².

4. MAXIMUM DOSE RATES AND
TRANSPORT INDEX (TI)

517 The dose rate at 3 m from the unshielded material is not allowed to exceed 10 mSv/h.

526–528 (i) The dose rate 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.

(ii) The maximum dose rate 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.¹

(iii) The maximum dose rate 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

521, table 5 LSA material is required to be packaged in accordance with table 5 of the Transport Regulations.

¹ Packages or overpacks having a surface dose rate greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel (see footnote to table 10 of the Transport Regulations).

- 523, 524, 524A The TI is required to be derived in accordance with paras 523, 524 and 524A of the Transport Regulations.
- 529, table 8 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 for dangerous goods.
- 531 Each package is required to be marked with an identification of either the consignor or the consignee, or both.
- 532, table 9 Packages are required to bear the mark “UN 3322” and the proper shipping name “RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-III)”.
- 533 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass on the outside of the packaging.
- 534(a) Each package that conforms to an IP-2 or IP-3 design is required to be marked with “TYPE IP-2” or “TYPE IP-3” as appropriate.
- 534(c) Each package that 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 the 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.
- 531–534 All marks are required to be legible and durable, and are required to be on the outside of the packaging.

- 536A Any mark on the package made in accordance with paras 534(a) and (b) and 535(c) of the Transport Regulations that does not relate to the UN number and proper shipping name assigned to the consignment is required to be removed or covered.
- 538, figs 2–4 Each package, overpack and freight container is required to bear the appropriate labels.
- Any labels that do not relate to the contents are required to be removed or covered.
- 539 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 marks specified in paras 531–536 of the Transport Regulations.
- 540(a), (b) Each label is required to be marked with the name(s) of the radionuclide(s), followed by “LSA-III”, and the maximum activity of the contents. Paragraph 540(a) of the Transport Regulations also establishes requirements for labelling mixtures of radionuclides.
- 540(c) Except for mixed loads, each label on a freight container or overpack is required to be marked with:
- (i) The radioactive contents;
 - (ii) The maximum activity of the total radioactive contents during transport.
- For mixed loads, such entries may read “See Transport Documents”.
- 540(d) Each label is required to show the TI, except for category I-WHITE.
- 545 It is the consignor’s responsibility to comply with the requirements of marking and labelling.

7. REQUIREMENTS BEFORE SHIPMENT

- 501(a) Before the first shipment of any package for which the design pressure exceeds 35 kPa, confirmation that the containment system conforms to the approved design is required.
- 502, 503(a), (e) Before each shipment of any package, the following requirements apply:
- (i) The content of the package is in accordance with the specifications of design regarding the radionuclide, its form and physical or chemical state.
 - (ii) All the relevant requirements of the Transport Regulations and applicable certificates of approval have been fulfilled.
 - (iii) Provisions on lifting attachments are complied with.
 - (iv) For packages intended to be used for shipment after storage, it is required to take into account ageing mechanisms.
- 546 The transport documents with each consignment (consignment notes) are required to include all relevant particulars of the consignment.
- 547–553 The consignor is required to include a declaration in the transport documents.
- 554, 555 The consignor is required to provide a statement regarding actions to be taken by the carrier.
- 825(d) Multilateral approval is required for radiation protection programmes for shipments by special use vessels.
- 826 Competent authority authorization of transport without shipment approval.

8. PROVISIONS CONCERNING
TRANSPORT OPERATIONS

8.1. Modal requirements

- 410 LSA-III material activity limit for air transport.
- 573 For transport by rail and by road: for consignments under exclusive use, the dose rate 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 that prevents unauthorized access during transport;
 - (ii) The package or overpack is secured to retain its position within the enclosure during routine transport;
 - (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.
 - (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 dose rate greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with table 10 of the Transport Regulations, footnote (a), are not allowed to be transported except 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. 566 of the Transport Regulations relating to TI and dose rate provided that the conditions stated in para. 576 of the Transport Regulations are met.
- 579 For transport by air: packages or overpacks having a surface dose rate greater than 2 mSv/h are not allowed to be transported, except under special arrangement.
- 580, 581 Transport by post is not allowed.

8.2. Placarding

- 507 Placards may be required for other dangerous properties of the contents.
- 543, 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. Any placards that do not relate to the contents are required to be removed.
- 543, figs 2–4, 6 As an alternative to the use of placards on large freight containers and tanks, enlarged labels are permitted.

- 544, figs 6, 7 Where an exclusive use consignment in a freight container 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 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 Transport Regulations against the white background, or on the placard shown in fig. 7 of the Transport Regulations. If the placard shown in fig. 7 of the Transport Regulations is used, it is required to be fixed immediately adjacent to each main placard.
- 545 Consignor’s responsibilities.
- 571, figs 2–4, 6 Requirements on the location of placards and the use of placards with reduced dimensions on a road or rail vehicle.
- 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 Transport Regulations against the white background or on the placard shown in fig. 7 of the Transport Regulations. If the placard shown in fig. 7 of the Transport Regulations is used, it is required to be fixed immediately adjacent to each main placard.

8.3. Stowage during transport, storage in transit and segregation

- 506, 562 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 562(a)–(d) and 506 of the Transport Regulations.
- 563 Category II-YELLOW or category III-YELLOW packages or overpacks are not allowed to be carried in compartments occupied by passengers, except for compartments reserved for specially authorized couriers.

- 564 Consignments are required to be securely stowed.
- 565 A package or overpack may be carried or stored among packaged general cargo, subject to certain conditions.
- 566(a), table 10 TI limits for freight containers and conveyances.
- 566(b) Limits on the dose rates from freight containers and vehicles. Different limits apply for exclusive use; see remarks on para. 573 of the Transport Regulations in 8.1 above.
- 567 Any package or overpack having a TI greater than 10 is required to be transported under exclusive use.
- 576 For a special use vessel, the storage arrangements are excepted from the requirements of para. 566 of the Transport Regulations provided that the conditions stated in para. 576 of the Transport 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 that are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport.

8.5. Decontamination

- 505 Freight containers, intermediate bulk containers, tanks, packagings and overpacks used for the transport of radioactive material are not allowed to be used for the storage or transport of other goods, unless decontaminated below the levels specified in the Transport Regulations.
- 512 Periodic checking of conveyances and equipment is required to determine the level of contamination.

513 Decontamination of conveyances and equipment, or parts thereof that have become contaminated, is required.

8.6. Other provisions

309 In the event of non-compliance with any limit in the Transport Regulations applicable to dose rate or contamination, 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

**Paragraph(s) of
the Transport
Regulations [1]**

Subject

1. GENERAL PROVISIONS

110, 507	Transport with other dangerous goods, and other dangerous properties of contents.
301–303	General provisions for radiation protection.
304, 305, 554(c)	Emergency response.
306	Management system.
311–315	Training.
504	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.
561	Possession of package design approval certificates, and possession of instructions for the proper closing of the package and other preparations for shipment.
602–604	Design requirements for special form radioactive material.
607–618	Design requirements for all packagings and packages.
619–621	Additional design requirements — air transport.

- 636–649 Design requirements for Type A packages (also apply to Type C packages).
- 653–657, 661–666 Design requirements for Type B(U) packages (also apply to Type C packages).
- 670–672 Design requirements for Type C packages.
- 802(a), 803–806, 808–810 Special form radioactive material, exception from fissile classification, as applicable, and package design — requirements for competent authority approval.
- 820 Transitional arrangements for packages approved under the 1985, 1985 (As Amended 1990), 1996, 1996 (Revised), 1996 (As Amended 2003), 2005, 2009 and 2012 Editions of the Transport Regulations.
- 822 Transitional arrangement for packages excepted for fissile material under the 2009 Edition of the Transport Regulations.
- 823 Transitional arrangements for special form radioactive material approved under the 1985, 1985 (As Amended 1990), 1996, 1996 (Revised), 1996 (As Amended 2003), 2005, 2009 and 2012 Editions of the Transport Regulations.
- 824 Packaging serial numbers — informing the competent authority.

2. CONTENTS LIMITS FOR PACKAGES

- 417 If the package contains fissile material, one of the fissile exceptions provided by para. 417 of the Transport Regulations is required to be applied.
- Fissile material excepted under para. 417(f) is required to comply with para. 606 and requires multilateral approval as specified in para. 805.
- 432 The quantity of radioactive material is not allowed to exceed the limits specified in para. 432 of the Transport Regulations.

 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 and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over 300 cm² of any part of the surface:

- | | |
|--|--------------------------|
| (a) Beta, gamma and low toxicity alpha emitters, | 4 Bq/cm ² ; |
| (b) All other alpha emitters, | 0.4 Bq/cm ² . |

 4. MAXIMUM DOSE RATES AND
 TRANSPORT INDEX (TI)

- 526–528 (i) The dose rate 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.
- (ii) The maximum dose rate 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.¹
- (iii) The maximum dose rate at any point on any external surface of a package or overpack transported under exclusive use is not allowed to exceed 10 mSv/h.

¹ Packages or overpacks having a surface dose rate greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel (see footnote to table 10 of the Transport Regulations).

5. CATEGORIES OF PACKAGES AND OVERPACKS

- 523, 524, 524A The TI is required to be derived in accordance with paras 523, 524 and 524A of the Transport Regulations.
- 529, table 8 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 for dangerous goods.
- 531 Each package is required to be marked with an identification of either the consignor or the consignee, or both.
- 532, table 9 Packages are required to bear the mark “UN 3323” and the proper shipping name “RADIOACTIVE MATERIAL, TYPE C PACKAGE”.
- 533 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass on the outside of the packaging.
- 535 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 that conforms to that design;
 - (c) “TYPE C”.
- 531–533, 535 All marks are required to be legible and durable, and are required to be on the outside of the packaging.

- 536, fig. 1 The outside of the outermost receptacle that is resistant to the effects of fire and water is required to be plainly marked by embossing or stamping, or by other means resistant to the effects of fire and water, with the trefoil symbol shown in fig. 1 of the Transport Regulations.
- 536A Any mark on the package made in accordance with paras 534(a) and (b) and 535(c) of the Transport Regulations that does not relate to the UN number and proper shipping name assigned to the consignment is required to be removed or covered.
- 538, figs 2–4 Each package, overpack and freight container is required to bear the appropriate labels.
- Any labels that do not relate to the contents are required to be removed or covered.
- 539 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 marks specified in paras 531–536 of the Transport Regulations.
- 540(a), (b) Each label is required to be marked with the name(s) of the radionuclide(s) and the maximum activity of the contents. Paragraph 540(a) of the Transport Regulations also establishes requirements for labelling mixtures of radionuclides.
- 540(c) Except for mixed loads, each label on a freight container or overpack is required to be marked with:
- (i) The radioactive contents;
 - (ii) The maximum activity of the total radioactive contents during transport.
- For mixed loads, such entries may read “See Transport Documents”.

540(d) Each label is required to show the TI, except for category I-WHITE.

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

7. REQUIREMENTS BEFORE SHIPMENT

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

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

- (i) The content of the package is in accordance with the specifications of design regarding the radionuclide, its form and physical or chemical state.
- (ii) All the relevant requirements of the Transport Regulations and applicable certificates of approval have been fulfilled.
- (iii) Provisions on lifting attachments are complied with.
- (iv) For packages intended to be used for shipment after storage, it is required to take into account ageing mechanisms.
- (v) 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.

- 502,
503(a)–(c), (e)
(cont.)
- (vi) 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 659 and 671 of the Transport Regulations were made.
- (vii) For packages intended to be used for shipment after storage, it is required to take into account ageing mechanisms.
- 546
- The transport documents with each consignment (consignment notes) are required to include all relevant particulars of the consignment.
- 547–553
- The consignor is required to include a declaration in the transport documents.
- 554, 555
- The consignor is required to provide a statement regarding actions to be taken by the carrier.
- 556
- The consignor is required to make competent authority certificates available to the carrier(s) before loading and unloading.
- 557
- Delivery of the approval certificate before the first shipment of any package requiring competent authority approval to all competent authorities involved in the shipment, i.e. the competent authority of the country of origin and of each country through or into which the consignment is to be transported.
- 558(a)
- Consignor's notification to the competent authority of the country of origin of the shipment and of each country through or into which the consignment is to be transported for each shipment whose contents exceeds $3000A_1$ or $3000A_2$, as appropriate, or 1000 TBq, whichever is the lower.

- 559 Details of the notification referred to in para. 558 of the Transport Regulations.
- 825(d) Multilateral approval is required for radiation protection programmes for shipments by special use vessels.
- 826 Competent authority authorization of transport without shipment approval.

8. PROVISIONS CONCERNING
TRANSPORT OPERATIONS

8.1. Modal requirements

- 573 For transport by rail and by road: for consignments under exclusive use, the dose rate 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 that prevents unauthorized access during transport;
 - (ii) The package or overpack is secured to retain its position within the enclosure during routine transport;
 - (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.

- 573
(cont.) (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 dose rate greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with table 10 of the Transport Regulations, footnote (a), are not allowed to be transported except 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. 566 of the Transport Regulations relating to TI and dose rate provided that the conditions stated in para. 576 of the Transport Regulations are met.
- 579 For transport by air: packages or overpacks having a surface dose rate greater than 2 mSv/h are not allowed to be transported, except under special arrangement.
- 580, 581 Transport by post is not allowed.

8.2. Placarding

- 507 Placards may be required for other dangerous properties of the contents.
- 543, 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. Any placards that do not relate to the contents are required to be removed.

- 543, figs 2–4, 6 As an alternative to the use of placards on large freight containers, enlarged labels are permitted.
- 544, figs 6, 7 Where an exclusive use consignment in a freight container 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 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 Transport Regulations against the white background, or on the placard shown in fig. 7 of the Transport Regulations. If the placard shown in fig. 7 of the Transport Regulations is used, it is required to be fixed immediately adjacent to each main placard.
- 545 Consignor’s responsibilities.
- 571, figs 2–4, 6 Requirements on the location of placards and the use of placards with reduced dimensions on a road or rail vehicle.
- 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 Transport Regulations against the white background or on the placard shown in fig. 7 of the Transport Regulations. If the placard shown in fig. 7 of the Transport Regulations is used, it is required to be fixed immediately adjacent to each main placard.

8.3. Stowage during transport, storage in transit and segregation

- 506, 562 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 562(a)–(d) and 506 of the Transport Regulations.

- 563 Category II-YELLOW or category III-YELLOW packages or overpacks are not allowed to be carried in compartments occupied by passengers, except for compartments reserved for specially authorized couriers.
- 564 Consignments are required to be securely stowed.
- 565 A package or overpack may be carried or stored among packaged general cargo, subject to certain conditions.
- 566(a), table 10 TI limits for freight containers and conveyances.
- 566(b) Limits on the dose rates from freight containers and vehicles. Different limits apply for exclusive use; see remarks on para. 573 of the Transport Regulations in 8.1 above.
- 567 Any package or overpack having a TI greater than 10 is required to be transported under exclusive use.
- 576 For a special use vessel, the storage arrangements are excepted from the requirements of para. 566 of the Transport Regulations provided that the conditions stated in para. 576 of the Transport 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 that are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport.

8.5. Decontamination

- 505 Freight containers, intermediate bulk containers, tanks, packagings and overpacks used for the transport of radioactive material are not allowed to be used for the storage

- 505
(cont.) or transport of other goods, unless decontaminated below the levels specified in the Transport Regulations.
- 512 Periodic checking of conveyances and equipment is required to determine the level of contamination.
- 513 Decontamination of conveyances and equipment, or parts thereof that have become contaminated, is required.

8.6. Other provisions

- 309 In the event of non-compliance with any limit in the Transport Regulations applicable to dose rate or contamination, 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

Paragraph(s) of the Transport Regulations [1]	Subject
<hr/>	
1. GENERAL PROVISIONS	
<hr/>	
110, 507	Transport with other dangerous goods, and other dangerous properties of contents.
301–303	General provisions for radiation protection.
304, 305, 554(c)	Emergency response.
306	Management system.
311–315	Training.
504	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.
561	Possession of package design approval certificates, and possession of instructions for the proper closing of the package and other preparations for shipment.
607–618	Design requirements for all packagings and packages.
619–621	Additional design requirements — air transport.
624	Design requirements for Type IP-2 packages.

- 625 Design requirements for Type IP-3 packages (LSA-II material, liquids and gases, not under exclusive use).
- 626–630 Alternative design requirements for Type IP-2 and Type IP-3 packages.
- 673–685 Additional design requirements for packages containing fissile material.
- 802(a), 814–816 Package designs to contain fissile material — requirements for competent authority approval.
- 820 Transitional arrangements for packages approved under the 1985, 1985 (As Amended 1990), 1996, 1996 (Revised), 1996 (As Amended 2003), 2005, 2009 and 2012 Editions of the Transport Regulations.
- 824 Packaging serial numbers — informing the competent authority.

2. CONTENTS LIMITS FOR PACKAGES

- 409(b) LSA-II activity concentration and activity limits.
- 411, 517 The contents are required to be restricted such that the dose rates specified in para. 517 of the Transport Regulations will not be exceeded (see 4 below).
- 417, 418 Classification and contents limits for fissile material.

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 and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over 300 cm² of any part of the surface:

Schedule for UN 3324

508, 509 (cont.)	(a) Beta, gamma and low toxicity alpha emitters,	4 Bq/cm ² ;
	(b) All other alpha emitters,	0.4 Bq/cm ² .

4. MAXIMUM DOSE RATES, TRANSPORT INDEX (TI)
AND CRITICALITY SAFETY INDEX (CSI)

517 The dose rate at 3 m from the unshielded material is not allowed to exceed 10 mSv/h.

526–528 (i) The dose rate for a package or overpack is required to be such that the transport index (TI) of the package or overpack does not exceed 10. The criticality safety index (CSI) is not allowed to exceed 50, except when transported under exclusive use.

(ii) The maximum dose rate 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.¹

(iii) The maximum dose rate 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

521, table 5 LSA material is required to be packaged in accordance with table 5 of the Transport Regulations.

523, 524, 524A The TI is required to be derived in accordance with paras 523, 524 and 524A of the Transport Regulations.

¹ Packages or overpacks having a surface dose rate greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel (see footnote to table 10 of the Transport Regulations).

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- 525, 686 Determination of the CSI for packages containing fissile material, and for overpacks and freight containers.
- 529, table 8 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 for dangerous goods.
- 531 Each package is required to be marked with an identification of either the consignor or the consignee, or both.
- 532, table 9 Packages are required to bear the mark “UN 3324” and the proper shipping name “RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-II), FISSILE”.
- 533 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass on the outside of the packaging.
- 534(a) Each package that conforms to an IP-2 or IP-3 design is required to be marked with “TYPE IP-2” or “TYPE IP-3” as appropriate.
- 534(c) Each package that 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 the 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.

- 535 Each package that conforms to a competent authority approved design 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 that conforms to that design.
- 531–535 All marks are required to be legible and durable, and are required to be on the outside of the packaging.
- 536A Any mark on the package made in accordance with paras 534(a) and (b) and 535(c) of the Transport Regulations that does not relate to the UN number and proper shipping name assigned to the consignment is required to be removed or covered.
- 538, 541, 542,
figs 2–5 Each package, overpack and freight container is required to bear the appropriate labels.
- Any labels that do not relate to the contents are required to be removed or covered.
- 539 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 marks specified in paras 531–536 of the Transport Regulations.
- 540(a), (b) Each label is required to be marked with the name(s) of the radionuclide(s), followed by “LSA-II”, and the maximum activity of the contents. The mass of fissile nuclides may be used instead of the activity. Paragraph 540(a) of the Transport Regulations also establishes requirements for labelling mixtures of radionuclides.

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

- (i) The radioactive contents;
- (ii) The maximum activity of the total radioactive contents during transport.

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

540(d) Each label is required to show the TI, except for category I-WHITE.

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

7. REQUIREMENTS BEFORE SHIPMENT

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

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

- (i) The content of the package is in accordance with the specifications of design regarding the radionuclide, its form and physical or chemical state.
- (ii) All the relevant requirements of the Transport Regulations and applicable certificates of approval have been fulfilled.
- (iii) Provisions on lifting attachments are complied with.

Schedule for UN 3324

- 502,
503(a), (d), (e)
(cont.)
- (iv) For packages containing fissile material, the measurement specified in para. 677(b) of the Transport Regulations and the tests to demonstrate closure of each package as specified in para. 680 of the Transport Regulations are required to be performed where applicable.
- (v) For packages intended to be used for shipment after storage, it is required to take into account ageing mechanisms.
- 546
- The transport documents with each consignment (consignment notes) are required to include all relevant particulars of the consignment.
- 547–553
- The consignor is required to include a declaration in the transport documents.
- 554, 555
- The consignor is required to provide a statement regarding actions to be taken by the carrier.
- 556
- The consignor is required to make competent authority certificates available to the carrier(s) before loading and unloading.
- 557
- Delivery of the approval certificate before the first shipment of any package requiring competent authority approval to all competent authorities involved in the shipment, i.e. the competent authority of the country of origin and of each country through or into which the consignment is to be transported.
- 825(c)
- Multilateral approval is required for shipments where the sum of the CSIs of the packages in a single freight container or in a single conveyance is greater than 50.
- 825(d)
- Multilateral approval is required for radiation protection programmes for shipments by special use vessels.

- 826 Competent authority authorization of transport without shipment approval.
- 827 Information to be included in an application for shipment approval.
- 828 Shipment approval certificate (as applicable).

8. PROVISIONS CONCERNING
TRANSPORT OPERATIONS

8.1. Modal requirements

- 410 LSA-II material activity limit for air transport.
- 573 For transport by rail and by road: for consignments under exclusive use, the dose rate 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 that prevents unauthorized access during transport;
 - (ii) The package or overpack is secured to retain its position within the enclosure during routine transport;
 - (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.

- 573
(cont.) (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 dose rate greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with table 10 of the Transport Regulations, footnote (a), are not allowed to be transported except under special arrangement.
- 576 For transport by vessels: the transport of consignments by means of a special use vessel is exempted from the requirements of para. 566 of the Transport Regulations relating to TI, CSI and dose rate provided that the conditions stated in para. 576 of the Transport Regulations are met.
- 579 For transport by air: packages or overpacks having a surface dose rate greater than 2 mSv/h are not allowed to be transported, except under special arrangement.
- 580, 581 Transport by post is not allowed.

8.2. Placarding

- 507 Placards may be required for other dangerous properties of the contents.
- 543, 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. Any placards that do not relate to the contents are required to be removed.

- 543, figs 2–6 As an alternative to the use of placards on large freight containers and tanks, enlarged labels are permitted.
- 544, figs 6, 7 Where an exclusive use consignment in a freight container 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 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 Transport Regulations against the white background, or on the placard shown in fig. 7 of the Transport Regulations. If the placard shown in fig. 7 of the Transport Regulations is used, it is required to be fixed immediately adjacent to each main placard.
- 545 Consignor’s responsibilities.
- 571, figs 2–6 Requirements on the location of placards and the use of placards with reduced dimensions on a road or rail vehicle.
- 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 Transport Regulations against the white background or on the placard shown in fig. 7 of the Transport Regulations. If the placard shown in fig. 7 of the Transport Regulations is used, it is required to be fixed immediately adjacent to each main placard.

8.3. Stowage during transport, storage in transit and segregation

- 506, 562 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 562(a)–(d) and 506 of the Transport Regulations.

- 563 Category II-YELLOW or category III-YELLOW packages or overpacks are not allowed to be carried in compartments occupied by passengers, except for compartments reserved for specially authorized couriers.
- 564 Consignments are required to be securely stowed.
- 565 A package or overpack may be carried or stored among packaged general cargo, subject to certain conditions.
- 566(a),
table 10 TI limits for freight containers and conveyances.
- 566(b) Limits on the dose rates from freight containers and vehicles. Different limits apply for exclusive use; see remarks on para. 573 of the Transport Regulations in 8.1 above.
- 566(c),
table 11 CSI limits for freight containers and conveyances.
- 567 Any package or overpack having a TI greater than 10 is required to be transported under exclusive use.
- 568, 569,
table 11 Segregation of packages containing fissile material during transport and during storage in transit.
- 576 For a special use vessel, the storage arrangements are excepted from the requirements of para. 566 of the Transport Regulations provided that the conditions stated in para. 576 of the Transport 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 that are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport.

8.5. Decontamination

- 505 Freight containers, intermediate bulk containers, tanks, packagings and overpacks used for the transport of radioactive material are not allowed to be used for the storage or transport of other goods, unless decontaminated below the levels specified in the Transport Regulations.
- 512 Periodic checking of conveyances and equipment is required to determine the level of contamination.
- 513 Decontamination of conveyances and equipment, or parts thereof that have become contaminated, is required.

8.6. Other provisions

- 309 In the event of non-compliance with any limit in the Transport Regulations applicable to dose rate or contamination, 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

Paragraph(s) of the Transport Regulations [1]	Subject
<hr/>	
1. GENERAL PROVISIONS	
<hr/>	
110, 507	Transport with other dangerous goods, and other dangerous properties of contents.
301–303	General provisions for radiation protection.
304, 305, 554(c)	Emergency response.
306	Management system.
311–315	Training.
504	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.
561	Possession of package design approval certificates, and possession of instructions for the proper closing of the package and other preparations for shipment.
607–618	Design requirements for all packagings and packages.
619–621	Additional design requirements — air transport.
624	Design requirements for Type IP-2 packages (LSA-III material, under exclusive use).

- 625 Design requirements for Type IP-3 packages (LSA-III material, not under exclusive use).
- 626, 627, 629, 630 Alternative design requirements for Type IP-2 and Type IP-3 packages.
- 673–685 Additional design requirements for packages containing fissile material.
- 802(a), 814–816 Package designs to contain fissile material — requirements for competent authority approval.
- 820 Transitional arrangements for packages approved under the 1985, 1985 (As Amended 1990), 1996, 1996 (Revised), 1996 (As Amended 2003), 2005, 2009 and 2012 Editions of the Transport Regulations.
- 824 Packaging serial numbers — informing the competent authority.

2. CONTENTS LIMITS FOR PACKAGES

- 409(c) LSA-III activity concentration and activity limits.
- 411, 517 The contents are required to be restricted such that the dose rates specified in para. 517 of the Transport Regulations will not be exceeded (see 4 below).
- 417, 418 Classification and contents limits for fissile material.

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 and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over 300 cm² of any part of the surface:

Schedule for UN 3325

508, 509 (cont.)	(a) Beta, gamma and low toxicity alpha emitters,	4 Bq/cm ² ;
	(b) All other alpha emitters,	0.4 Bq/cm ² .

4. MAXIMUM DOSE RATES, TRANSPORT INDEX (TI)
AND CRITICALITY SAFETY INDEX (CSI)

517	The dose rate at 3 m from the unshielded material is not allowed to exceed 10 mSv/h.	
526–528	(i)	The dose rate for a package or overpack is required to be such that the transport index (TI) of the package or overpack does not exceed 10. The criticality safety index (CSI) is not allowed to exceed 50, except when transported under exclusive use.
	(ii)	The maximum dose rate 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. ¹
	(iii)	The maximum dose rate 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

521, table 5	LSA material is required to be packaged in accordance with table 5 of the Transport Regulations.	
523, 524, 524A	The TI is required to be derived in accordance with paras 523, 524 and 524A of the Transport Regulations.	

¹ Packages or overpacks having a surface dose rate greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel (see footnote to table 10 of the Transport Regulations).

- 525, 686 Determination of the CSI for packages containing fissile material, and for overpacks and freight containers.
- 529, table 8 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 for dangerous goods.
- 531 Each package is required to be marked with an identification of either the consignor or the consignee, or both.
- 532, table 9 Packages are required to bear the mark “UN 3325” and the proper shipping name “RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-III), FISSILE”.
- 533 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass on the outside of the packaging.
- 534(a) Each package that conforms to an IP-2 or IP-3 design is required to be marked with “TYPE IP-2” or “TYPE IP-3” as appropriate.
- 534(c) Each package that 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 the 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.
- 535 Each package that conforms to a competent authority approved design is required to be marked with:

- 535
(cont.)
- (a) The identification mark allocated to that design by the competent authority;
 - (b) A serial number to uniquely identify each packaging that conforms to that design.
- 531–535
- All marks are required to be legible and durable, and are required to be on the outside of the packaging.
- 536A
- Any mark on the package made in accordance with paras 534(a) and (b) and 535(c) of the Transport Regulations that does not relate to the UN number and proper shipping name assigned to the consignment is required to be removed or covered.
- 538, 541, 542,
figs 2–5
- Each package, overpack and freight container is required to bear the appropriate labels.
- Any labels that do not relate to the contents are required to be removed or covered.
- 539
- 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 marks specified in paras 531–536 of the Transport Regulations.
- 540(a), (b)
- Each label is required to be marked with the name(s) of the radionuclide(s), followed by “LSA-III”, and the maximum activity of the contents. The mass of fissile nuclides may be used instead of the activity. Paragraph 540(a) of the Transport Regulations also establishes requirements for labelling mixtures of radionuclides.

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

- (i) The radioactive contents;
- (ii) The maximum activity of the total radioactive contents during transport.

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

540(d) Each label is required to show the TI, except for category I-WHITE.

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

7. REQUIREMENTS BEFORE SHIPMENT

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

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

- (i) The content of the package is in accordance with the specifications of design regarding the radionuclide, its form and physical or chemical state.
- (ii) All the relevant requirements of the Transport Regulations and applicable certificates of approval have been fulfilled.
- (iii) Provisions on lifting attachments are complied with.

- 502,
503(a), (d), (e)
(cont.)
- (iv) For packages containing fissile material, the measurement specified in para. 677(b) of the Transport Regulations and the tests to demonstrate closure of each package as specified in para. 680 of the Transport Regulations are required to be performed where applicable.
- (v) For packages intended to be used for shipment after storage, it is required to take into account ageing mechanisms.
- 546
- The transport documents with each consignment (consignment notes) are required to include all relevant particulars of the consignment.
- 547–553
- The consignor is required to include a declaration in the transport documents.
- 554, 555
- The consignor is required to provide a statement regarding actions to be taken by the carrier, and to retain a copy of the transport documents.
- 556
- The consignor is required to make competent authority certificates available to the carrier(s) before loading and unloading.
- 557
- Delivery of the approval certificate before the first shipment of any package requiring competent authority approval to all competent authorities involved in the shipment, i.e. the competent authority of the country of origin and of each country through or into which the consignment is to be transported.
- 825(c)
- Multilateral approval is required for shipments where the sum of the CSIs of the packages in a single freight container or in a single conveyance is greater than 50.
- 825(d)
- Multilateral approval is required for radiation protection programmes for shipments by special use vessels.

- 826 Competent authority authorization of transport without shipment approval.
- 827 Information to be included in an application for shipment approval.
- 828 Shipment approval certificate (as applicable).

8. PROVISIONS CONCERNING
TRANSPORT OPERATIONS

8.1. Modal requirements

- 410 LSA-III material activity limit for air transport.
- 573 For transport by rail and by road: for consignments under exclusive use, the dose rate 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 that prevents unauthorized access during transport;
 - (ii) The package or overpack is secured to retain its position within the enclosure during routine transport;
 - (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.

- 573
(cont.) (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 dose rate greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with table 10 of the Transport Regulations, footnote (a), are not allowed to be transported except 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. 566 of the Transport Regulations relating to TI, CSI and dose rate provided that the conditions stated in para. 576 of the Transport Regulations are met.
- 579 For transport by air: packages or overpacks having a surface dose rate greater than 2 mSv/h are not allowed to be transported, except under special arrangement.
- 580, 581 Transport by post is not allowed.

8.2. Placarding

- 507 Placards may be required for other dangerous properties of the contents.
- 543, 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. Any placards that do not relate to the contents are required to be removed.

- 543, figs 2–6 As an alternative to the use of placards on large freight containers and tanks, enlarged labels are permitted.
- 544, figs 6, 7 Where an exclusive use consignment in a freight container 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 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 Transport Regulations against the white background, or on the placard shown in fig. 7 of the Transport Regulations. If the placard shown in fig. 7 of the Transport Regulations is used, it is required to be fixed immediately adjacent to each main placard.
- 545 Consignor’s responsibilities.
- 571, figs 2–6 Requirements on the location of placards and the use of placards with reduced dimensions on a road or rail vehicle.
- 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 Transport Regulations against the white background or on the placard shown in fig. 7 of the Transport Regulations. If the placard shown in fig. 7 of the Transport Regulations is used, it is required to be fixed immediately adjacent to each main placard.

8.3. Stowage during transport, storage in transit and segregation

- 506, 562 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 562(a)–(d) and 506 of the Transport Regulations.

- 563 Category II-YELLOW or category III-YELLOW packages or overpacks are not allowed to be carried in compartments occupied by passengers, except for compartments reserved for specially authorized couriers.
- 564 Consignments are required to be securely stowed.
- 565 A package or overpack may be carried or stored among packaged general cargo, subject to certain conditions.
- 566(a), table 10 TI limits for freight containers and conveyances.
- 566(b) Limits on the dose rates from freight containers and vehicles. Different limits apply for exclusive use; see remarks on para. 573 of the Transport Regulations in 8.1 above.
- 566(c), table 11 CSI limits for freight containers and conveyances.
- 567 Any package or overpack having a TI greater than 10 is required to be transported under exclusive use.
- 568, 569, table 11 Segregation of packages containing fissile material during transport and during storage in transit.
- 576 For a special use vessel, the storage arrangements are excepted from the requirements of para. 566 of the Transport Regulations provided that the conditions stated in para. 576 of the Transport 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 that are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport.

8.5. Decontamination

- 505 Freight containers, intermediate bulk containers, tanks, packagings and overpacks used for the transport of radioactive material are not allowed to be used for the storage or transport of other goods, unless decontaminated below the levels specified in the Transport Regulations.
- 512 Periodic checking of conveyances and equipment is required to determine the level of contamination.
- 513 Decontamination of conveyances and equipment, or parts thereof that have become contaminated, is required.

8.6. Other provisions

- 309 In the event of non-compliance with any limit in the Transport Regulations applicable to dose rate or contamination, 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

Paragraph(s) of the Transport Regulations [1]	Subject
<hr/>	
1. GENERAL PROVISIONS	
<hr/>	
110, 507	Transport with other dangerous goods, and other dangerous properties of contents.
301–303	General provisions for radiation protection.
304, 305, 554(c)	Emergency response.
306	Management system.
311–315	Training.
504	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.
561	Possession of package design approval certificates, and possession of instructions for the proper closing of the package and other preparations for shipment.
607–618	Design requirements for all packagings and packages.
619–621	Additional design requirements — air transport.
623	Design requirements for Type IP-1 packages.
624	Design requirements for Type IP-2 packages.

- 626–630 Alternative design requirements for Type IP-2 packages.
- 673–685 Additional design requirements for packages containing fissile material.
- 802(a), 814–816 Package designs to contain fissile material — requirements for competent authority approval.
- 820 Transitional arrangements for packages approved under the 1985, 1985 (As Amended 1990), 1996, 1996 (Revised), 1996 (As Amended 2003), 2005, 2009 and 2012 Editions of the Transport Regulations.
- 824 Packaging serial numbers — informing the competent authority.

2. CONTENTS LIMITS FOR PACKAGES

- 413 SCO-I and SCO-II definitions and surface contamination limits.
- 414, 517 The contents are required to be restricted such that the dose rates specified in para. 517 of the Transport Regulations will not be exceeded (see 4 below).
- 417, 418 Classification and contents limits for fissile material.
- 520 SCO-I is allowed to be transported unpackaged, subject to the conditions stated in para. 520 of the Transport Regulations.
- 522 The activity limits for conveyances carrying SCO are stated in table 6 of the Transport Regulations.

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 and conveyances is required to be kept as low as practicable and is not allowed

508, 509
(cont.) to exceed the following limits, when averaged over 300 cm² of any part of the surface:

- (a) Beta, gamma and low toxicity alpha emitters, 4 Bq/cm²;
- (b) All other alpha emitters, 0.4 Bq/cm².

514 A freight container or conveyance dedicated to the transport of unpackaged SCO-I material under exclusive use may be excepted from the requirements of paras 509 and 513 of the Transport Regulations with regard to contamination on internal surfaces for as long as it remains under that specific exclusive use.

4. MAXIMUM DOSE RATES

517 The dose rate at 3 m from the unshielded material is not allowed to exceed 10 mSv/h.

- 526–528
- (i) The dose rate for a package or overpack is required to be such that the transport index (TI) of the package or overpack does not exceed 10. The criticality safety index (CSI) is not allowed to exceed 50, except when transported under exclusive use.
 - (ii) The maximum dose rate 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.¹
 - (iii) The maximum dose rate at any point on any external surface of a package or overpack transported under exclusive use is not allowed to exceed 10 mSv/h.

¹ Packages or overpacks having a surface dose rate greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel (see footnote to table 10 of the Transport Regulations).

5. CATEGORIES OF PACKAGES AND OVERPACKS

521, table 5	SCO are required to be packaged in accordance with table 5 of the Transport Regulations.
523, 524, 524A	The TI is required to be derived in accordance with paras 523, 524 and 524A of the Transport Regulations.
525, 686	Determination of the CSI for packages containing fissile material, and for overpacks and freight containers.
529, table 8	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 for dangerous goods.
531	Each package is required to be marked with an identification of either the consignor or the consignee, or both.
532, table 9	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.
533	Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass on the outside of the packaging.

- 534(a) Each package that conforms to an IP-1 or IP-2 design is required to be marked with “TYPE IP-1” or “TYPE IP-2” as appropriate.
- 534(c) Each package that 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 the 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.
- 535 Each package that conforms to a competent authority approved design 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 that conforms to that design.
- 531–535 All marks are required to be legible and durable, and are required to be on the outside of the packaging.
- 536A Any mark on the package made in accordance with paras 534(a) and (b) and 535(c) of the Transport Regulations that does not relate to the UN number and proper shipping name assigned to the consignment is required to be removed or covered.
- 537 When the SCO-I object is contained in receptacles or wrapping materials and is transported under exclusive use, as permitted by para. 520, the outer surface of these receptacles or materials may be marked “RADIOACTIVE SCO-I”.
- 538, 541, 542,
figs 2–5 Each package, overpack and freight container is required to bear the appropriate labels.
- Any labels that do not relate to the contents are required to be removed or covered.

- 539 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 marks specified in paras 531–536 of the Transport Regulations.
- 540(a), (b) 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, and the maximum activity of the contents. The mass of fissile nuclides may be used instead of the activity. Paragraph 540(a) of the Transport Regulations also establishes requirements for labelling mixtures of radionuclides.
- 540(c) Except for mixed loads, each label on a freight container or overpack is required to be marked with:
- (i) The radioactive contents;
 - (ii) The maximum activity of the total radioactive contents during transport.
- For mixed loads, such entries may read “See Transport Documents”.
- 540(d) Each label is required to show the TI, except for category I-WHITE.
- 545 It is the consignor’s responsibility to comply with the requirements of marking and labelling.

7. REQUIREMENTS BEFORE SHIPMENT

- 501 Before the first shipment, confirmation that the shielding, containment, heat transfer characteristics, confinement system and neutron poisons conform to the approved design is required.
- 502,
503(a), (d), (e) Before each shipment of any package, the following requirements apply:

- 502,
503(a), (d), (e)
(cont.)
- (i) The content of the package is in accordance with the specifications of design regarding the radionuclide, its form and physical or chemical state.
 - (ii) All the relevant requirements of the Transport Regulations and applicable certificates of approval have been fulfilled.
 - (iii) Provisions on lifting attachments are complied with.
 - (iv) For packages containing fissile material, the measurement specified in para. 677(b) of the Transport Regulations and the tests to demonstrate closure of each package as specified in para. 680 of the Transport Regulations are required to be performed where applicable.
 - (v) For packages intended to be used for shipment after storage, it is required to take into account ageing mechanisms.
- 546
- The transport documents with each consignment (consignment notes) are required to include all relevant particulars of the consignment.
- 547–553
- The consignor is required to include a declaration in the transport documents.
- 554, 555
- The consignor is required to provide a statement regarding actions to be taken by the carrier.
- 556
- The consignor is required to make competent authority certificates available to the carrier(s) before loading and unloading.
- 557
- Delivery of the approval certificate before the first shipment of any package requiring competent authority approval to all competent authorities involved in the shipment, i.e. the competent authority of the country of origin and of

- 557
(cont.) each country through or into which the consignment is to be transported.
- 825(c) Multilateral approval is required for shipments where the sum of the CSIs of the packages in a single freight container or in a single conveyance is greater than 50.
- 825(d) Multilateral approval is required for radiation protection programmes for shipments by special use vessels.
- 826 Competent authority authorization of transport without shipment approval.
- 827 Information to be included in an application for shipment approval.
- 828 Shipment approval certificate (as applicable).

8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

8.1. Modal requirements

- 573 For transport by rail and by road: for consignments under exclusive use, the dose rate 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 that prevents unauthorized access during transport;
 - (ii) The package or overpack is secured to retain its position within the enclosure during routine transport;
 - (iii) There are no loading or unloading operations between the beginning and the end of the shipment.

- 573
(cont.)
- (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.
 - (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 dose rate greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with table 10 of the Transport Regulations, footnote (a), are not allowed to be transported except 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. 566 of the Transport Regulations relating to TI, CSI and dose rate provided that the conditions stated in para. 576 of the Transport Regulations are met.
- 579
- For transport by air: packages or overpacks having a surface dose rate greater than 2 mSv/h are not allowed to be transported, except under special arrangement.
- 580, 581
- Transport by post is not allowed.

8.2. Placarding

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

- 543, fig. 6 Large freight containers carrying unpackaged SCO-I or packages containing SCO, are required to bear four placards in a vertical orientation on the two external side walls and the two external end walls. Any placards that do not relate to the contents are required to be removed.
- 543, figs 2–6 As an alternative to the use of placards on large freight containers, enlarged labels are permitted.
- 544, figs 6, 7 Where the consignment in the freight container is unpackaged SCO-I only, or where an exclusive use consignment in a freight container 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 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 Transport Regulations against the white background, or on the placard shown in fig. 7 of the Transport Regulations. If the placard shown in fig. 7 of the Transport Regulations is used, it is required to be fixed immediately adjacent to each main placard.
- 545 Consignor’s responsibilities.
- 571, figs 2–6 Requirements on the location of placards and the use of placards with reduced dimensions on a road or rail vehicle.
- 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 Transport Regulations against the white background or on the placard shown in fig. 7 of the Transport Regulations. If the placard shown in fig. 7 of the Transport Regulations is used, it is required to be fixed immediately adjacent to each main placard.

8.3. Stowage during transport, storage in transit and segregation

- 506, 562 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 562(a)–(d) and 506 of the Transport Regulations.
- 563 Category II-YELLOW or category III-YELLOW packages or overpacks are not allowed to be carried in compartments occupied by passengers, except for compartments reserved for specially authorized couriers.
- 564 Consignments are required to be securely stowed.
- 565 A package or overpack may be carried or stored among packaged general cargo, subject to certain conditions.
- 566(a), table 10 TI limits for freight containers and conveyances.
- 566(b) Limits on the dose rates from freight containers and vehicles. Different limits apply for exclusive use; see remarks on para. 573 of the Transport Regulations in 8.1 above.
- 566(c), table 11 CSI limits for freight containers and conveyances.
- 567 Any package or overpack having a TI greater than 10, or any consignment having a CSI greater than 50, is required to be transported under exclusive use.
- 568, 569, table 11 Segregation of packages containing fissile material during transport and during storage in transit.
- 576 For a special use vessel, the storage arrangements are excepted from the requirements of para. 566 of the Transport Regulations provided that the conditions stated in para. 576 of the Transport 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 that are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport.

8.5. Decontamination

- 505 Freight containers, intermediate bulk containers, tanks, packagings and overpacks used for the transport of radioactive material are not allowed to be used for the storage or transport of other goods, unless decontaminated below the levels specified in the Transport Regulations.
- 512 Periodic checking of conveyances and equipment is required to determine the level of contamination.
- 513 Decontamination of conveyances and equipment, or parts thereof that have become contaminated, is required.

8.6. Other provisions

- 309 In the event of non-compliance with any limit in the Transport Regulations applicable to dose rate or contamination, 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

Paragraph(s) of the Transport Regulations [1]	Subject
<hr/>	
1. GENERAL PROVISIONS	
<hr/>	
110, 507	Transport with other dangerous goods, and other dangerous properties of contents.
301–303	General provisions for radiation protection.
304, 305, 554(c)	Emergency response.
306	Management system.
311–315	Training.
504	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.
561	Possession of package design approval certificates, and possession of instructions for the proper closing of the package and other preparations for shipment.
607–618	Design requirements for all packagings and packages.
619–621	Additional design requirements — air transport.
635–651	Design requirements for Type A packages.

- 673–685 Additional design requirements for packages containing fissile material.
- 802(a), 814–816 Package designs to contain fissile material — requirements for competent authority approval.
- 820 Transitional arrangements for packages approved under the 1985, 1985 (As Amended 1990), 1996, 1996 (Revised), 1996 (As Amended 2003), 2005, 2009 and 2012 Editions of the Transport Regulations.
- 824 Packaging serial numbers — informing the competent authority.

2. CONTENTS LIMITS FOR PACKAGES

- 417, 418 Classification and contents limits for fissile material.
- 429(b), 430 The quantity of radioactive material is not allowed to exceed the limits specified in paras 429(b) and 430 of the Transport Regulations.

When special form radioactive material and non-special form radioactive material are packed in the same Type A package, the quantity of radioactive material is not allowed to exceed the limits specified in para. 430 of the Transport Regulations. In that case, the schedule for UN 3333 is also applicable.

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 and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over 300 cm² of any part of the surface:
- (a) Beta, gamma and low toxicity alpha emitters, 4 Bq/cm²;
 - (b) All other alpha emitters, 0.4 Bq/cm².

4. MAXIMUM DOSE RATES, TRANSPORT INDEX (TI) AND CRITICALITY SAFETY INDEX

- 526–528
- (i) The dose rate for a package or overpack is required to be such that the transport index (TI) of the package or overpack does not exceed 10. The criticality safety index (CSI) is not allowed to exceed 50, except when transported under exclusive use.
 - (ii) The maximum dose rate 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.¹
 - (iii) The maximum dose rate 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

- 523, 524, 524A The TI is required to be derived in accordance with paras 523, 524 and 524A of the Transport Regulations.
- 525, 686 Determination of the CSI for packages containing fissile material, and for overpacks and freight containers.
- 529, table 8 Packages and overpacks are required to be assigned to category I-WHITE, category II-YELLOW or category III-YELLOW.

¹ Packages or overpacks having a surface dose rate greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel (see footnote to table 10 of the Transport 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 for dangerous goods.
- 531 Each package is required to be marked with an identification of either the consignor or the consignee, or both.
- 532, table 9 Packages are required to bear the mark “UN 3327” and the proper shipping name “RADIOACTIVE MATERIAL, TYPE A PACKAGE, FISSILE”.
- 533 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass on the outside of the packaging.
- 534(b) Each package is required to be marked with “TYPE A”.
- 534(c) Each package is required to be marked with the international vehicle registration code (VRI Code) of the country of origin of the 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.
- 535 Each package that conforms to a competent authority approved design 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 that conforms to that design.
- 531–535 All marks are required to be legible and durable, and are required to be on the outside of the packaging.

- 536A Any mark on the package made in accordance with paras 534(a) and (b) and 535(c) of the Transport Regulations that does not relate to the UN number and proper shipping name assigned to the consignment is required to be removed or covered.
- 538, 541, 542,
figs 2–5 Each package, overpack and freight container is required to bear the appropriate labels.
- Any labels that do not relate to the contents are required to be removed or covered.
- 539 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 marks specified in paras 531–536 of the Transport Regulations.
- 540(a), (b) Each label is required to be marked with the name(s) of the radionuclide(s), and the maximum activity of the contents. The mass of fissile nuclides may be used instead of the activity. Paragraph 540(a) of the Transport Regulations also establishes requirements for labelling mixtures of radionuclides.
- 540(c) Except for mixed loads, each label on a freight container or overpack is required to be marked with:
- (i) The radioactive contents;
 - (ii) The maximum activity of the total radioactive contents during transport.
- For mixed loads, such entries may read “See Transport Documents”.
- 540(d) Each label is required to show the TI, except for category I-WHITE.

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

7. REQUIREMENTS BEFORE SHIPMENT

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

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

- (i) The content of the package is in accordance with the specifications of design regarding the radionuclide, its form and physical or chemical state.
- (ii) All the relevant requirements of the Transport Regulations and applicable certificates of approval have been fulfilled.
- (iii) Provisions on lifting attachments are complied with.
- (iv) For packages containing fissile material, the measurement specified in para. 677(b) of the Transport Regulations and the tests to demonstrate closure of each package as specified in para. 680 of the Transport Regulations are required to be performed where applicable.
- (v) For packages intended to be used for shipment after storage, it is required to take into account ageing mechanisms.

546 The transport documents with each consignment (consignment notes) are required to include all relevant particulars of the consignment.

547–553 The consignor is required to include a declaration in the transport documents.

- 554, 555 The consignor is required to provide a statement regarding actions to be taken by the carrier.
- 556 The consignor is required to make competent authority certificates available to the carrier(s) before loading and unloading.
- 557 Delivery of the approval certificate before the first shipment of any package requiring competent authority approval to all competent authorities involved in the shipment, i.e. the competent authority of the country of origin and of each country through or into which the consignment is to be transported.
- 825(c) Multilateral approval is required for shipments where the sum of the CSIs of the packages in a single freight container or in a single conveyance is greater than 50.
- 825(d) Multilateral approval is required for radiation protection programmes for shipments by special use vessels.
- 826 Competent authority authorization of transport without shipment approval.
- 827 Information to be included in an application for shipment approval.
- 828 Shipment approval certificate (as applicable).

8. PROVISIONS CONCERNING
TRANSPORT OPERATIONS

8.1. Modal requirements

- 573 For transport by rail and by road: for consignments under exclusive use, the dose rate 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:

573
(cont.)

- (i) The vehicle is equipped with an enclosure that prevents unauthorized access during transport;
 - (ii) The package or overpack is secured to retain its position within the enclosure during routine transport;
 - (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.
- (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.

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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 dose rate greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with table 10 of the Transport Regulations, footnote (a), are not allowed to be transported except 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. 566 of the Transport Regulations relating to TI, CSI and dose rate provided that the conditions stated in para. 576 of the Transport Regulations are met.

579 For transport by air: packages or overpacks having a surface dose rate greater than 2 mSv/h are not allowed to be transported, except under special arrangement.

580, 581 Transport by post is not allowed.

8.2. Placarding

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

543, 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. Any placards that do not relate to the contents are required to be removed.

543, figs 2–6 As an alternative to the use of placards on large freight containers and tanks, enlarged labels are permitted.

544, figs 6, 7 Where an exclusive use consignment in a freight container 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 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 Transport Regulations against the white background, or on the placard shown in fig. 7 of the Transport Regulations. If the placard shown in fig. 7 of the Transport Regulations is used, it is required to be fixed immediately adjacent to each main placard.

545 Consignor’s responsibilities.

571, figs 2–6 Requirements on the location of placards and the use of placards with reduced dimensions on a road or rail vehicle.

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 Transport Regulations against the white background or on the placard shown in fig. 7 of the Transport Regulations. If the placard shown in fig. 7 of the Transport Regulations is used, it is required to be fixed immediately adjacent to each main placard.

8.3. Stowage during transport, storage in transit and segregation

- 506, 562 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 562(a)–(d) and 506 of the Transport Regulations.

- 563 Category II-YELLOW or category III-YELLOW packages or overpacks are not allowed to be carried in compartments occupied by passengers, except for compartments reserved for specially authorized couriers.

- 564 Consignments are required to be securely stowed.

- 565 A package or overpack may be carried or stored among packaged general cargo, subject to certain conditions.

- 566(a), table 10 TI limits for freight containers and conveyances.

- 566(b) Limits on the dose rates from freight containers and vehicles. Different limits apply for exclusive use; see remarks on para. 573 of the Transport Regulations in 8.1 above.

- 566(c), table 11 CSI limits for freight containers and conveyances.

- 567 Any package or overpack having a TI greater than 10, or any consignment having a CSI greater than 50, is required to be transported under exclusive use.

568, 569,
table 11 Segregation of packages containing fissile material during transport and during storage in transit.

576 For a special use vessel, the storage arrangements are excepted from the requirements of para. 566 of the Transport Regulations provided that the conditions stated in para. 576 of the Transport 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 that are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport.

8.5. Decontamination

505 Freight containers, intermediate bulk containers, tanks, packagings and overpacks used for the transport of radioactive material are not allowed to be used for the storage or transport of other goods, unless decontaminated below the levels specified in the Transport Regulations.

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

513 Decontamination of conveyances and equipment, or parts thereof that have become contaminated, is required.

8.6. Other provisions

309 In the event of non-compliance with any limit in the Transport Regulations applicable to dose rate or contamination, appropriate actions are required to be taken as soon as possible, including communication and remedy.

Schedule for UN 3327

- 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

Paragraph(s) of the Transport Regulations [1]	Subject
<hr/>	
1. GENERAL PROVISIONS	
<hr/>	
110, 507	Transport with other dangerous goods, and other dangerous properties of contents.
301–303	General provisions for radiation protection.
304, 305, 554(c)	Emergency response.
306	Management system.
311–315	Training.
431	Classification of packages for international shipment when different approval types apply.
504	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.
561	Possession of package design approval certificates, and possession of instructions for the proper closing of the package and other preparations for shipment.
602–604	Design requirements for special form radioactive material.
605	Design requirements for low dispersible radioactive material.
607–618	Design requirements for all packagings and packages.

- 619–621 Additional design requirements — air transport.
- 636–647, 648(b), 649 Design requirements for Type A packages (also apply to Type B(U) packages).
- 653–666 Design requirements for Type B(U) packages.
- 673–685 Additional design requirements for packages containing fissile material.
- 802(a), 803, 804, 808–810, 814–816 Special form radioactive material, low dispersible radioactive material and package design (including package designs to contain fissile material) — requirements for competent authority approval (as applicable).
- 820 Transitional arrangements for packages approved under the 1985, 1985 (As Amended 1990), 1996, 1996 (Revised), 1996 (As Amended 2003), 2005, 2009 and 2012 Editions of the Transport Regulations.
- 823 Transitional arrangements for special form radioactive material approved under the 1985, 1985 (As Amended 1990), 1996, 1996 (Revised), 1996 (As Amended 2003), 2005, 2009 and 2012 Editions of the Transport Regulations.
- 824 Packaging serial numbers — informing the competent authority.

2. CONTENTS LIMITS FOR PACKAGES

- 417, 418 Classification and contents limits for fissile material.
- 432 The quantity of radioactive material is not allowed to exceed the limits specified in para. 432 of the Transport Regulations.

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 and conveyances is required to be

529, table 8 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 for dangerous goods.

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

532, table 9 Packages are required to bear the mark “UN 3328” and the proper shipping name “RADIOACTIVE MATERIAL, TYPE B(U) PACKAGE, FISSILE”.

533 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass on the outside of the packaging.

535 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 that conforms to that design;
- (c) “TYPE B(U)”.

531–533, 535 All marks are required to be legible and durable, and are required to be on the outside of the packaging.

- 536, fig. 1 The outside of the outermost receptacle that is resistant to the effects of fire and water is required to be plainly marked by embossing or stamping, or by other means resistant to the effects of fire and water, with the trefoil symbol shown in fig. 1 of the Transport Regulations.
- 536A Any mark on the package made in accordance with paras 534(a) and (b) and 535(c) of the Transport Regulations that does not relate to the UN number and proper shipping name assigned to the consignment is required to be removed or covered.
- 538, 541, 542,
figs 2–5 Each package, overpack and freight container is required to bear the appropriate labels.
- Any labels that do not relate to the contents are required to be removed or covered.
- 539 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 marks specified in paras 531–536 of the Transport Regulations.
- 540(a), (b) Each label is required to be marked with the name(s) of the radionuclide(s) and the maximum activity of the contents. The mass of fissile nuclides may be used instead of the activity. Paragraph 540(a) of the Transport Regulations also establishes requirements for labelling mixtures of radionuclides.
- 540(c) Except for mixed loads, each label on a freight container or overpack is required to be marked with:
- (i) The radioactive contents;
 - (ii) The maximum activity of the total radioactive contents during transport.

- 540(c) For mixed loads, such entries may read “See
(cont.) Transport Documents”.
- 540(d) Each label is required to show the TI, except for
category I-WHITE.
- 545 It is the consignor’s responsibility to comply with the
requirements of marking and labelling.

7. REQUIREMENTS BEFORE SHIPMENT

- 501 Before the first shipment, confirmation that the shielding,
containment, heat transfer characteristics, confinement
system and neutron poisons conform to the approved
design is required.
- 502, 503 Before each shipment of any package, the following
requirements apply:
- (i) The content of the package is in accordance with the
specifications of design regarding the radionuclide, its
form and physical or chemical state.
 - (ii) All the relevant requirements of the Transport Regulations
and applicable certificates of approval have been fulfilled.
 - (iii) Provisions on lifting attachments are complied with.
 - (iv) 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.

- 502, 503
(cont.)
- (v) 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 659 and 671 of the Transport Regulations were made. For packages containing fissile material, the measurement specified in para. 677(b) of the Transport Regulations and the tests to demonstrate closure of each package as specified in para. 680 of the Transport Regulations are required to be performed where applicable.
- (vi) For packages intended to be used for shipment after storage, it is required to take into account ageing mechanisms.
- 546 The transport documents with each consignment (consignment notes) are required to include all relevant particulars of the consignment.
- 547–553 The consignor is required to include a declaration in the transport documents.
- 554, 555 The consignor is required to provide a statement regarding actions to be taken by the carrier.
- 556 The consignor is required to make competent authority certificates available to the carrier(s) before loading and unloading.
- 557 Delivery of the approval certificate before the first shipment of any package requiring competent authority approval to all competent authorities involved in the shipment, i.e. the competent authority of the country of origin and of each country through or into which the consignment is to be transported.

- 558(b) Consignor's notification to the competent authority of the country of origin of the shipment and of each country through or into which the consignment is to be transported for each shipment whose content exceeds $3000A_1$ or $3000A_2$, as appropriate, or 1000 TBq, whichever is the lower.
- 559 Details of the notification referred to in para. 558 of the Transport Regulations.
- 560 Separate notification is not required if the information has been included in the application for shipment approval (see para. 827 of the Transport Regulations).
- 825(c) Multilateral approval is required for shipments where the sum of the CSIs of the packages in a single freight container or in a single conveyance is greater than 50.
- 825(d) Multilateral approval is required for radiation protection programmes for shipments by special use vessels.
- 826 Competent authority authorization of transport without shipment approval.
- 827 Information to be included in an application for shipment approval.
- 828 Shipment approval certificate (as applicable).

8. PROVISIONS CONCERNING
TRANSPORT OPERATIONS

8.1. Modal requirements

- 433 Type B(U) package contents limits for air transport.

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For transport by rail and by road: for consignments under exclusive use, the dose rate 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 that prevents unauthorized access during transport;
 - (ii) The package or overpack is secured to retain its position within the enclosure during routine transport;
 - (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.
- (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 dose rate greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with table 10 of the Transport Regulations, footnote (a), are not allowed to be transported except under special arrangement.
- 576 For transport by vessels: the transport of consignments by means of a special use vessel is exempted from the requirements of para. 566 of the Transport Regulations relating to TI, CSI and dose rate provided that the conditions stated in para. 576 of the Transport Regulations are met.
- 579 For transport by air: packages or overpacks having a surface dose rate greater than 2 mSv/h are not allowed to be transported, except under special arrangement.
- 580, 581 Transport by post is not allowed.

8.2. Placarding

- 507 Placards may be required for other dangerous properties of the contents.
- 543, 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. Any placards that do not relate to the contents are required to be removed.
- 543, figs 2–6 As an alternative to the use of placards on large freight containers and tanks, enlarged labels are permitted.
- 544, figs 6, 7 Where an exclusive use consignment in a freight container is UN 3328 Type B(U) packages only, 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

- 544, figs 6, 7
(cont.) the Transport Regulations against the white background, or on the placard shown in fig. 7 of the Transport Regulations. If the placard shown in fig. 7 of the Transport Regulations is used, it is required to be fixed immediately adjacent to each main placard.
- 545 Consignor's responsibilities.
- 571, figs 2–6 Requirements on the location of placards and the use of placards with reduced dimensions on a road or rail vehicle.
- 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 3328" 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 Transport Regulations against the white background or on the placard shown in fig. 7 of the Transport Regulations. If the placard shown in fig. 7 of the Transport Regulations is used, it is required to be fixed immediately adjacent to each main placard.

8.3. Stowage during transport, storage in transit and segregation

- 506, 562 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 562(a)–(d) and 506 of the Transport Regulations.
- 563 Category II-YELLOW or category III-YELLOW packages or overpacks are not allowed to be carried in compartments occupied by passengers, except for compartments reserved for specially authorized couriers.
- 564 Consignments are required to be securely stowed.
- 565 A package or overpack may be carried or stored among packaged general cargo, subject to certain conditions.

566(a), table 10	TI limits for freight containers and conveyances.
566(b)	Limits on the dose rates from freight containers and vehicles. Different limits apply for exclusive use; see remarks on para. 573 of the Transport Regulations in 8.1 above.
566(c), table 11	CSI limits for freight containers and conveyances.
567	Any package or overpack having a TI greater than 10, or any consignment having a CSI greater than 50, is required to be transported under exclusive use.
568, 569, table 11	Segregation of packages containing fissile material during transport and during storage in transit.
576	For a special use vessel, the storage arrangements are excepted from the requirements of para. 566 of the Transport Regulations provided that the conditions stated in para. 576 of the Transport 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 that are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport.

8.5. Decontamination

505	Freight containers, intermediate bulk containers, tanks, packagings and overpacks used for the transport of radioactive material are not allowed to be used for the storage or transport of other goods, unless decontaminated below the levels specified in the Transport Regulations.
512	Periodic checking of conveyances and equipment is required to determine the level of contamination.

513 Decontamination of conveyances and equipment, or parts thereof that have become contaminated, is required.

8.6. Other provisions

309 In the event of non-compliance with any limit in the Transport Regulations applicable to dose rate or contamination, 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

Paragraph(s) of the Transport Regulations [1]	Subject
<hr/>	
1. GENERAL PROVISIONS	
<hr/>	
110, 507	Transport with other dangerous goods, and other dangerous properties of contents.
301–303	General provisions for radiation protection.
304, 305, 554(c)	Emergency response.
306	Management system.
311–315	Training.
431	Classification of packages for international shipment when different approval types apply.
504	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.
561	Possession of package design approval certificates, and possession of instructions for the proper closing of the package and other preparations for shipment.
602–604	Design requirements for special form radioactive material.
605	Design requirements for low dispersible radioactive material.
607–618	Design requirements for all packagings and packages.

Schedule for UN 3329

- 619–621 Additional design requirements — air transport.
- 636–647, 648(b), 649 Design requirements for Type A packages (also apply to Type B(U) packages).
- 652–666 Design requirements for Type B(U) packages (also apply to Type B(M) packages).
- 667, 668 Design requirements for Type B(M) packages.
- 673–685 Additional design requirements for packages containing fissile material.
- 802(a), 803, 804, 811–816 Special form radioactive material, low dispersible radioactive material and package design (including package designs to contain fissile material) — requirements for competent authority approval.
- 820 Transitional arrangements for packages approved under the 1985, 1985 (As Amended 1990), 1996, 1996 (Revised), 1996 (As Amended 2003), 2005, 2009 and 2012 Editions of the Transport Regulations.
- 823 Transitional arrangements for special form radioactive material approved under the 1985, 1985 (As Amended 1990), 1996, 1996 (Revised), 1996 (As Amended 2003), 2005, 2009 and 2012 Editions of the Transport Regulations.
- 824 Packaging serial numbers — informing the competent authority.

2. CONTENTS LIMITS FOR PACKAGES

- 417, 418 Classification and contents limits for fissile material.
- 432 The quantity of radioactive material is not allowed to exceed the limits specified in para. 432 of the Transport Regulations.

 3. CONTAMINATION

508, 509 Non-fixed contamination on the external surfaces of any package package and on the external and internal surfaces of overpacks, freight 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 cm² of any part of the surface:

- | | | |
|-----|--|--------------------------|
| (a) | Beta, gamma and low toxicity alpha emitters, | 4 Bq/cm ² ; |
| (b) | All other alpha emitters, | 0.4 Bq/cm ² . |

 4. MAXIMUM DOSE RATES, TRANSPORT INDEX (TI) AND CRITICALITY SAFETY INDEX (CSI)

- 526–528
- (i) The dose rate for a package or overpack is required to be such that the transport index (TI) of the package or overpack does not exceed 10. The criticality safety index (CSI) is not allowed to exceed 50, except when transported under exclusive use.
 - (ii) The maximum dose rate 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.¹
 - (iii) The maximum dose rate at any point on any external surface of a package or overpack transported under exclusive use is not allowed to exceed 10 mSv/h.

¹ Packages or overpacks having a surface dose rate greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel (see footnote to table 10 of the Transport Regulations).

5. CATEGORIES OF PACKAGES AND OVERPACKS

- 523, 524, 524A The TI is required to be derived in accordance with paras 523, 524 and 524A of the Transport Regulations.
- 525, 686 Determination of the CSI for packages containing fissile material, and for overpacks and freight containers.
- 529, table 8 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 for dangerous goods.
- 531 Each package is required to be marked with an identification of either the consignor or the consignee, or both.
- 532, table 9 Packages are required to bear the mark “UN 3329” and the proper shipping name “RADIOACTIVE MATERIAL, TYPE B(M) PACKAGE, FISSILE”.
- 533 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass on the outside of the packaging.
- 535 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 that conforms to that design;
 - (c) “TYPE B(M)”.

- 531–533, 535 All marks are required to be legible and durable, and are required to be on the outside of the packaging.
- 536, fig. 1 The outside of the outermost receptacle that is resistant to the effects of fire and water is required to be plainly marked by embossing or stamping, or by other means resistant to the effects of fire and water, with the trefoil symbol shown in fig. 1 of the Transport Regulations.
- 536A Any mark on the package made in accordance with paras 534(a) and (b) and 535(c) of the Transport Regulations that does not relate to the UN number and proper shipping name assigned to the consignment is required to be removed or covered.
- 538, 541, 542,
figs 2–5 Each package, overpack and freight container is required to bear the appropriate labels.
- Any labels that do not relate to the contents are required to be removed or covered.
- 539 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 marks specified in paras 531–536 of the Transport Regulations.
- 540(a), (b) Each label is required to be marked with the name(s) of the radionuclide(s) and the maximum activity of the contents. The mass of fissile nuclides may be used instead of the activity. Paragraph 540(a) of the Transport Regulations also establishes requirements for labelling mixtures of radionuclides.
- 540(c) Except for mixed loads, each label on a freight container or overpack is required to be marked with:
- (i) The radioactive contents;
 - (ii) The maximum activity of the total radioactive contents during transport.

- 540(c) (cont.) For mixed loads, such entries may read “See Transport Documents”.
- 540(d) Each label is required to show the TI, except for category I-WHITE.
- 545 It is the consignor’s responsibility to comply with the requirements of marking and labelling.

7. REQUIREMENTS BEFORE SHIPMENT

- 501 Before the first shipment, confirmation that the shielding, containment, heat transfer characteristics, confinement system and neutron poisons conform to the approved design is required.
- 502, 503 Before each shipment of any package, the following requirements apply:
- (i) The content of the package is in accordance with the specifications of design regarding the radionuclide, its form and physical or chemical state.
 - (ii) All the relevant requirements of the Transport Regulations and applicable certificates of approval have been fulfilled.
 - (iii) Provisions on lifting attachments are complied with.
 - (iv) 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.

- 502, 503
(cont.)
- (v) 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 659 and 671 of the Transport Regulations were made.
 - (vi) For packages containing fissile material, the measurement specified in para. 677(b) of the Transport Regulations and the tests to demonstrate closure of each package as specified in para. 680 of the Transport Regulations are required to be performed where applicable.
 - (vii) For packages intended to be used for shipment after storage, it is required to take into account ageing mechanisms.
- 546
- The transport documents with each consignment (consignment notes) are required to include all relevant particulars of the consignment.
- 547–553
- The consignor is required to include a declaration in the transport documents.
- 554, 555
- The consignor is required to provide a statement regarding actions to be taken by the carrier.
- 556
- The consignor is required to make competent authority certificates available to the carrier(s) before loading and unloading.
- 557
- Delivery of the approval certificate before the first shipment of any package requiring competent authority approval to all competent authorities involved in the shipment, i.e. the competent authority of the country of origin and of each country through or into which the consignment is to be transported.

- 558(c) Consignor's notification to the competent authority of the country of origin of the shipment and of each country through or into which the consignment is to be transported.
- 559 Details of the notification referred to in para. 558 of the Transport Regulations.
- 560 Separate notification is not required if the information has been included in the application for shipment approval (see para. 827 of the Transport Regulations).
- 825(a), (b) Multilateral approval is required for shipments of certain Type B(M) packages.
- 825(c) Multilateral approval is required for shipments where the sum of the CSIs of the packages in a single freight container or in a single conveyance is greater than 50.
- 825(d) Multilateral approval is required for radiation protection programmes for shipments by special use vessels.
- 826 Competent authority authorization of transport without shipment approval.
- 827 Information to be included in an application for shipment approval.
- 828 Shipment approval certificate (as applicable).

8. PROVISIONS CONCERNING
TRANSPORT OPERATIONS

8.1. Modal requirements

- 433 Type B package contents limits for air transport.

- 573 For transport by rail and by road: for consignments under exclusive use, the dose rate 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 that prevents unauthorized access during transport;
 - (ii) The package or overpack is secured to retain its position within the enclosure during routine transport;
 - (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.
 - (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 dose rate greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with table 10 of the Transport Regulations, footnote (a), are not allowed to be transported except 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. 566 of the Transport Regulations relating to TI, CSI and dose rate provided that the conditions stated in para. 576 of the Transport Regulations are met.
- 577–579 Additional requirements relating to transport by air are established in paras 577–579 of the Transport Regulations.
- 580, 581 Transport by post is not allowed.

8.2. Placarding

- 507 Placards may be required for other dangerous properties of the contents.
- 543, 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. Any placards that do not relate to the contents are required to be removed.
- 543, figs 2–6 As an alternative to the use of placards on large freight containers and tanks, enlarged labels are permitted.
- 544, figs 6, 7 Where an exclusive use consignment in a freight container 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 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 Transport Regulations against the white background, or on the placard shown in fig. 7 of the Transport Regulations. If the placard shown in fig. 7 of the Transport Regulations is used, it is required to be fixed immediately adjacent to each main placard.
- 545 Consignor’s responsibilities.
- 571, figs 2–6 Requirements on the location of placards and the use of placards with reduced dimensions on a road or rail vehicle.

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 Transport Regulations against the white background or on the placard shown in fig. 7 of the Transport Regulations. If the placard shown in fig. 7 of the Transport Regulations is used, it is required to be fixed immediately adjacent to each main placard.

8.3. Stowage during transport, storage in transit and segregation

506, 562 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 562(a)–(d) and 506 of the Transport Regulations.

563 Category II-YELLOW or category III-YELLOW packages or overpacks are not allowed to be carried in compartments occupied by passengers, except for compartments reserved for specially authorized couriers.

564 Consignments are required to be securely stowed.

565 A package or overpack may be carried or stored among packaged general cargo, subject to certain conditions.

566(a), table 10 TI limits for freight containers and conveyances.

566(b) Limits on the dose rates from freight containers and vehicles. Different limits apply for exclusive use; see remarks on para. 573 of the Transport Regulations in 8.1 above.

566(c), table 11 CSI limits for freight containers and conveyances.

567 Any package or overpack having a TI greater than 10, or any consignment having a CSI greater than 50, is required to be transported under exclusive use.

568, 569,
table 11 Segregation of packages containing fissile material during transport and during storage in transit.

576 For a special use vessel, the storage arrangements are excepted from the requirements of para. 566 of the Transport Regulations provided that the conditions stated in para. 576 of the Transport 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 that are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport.

8.5. Decontamination

505 Freight containers, intermediate bulk containers, tanks, packagings and overpacks used for the transport of radioactive material are not allowed to be used for the storage or transport of other goods, unless decontaminated below the levels specified in the Transport Regulations.

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

513 Decontamination of conveyances and equipment, or parts thereof that have become contaminated, is required.

8.6. Other provisions

309 In the event of non-compliance with any limit in the Transport Regulations applicable to dose rate or contamination, appropriate actions are required to be taken as soon as possible, including communication and remedy.

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- 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.
- 668 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

Paragraph(s) of the Transport Regulations [1]	Subject
<hr/>	
1. GENERAL PROVISIONS	
<hr/>	
110, 507	Transport with other dangerous goods, and other dangerous properties of contents.
301–303	General provisions for radiation protection.
304, 305, 554(c)	Emergency response.
306	Management system.
311–315	Training.
431	Classification of packages for international shipment when different approval types apply.
504	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.
561	Possession of package design approval certificates, and possession of instructions for the proper closing of the package and other preparations for shipment.
602–604	Design requirements for special form radioactive material.
607–618	Design requirements for all packagings and packages.
619–621	Additional design requirements — air transport.

- 636–647, 648(b), 649 Design requirements for Type A packages (also apply to Type C packages).
- 653–657, 661–666 Design requirements for Type B(U) packages (also apply to Type C packages).
- 669–672 Design requirements for Type C packages.
- 673–685 Additional design requirements for packages containing fissile material.
- 802(a), 803, 804, 808–810, 814–816 Special form radioactive material and package design (including package designs to contain fissile material) — requirements for competent authority approval.
- 820 Transitional arrangements for packages approved under the 1985, 1985 (As Amended 1990), 1996, 1996 (Revised), 1996 (As Amended 2003), 2005, 2009 and 2012 Editions of the Transport Regulations.
- 823 Transitional arrangements for special form radioactive material approved under the 1985, 1985 (As Amended 1990), 1996, 1996 (Revised), 1996 (As Amended 2003), 2005, 2009 and 2012 Editions of the Transport Regulations.
- 824 Packaging serial numbers — informing the competent authority.

2. CONTENTS LIMITS FOR PACKAGES

- 432 The quantity of radioactive material is not allowed to exceed the limits specified in para. 432 of the Transport Regulations.
- 417, 418 Classification and contents limits for fissile material.

3. CONTAMINATION

- 508, 509 Non-fixed contamination on the external surfaces of any package and on the external and internal surfaces of overpacks,

508, 509
(cont.) freight 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 cm² of any part of the surface:

- (a) Beta, gamma and low toxicity alpha emitters, 4 Bq/cm²;
- (b) All other alpha emitters, 0.4 Bq/cm².

4. MAXIMUM DOSE RATES, TRANSPORT INDEX (TI) AND CRITICALITY SAFETY INDEX (CSI)

- 526–528
- (i) The dose rate for a package or overpack is required to be such that the transport index (TI) of the package or overpack does not exceed 10. The criticality safety index (CSI) is not allowed to exceed 50, except when transported under exclusive use.
 - (ii) The maximum dose rate 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.¹
 - (iii) The maximum dose rate 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

523, 524,
524A The TI is required to be derived in accordance with paras 523, 524 and 524A of the Transport Regulations.

¹ Packages or overpacks having a surface dose rate greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel (see footnote to table 10 of the Transport Regulations).

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525, 686 Determination of the CSI for packages containing fissile material, and for overpacks and freight containers.

529, table 8 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 for dangerous goods.

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

532, table 9 Packages are required to bear the mark “UN 3330” and the proper shipping name “RADIOACTIVE MATERIAL, TYPE C PACKAGE, FISSILE”.

533 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass on the outside of the packaging.

535 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 that conforms to that design;
- (c) “TYPE C”.

531–533, 535 All marks are required to be legible and durable, and are required to be on the outside of the packaging.

- 536, fig. 1 The outside of the outermost receptacle that is resistant to the effects of fire and water is required to be plainly marked by embossing or stamping, or by other means resistant to the effects of fire and water, with the trefoil symbol shown in fig. 1 of the Transport Regulations.
- 536A Any mark on the package made in accordance with paras 534(a) and (b) and 535(c) of the Transport Regulations that does not relate to the UN number and proper shipping name assigned to the consignment is required to be removed or covered.
- 538, 541, 542,
figs 2–5 Each package, overpack and freight container is required to bear the appropriate labels.
- Any labels that do not relate to the contents are required to be removed or covered.
- 539 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 marks specified in paras 531–536 of the Transport Regulations.
- 540(a), (b) Each label is required to be marked with the name(s) of the radionuclide(s) and the maximum activity of the contents. The mass of fissile nuclides may be used instead of the activity. Paragraph 540(a) of the Transport Regulations also establishes requirements for labelling mixtures of radionuclides.
- 540(c) Except for mixed loads, each label on a freight container or overpack is required to be marked with:
- (i) The radioactive contents;
- (ii) The maximum activity of the total radioactive contents during transport.
- For mixed loads, such entries may read “See Transport Documents”.

540(d) Each label is required to show the TI, except for category I-WHITE.

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

7. REQUIREMENTS BEFORE SHIPMENT

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

502, 503 Before each shipment of any package, the following requirements apply:

- (i) The content of the package is in accordance with the specifications of design regarding the radionuclide, its form and physical or chemical state.
- (ii) All the relevant requirements of the Transport Regulations and applicable certificates of approval have been fulfilled.
- (iii) Provisions on lifting attachments are complied with.
- (iv) 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.
- (v) 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 659 and 671 of the Transport Regulations were made.

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- 502, 503
(cont.)
- (vi) For packages containing fissile material, the measurement specified in para. 677(b) of the Transport Regulations and the tests to demonstrate closure of each package as specified in para. 680 of the Transport Regulations are required to be performed where applicable.
- (vii) For packages intended to be used for shipment after storage, it is required to take into account ageing mechanisms.
- 546
- The transport documents with each consignment (consignment notes) are required to include all relevant particulars of the consignment.
- 547–553
- The consignor is required to include a declaration in the transport documents.
- 554, 555
- The consignor is required to provide a statement regarding actions to be taken by the carrier.
- 556
- The consignor is required to make competent authority certificates available to the carrier(s) before loading and unloading.
- 557
- Delivery of the approval certificate before the first shipment of any package requiring competent authority approval to all competent authorities involved in the shipment, i.e. the competent authority of the country of origin and of each country through or into which the consignment is to be transported.
- 558(a)
- Consignor's notification to the competent authority of the country of origin of the shipment and of each country through or into which the consignment is to be transported.
- 559
- Details of the notification referred to in para. 558 of the Transport Regulations.

- 560 Separate notification is not required if the information has been included in the application for shipment approval (see para. 827 of the Transport Regulations).
- 825(c) Multilateral approval is required for shipments where the sum of the CSIs of the packages in a single freight container or in a single conveyance is greater than 50.
- 825(d) Multilateral approval is required for radiation protection programmes for shipments by special use vessels.
- 826 Competent authority authorization of transport without shipment approval.
- 827 Information to be included in an application for shipment approval.
- 828 Shipment approval certificate (as applicable).

8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

8.1. Modal requirements

- 573 For transport by rail and by road: for consignments under exclusive use, the dose rate 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 that prevents unauthorized access during transport;
 - (ii) The package or overpack is secured to retain its position within the enclosure during routine transport;
 - (iii) There are no loading or unloading operations between the beginning and the end of the shipment.

- 573
(cont.)
- (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.
 - (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 dose rate greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with table 10 of the Transport Regulations, footnote (a), are not allowed to be transported except 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. 566 of the Transport Regulations relating to TI, CSI and dose rate provided that the conditions stated in para. 576 of the Transport Regulations are met.
- 579
- For transport by air: packages or overpacks having a surface dose rate greater than 2 mSv/h are not allowed to be transported, except under special arrangement.
- 580, 581
- Transport by post is not allowed.

8.2. Placarding

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

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- 543, 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. Any placards that do not relate to the contents are required to be removed.
- 543, figs 2–6 As an alternative to the use of placards on large freight containers and tanks, enlarged labels are permitted.
- 544, figs 6, 7 Where an exclusive use consignment in a freight container 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 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 Transport Regulations against the white background, or on the placard shown in fig. 7 of the Transport Regulations. If the placard shown in fig. 7 of the Transport Regulations is used, it is required to be fixed immediately adjacent to each main placard.
- 545 Consignor’s responsibilities.
- 571, figs 2–6 Requirements on the location of placards and the use of placards with reduced dimensions on a road or rail vehicle.
- 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 Transport Regulations against the white background or on the placard shown in fig. 7 of the Transport Regulations. If the placard shown in fig. 7 of the Transport Regulations is used, it is required to be fixed immediately adjacent to each main placard.

8.3. Stowage during transport, storage in transit and segregation

- 506, 562 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 562(a)–(d) and 506 of the Transport Regulations.
- 563 Category II-YELLOW or category III-YELLOW packages or overpacks are not allowed to be carried in compartments occupied by passengers, except for compartments reserved for specially authorized couriers.
- 564 Consignments are required to be securely stowed.
- 565 A package or overpack may be carried or stored among packaged general cargo, subject to certain conditions.
- 566(a), table 10 TI limits for freight containers and conveyances.
- 566(b) Limits on the dose rates from freight containers and vehicles. Different limits apply for exclusive use; see remarks on para. 573 of the Transport Regulations in 8.1 above.
- 566(c), table 11 CSI limits for freight containers and conveyances.
- 567 Any package or overpack having a TI greater than 10, or any consignment having a CSI greater than 50, is required to be transported under exclusive use.
- 568, 569, table 11 Segregation of packages containing fissile material during transport and during storage in transit.
- 576 For a special use vessel, the storage arrangements are excepted from the requirements of para. 566 of the Transport Regulations provided that the conditions stated in para. 576 of the Transport 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 that are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport.

8.5. Decontamination

- 505 Freight containers, intermediate bulk containers, tanks, packagings and overpacks used for the transport of radioactive material are not allowed to be used for the storage or transport of other goods, unless decontaminated below the levels specified in the Transport Regulations.
- 512 Periodic checking of conveyances and equipment is required to determine the level of contamination.
- 513 Decontamination of conveyances and equipment, or parts thereof that have become contaminated, is required.

8.6. Other provisions

- 309 In the event of non-compliance with any limit in the Transport Regulations applicable to dose rate or contamination, 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

Paragraph(s) of the Transport Regulations [1]	Subject
<hr/>	
1. GENERAL PROVISIONS	
<hr/>	
110, 507	Transport with other dangerous goods, and other dangerous properties of contents.
301–303	General provisions for radiation protection.
304, 305, 554(c)	Emergency response.
306	Management system.
310	Special arrangement.
311–315	Training.
504	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.
561	Possession of package design approval certificates, and possession of instructions for the proper closing of the package and other preparations for shipment.
602–604	Design requirements for special form radioactive material.
605	Design requirements for low dispersible radioactive material.
607–618	Design requirements for all packagings and packages.

Schedule for UN 3331

619–621	Additional design requirements — air transport.
624–630	Design requirements for industrial packages.
636–647, 648(b), 649	Design requirements for Type A packages (also apply to Type B and Type C packages).
653–666	Design requirements for Type B(U) packages.
667, 668	Design requirements for Type B(M) packages.
669–672	Design requirements for Type C packages.
673–685	Additional design requirements for packages containing fissile material.
802(a), (b), 803, 804, 807–816	Special form radioactive material, low dispersible radioactive material, package design (including package designs to contain fissile material) and special arrangement — requirements for competent authority approval.
820	Transitional arrangements for packages approved under the 1985, 1985 (As Amended 1990), 1996, 1996 (Revised), 1996 (As Amended 2003), 2005, 2009 and 2012 Editions of the Transport Regulations.
823	Transitional arrangements for special form radioactive material approved under the 1985, 1985 (As Amended 1990), 1996, 1996 (Revised), 1996 (As Amended 2003), 2005, 2009 and 2012 Editions of the Transport Regulations.
824	Packaging serial numbers — informing the competent authority.

2. CONTENTS LIMITS FOR PACKAGES

417, 418	Classification and contents limits for fissile material.
836(j), (k)	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 and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over 300 cm² of any part of the surface:

- | | | |
|-----|--|--------------------------|
| (a) | Beta, gamma and low toxicity alpha emitters, | 4 Bq/cm ² ; |
| (b) | All other alpha emitters, | 0.4 Bq/cm ² . |

4. MAXIMUM DOSE RATES, TRANSPORT INDEX (TI) AND CRITICALITY SAFETY INDEX (CSI)

- 526–528
- (i) The dose rate for a package or overpack is required to be such that the transport index (TI) of the package or overpack does not exceed 10. The criticality safety index (CSI) is not allowed to exceed 50, except when transported under exclusive use.
 - (ii) The maximum dose rate 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.¹
 - (iii) The maximum dose rate at any point on any external surface of a package or overpack transported under exclusive use is not allowed to exceed 10 mSv/h.

¹ Packages or overpacks having a surface dose rate greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel (see footnote to table 10 of the Transport Regulations).

5. CATEGORIES OF PACKAGES AND OVERPACKS

- 523, 524, 524A The TI is required to be derived in accordance with paras 523, 524 and 524A of the Transport Regulations.
- 525, 686 Determination of the CSI for packages containing fissile material, and for overpacks and freight containers.
- 529 A package or an overpack containing packages, transported under special arrangement is required to be assigned to 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 for dangerous goods.
- 530, 532, table 9 Except under certain provisions stated in para. 530 of the Transport Regulations, and except in case of uranium hexafluoride where the provisions in para. 419 of the Transport Regulations apply, packages are required to bear the mark “UN 3331” and the proper shipping name “RADIOACTIVE MATERIAL, TRANSPORTED UNDER SPECIAL ARRANGEMENT, FISSILE”.
- 531 Each package is required to be marked with an identification of either the consignor or the consignee, or both.
- 533 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass on the outside of the packaging.
- 531–535 All marks are required to be legible and durable, and are required to be on the outside of the packaging.

- 536A Any mark on the package made in accordance with paras 534(a) and (b) and 535(c) of the Transport Regulations that does not relate to the UN number and proper shipping name assigned to the consignment is required to be removed or covered.
- 538, 541, 542,
figs 2–5 Each package, overpack and freight container is required to bear the appropriate labels.
- Any labels that do not relate to the contents are required to be removed or covered.
- 539 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 marks specified in paras 531–536 of the Transport Regulations.
- 540(a), (b) Each label is required to be marked with the name(s) of the radionuclide(s) and the maximum activity of the contents. For fissile materials, the mass of fissile nuclides may be used instead of the activity. Paragraph 540(a) of the Transport Regulations also establishes requirements for labelling mixtures of radionuclides.
- 540(c) Except for mixed loads, each label on a freight container or overpack is required to be marked with:
- (i) The radioactive contents;
 - (ii) The maximum activity of the total radioactive contents during transport.
- For mixed loads, such entries may read “See Transport Documents”.
- 540(d) Each label is required to show the TI.
- 545 It is the consignor’s responsibility to comply with the requirements of marking and labelling.

7. REQUIREMENTS BEFORE SHIPMENT

- 501 Before the first shipment, confirmation that the shielding, containment, heat transfer characteristics, confinement system and neutron poisons conform to the approved design is required.
- 502, 503 Before each shipment of any package, the following requirements apply:
- (i) The content of the package is in accordance with the specifications of design regarding the radionuclide, its form and physical or chemical state.
 - (ii) All the relevant requirements of the Transport Regulations and applicable certificates of approval have been fulfilled.
 - (iii) Provisions on lifting attachments are complied with.
 - (iv) 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.
 - (v) 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 659 and 671 of the Transport Regulations were made.
 - (vi) For packages containing fissile material, the measurement specified in para. 677(b) of the Transport Regulations and the tests to demonstrate closure of each package as specified in para. 680 of the Transport Regulations are required to be performed where applicable.

Schedule for UN 3331

- 546 The transport documents with each consignment (consignment notes) are required to include all relevant particulars of the consignment.
- 547–553 The consignor is required to include a declaration in the transport documents.
- 554, 555 The consignor is required to provide a statement regarding actions to be taken by the carrier.
- 556 The consignor is required to make competent authority certificates available to the carrier(s) before loading and unloading.
- 558(d) Consignor's notification to the competent authority of the country of origin of the shipment and of each country through or into which the consignment is to be transported.
- 559 Details of the notification referred to in para. 558 of the Transport Regulations.
- 560 Separate notification is not required if the information has been included in the application for shipment approval.
- 825(c) Multilateral approval is required for shipments where the sum of the CSIs of the packages in a single freight container or in a single conveyance is greater than 50.
- 825(d) Multilateral approval is required for radiation protection programmes for shipments by special use vessels.
- 826 Competent authority authorization of transport without shipment approval.
- 828 Shipment approval certificate (as applicable).
- 829 Multilateral approval is required for consignments transported under special arrangement.
- 831 Shipment under special arrangement approval certificate.

8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

8.1. Modal requirements

- 433 Type B package contents limits for air transport.
- 573 For transport by rail and by road: for consignments under exclusive use, the dose rate 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 that prevents unauthorized access during transport;
 - (ii) The package or overpack is secured to retain its position within the enclosure during routine transport;
 - (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.
 - (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 dose rate greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with table 10 of the Transport Regulations, footnote (a), are not allowed to be transported except 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. 566 of the Transport Regulations relating to TI, CSI and dose rate provided that the conditions stated in para. 576 of the Transport Regulations are met.
- 577–579 Additional requirements relating to transport by air are established in paras 577–579 of the Transport Regulations.
- 580, 581 Transport by post is not allowed.

8.2. Placarding

- 507 Placards may be required for other dangerous properties of the contents.
- 543, 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. Any placards that do not relate to the contents are required to be removed.
- 543, figs 2–6 As an alternative to the use of placards on large freight containers and tanks, enlarged labels are permitted.
- 544, figs 6, 7 Where an exclusive use consignment in a freight container 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 on all four sides of the

- 544, figs 6, 7
(cont.) 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 Transport Regulations against the white background, or on the placard shown in fig. 7 of the Transport Regulations. If the placard shown in fig. 7 of the Transport Regulations is used, it is required to be fixed immediately adjacent to each main placard.
- 545 Consignor's responsibilities.
- 571, figs 2–6 Requirements on the location of placards and the use of placards with reduced dimensions on a road or rail vehicle.
- 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 Transport Regulations against the white background or on the placard shown in fig. 7 of the Transport Regulations. If the placard shown in fig. 7 of the Transport Regulations is used, it is required to be fixed immediately adjacent to each main placard.

8.3. Stowage during transport, storage in transit and segregation

- 506, 562 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 562(a)–(d) and 506 of the Transport Regulations.
- 563 Category II-YELLOW or category III-YELLOW packages or overpacks are not allowed to be carried in compartments occupied by passengers, except for compartments reserved for specially authorized couriers.
- 564 Consignments are required to be securely stowed.

- 565 A package or overpack may be carried or stored among packaged general cargo, subject to certain conditions.
- 566(a), table 10 TI limits for freight containers and conveyances.
- 566(b) Limits on the dose rates from freight containers and vehicles. Different limits apply for exclusive use; see remarks on para. 573 of the Transport Regulations in 8.1 above.
- 566(c), table 11 CSI limits for freight containers and conveyances.
- 567 Any package or overpack having a TI greater than 10, or any consignment having a CSI greater than 50, is required to be transported under exclusive use.
- 568, 569, table 11 Segregation of packages containing fissile material during transport and during storage in transit.
- 576 For a special use vessel, the storage arrangements are excepted from the requirements of para. 566 of the Transport Regulations provided that the conditions stated in para. 576 of the Transport 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 that are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport.

8.5. Decontamination

- 505 Freight containers, intermediate bulk containers, tanks, packagings and overpacks used for the transport of radioactive

- 505 (cont.) material are not allowed to be used for the storage or transport of other goods, unless decontaminated below the levels specified in the Transport Regulations.
- 512 Periodic checking of conveyances and equipment is required to determine the level of contamination.
- 513 Decontamination of conveyances and equipment, or parts thereof that have become contaminated, is required.

8.6. Other provisions

- 309 In the event of non-compliance with any limit in the Transport Regulations applicable to dose rate or contamination, 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 3332

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

Paragraph(s) of the Transport Regulations [1]	Subject
<hr/>	
1. GENERAL PROVISIONS	
<hr/>	
110, 507	Transport with other dangerous goods, and other dangerous properties of contents.
301–303	General provisions for radiation protection.
304, 305, 554(c)	Emergency response.
306	Management system.
311–315	Training.
504	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.
561	Possession of special form radioactive material certificates, and possession of instructions for the proper closing of the package and other preparations for shipment.
602–604	Design requirements for special form radioactive material.
607–618	Design requirements for all packagings and packages.
619–621	Additional design requirements — air transport.
635–651	Design requirements for Type A packages.

- 801 The consignor is required to demonstrate on request that the package design complies with all applicable competent authority requirements.
- 802(a), 803–806 Exception from fissile classification, as applicable, and special form radioactive material — requirements for competent authority approval.
- 819 Transitional arrangements for packages designed under the provisions of the 1985 or 1985 (As Amended 1990), 1996, 1996 (Revised), 1996 (As Amended 2003), 2005, 2009 and 2012 Editions of the Transport Regulations.
- 822 Transitional arrangement for packages excepted for fissile material under the 2009 Edition of the Transport Regulations.
- 823 Transitional arrangements for special form radioactive material approved under the 1985, 1985 (As Amended 1990), 1996, 1996 (Revised), 1996 (As Amended 2003), 2005, 2009 and 2012 Editions of the Transport Regulations.

2. CONTENTS LIMITS FOR PACKAGES

- 417 If the package contains fissile material, one of the fissile exceptions provided by para. 417 of the Transport Regulations is required to be applied.
- Fissile material excepted under para. 417(f) is required to comply with para. 606 and requires multilateral approval as specified in para. 805.
- 429(a), 430 The quantity of radioactive material is not allowed to exceed the limits specified in paras 429(a) and 430 of the Transport Regulations.
- When special form radioactive material and non-special form radioactive material are packed in the same Type A package, the quantity of radioactive material is not allowed to exceed the limits specified in para. 430 of the Transport Regulations. In that case, the schedule for UN 2915 is also applicable.

3. CONTAMINATION

508, 509	<p>Non-fixed contamination on the external surfaces of any package and on the external and internal surfaces of overpacks, freight 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 cm² of any part of the surface:</p> <p>(a) Beta, gamma and low toxicity alpha emitters, 4 Bq/cm²;</p> <p>(b) All other alpha emitters, 0.4 Bq/cm².</p>
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4. MAXIMUM DOSE RATES AND TRANSPORT INDEX (TI)

526–528	<p>(i) The dose rate 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.</p> <p>(ii) The maximum dose rate 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.¹</p> <p>(iii) The maximum dose rate at any point on any external surface of a package or overpack transported under exclusive use is not allowed to exceed 10 mSv/h.</p>
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5. CATEGORIES OF PACKAGES AND OVERPACKS

523, 524, 524A	<p>The TI is required to be derived in accordance with paras 523, 524 and 524A of the Transport Regulations.</p>
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¹ Packages or overpacks having a surface dose rate greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel (see footnote to table 10 of the Transport Regulations).

529, table 8 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 for dangerous goods.

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

532, table 9 Packages are required to bear the mark “UN 3332” and the proper shipping name “RADIOACTIVE MATERIAL, TYPE A PACKAGE, SPECIAL FORM”.

533 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass on the outside of the packaging.

534(b) Each package is required to be marked with “TYPE A”.

534(c) Each package is required to be marked with the international vehicle registration code (VRI Code) of the country of origin of the 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.

531–534 All marks are required to be legible and durable, and are required to be on the outside of the packaging.

536A Any mark on the package made in accordance with paras 534(a) and (b) and 535(c) of the Transport Regulations that does not relate to the UN number and proper shipping name assigned to the consignment is required to be removed or covered.

- 538, figs 2–4 Each package, overpack and freight container is required to bear the appropriate labels. Any labels that do not relate to the contents are required to be removed or covered.
- 539 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 marks specified in paras 531–536 of the Transport Regulations.
- 540(a), (b) Each label is required to be marked with the name(s) of the radionuclide(s) and the maximum activity of the contents. Paragraph 540(a) of the Transport Regulations also establishes requirements for labelling mixtures of radionuclides.
- 540(c) Except for mixed loads, each label on a freight container or overpack is required to be marked with:
- (i) The radioactive contents;
 - (ii) The maximum activity of the total radioactive contents during transport.
- For mixed loads, such entries may read “See Transport Documents”.
- 540(d) Each label is required to show the TI, except for category I-WHITE.
- 545 It is the consignor’s responsibility to comply with the requirements of marking and labelling.

7. REQUIREMENTS BEFORE SHIPMENT

- 501(a) Before the first shipment of any package for which the design pressure exceeds 35 kPa, confirmation that the containment system conforms to the approved design is required.
- 502, 503(a), (e) Before each shipment of any package, the following requirements apply:

- 502, 503(a), (e)
(cont.)
- (i) The content of the package is in accordance with the specifications of design regarding the radionuclide, its form and physical or chemical state.
 - (ii) All the relevant requirements of the Transport Regulations and applicable certificates of approval have been fulfilled.
 - (iii) Provisions on lifting attachments are complied with.
 - (iv) For packages intended to be used for shipment after storage, it is required to take into account ageing mechanisms.
- 546
- The transport documents with each consignment (consignment notes) are required to include all relevant particulars of the consignment.
- 547–553
- The consignor is required to include a declaration in the transport documents.
- 554, 555
- The consignor is required to provide a statement regarding actions to be taken by the carrier.
- 556
- The consignor is required to make competent authority certificates available to the carrier(s) before loading and unloading.
- 825(d)
- Multilateral approval is required for radiation protection programmes for shipments by special use vessels.
- 826
- Competent authority authorization of transport without shipment approval.

8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

8.1. Modal requirements

- 573
- For transport by rail and by road: for consignments under exclusive use, the dose rate is not allowed to exceed:

573
(cont.)

- (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 that prevents unauthorized access during transport;
 - (ii) The package or overpack is secured to retain its position within the enclosure during routine transport;
 - (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.
- (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.

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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.

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For transport by vessels: packages or overpacks having a surface dose rate greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with table 10 of the Transport Regulations, footnote (a), are not allowed to be transported except 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. 566 of the Transport Regulations relating to TI and dose rate provided that the conditions stated in para. 576 of the Transport Regulations are met.
- 579 For transport by air: packages or overpacks having a surface dose rate greater than 2 mSv/h are not allowed to be transported, except under special arrangement.
- 580, 581 Transport by post is not allowed.

8.2. Placarding

- 507 Placards may be required for other dangerous properties of the contents.
- 543, 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. Any placards that do not relate to the contents are required to be removed.
- 543, figs 2–4, 6 As an alternative to the use of placards on large freight containers, enlarged labels are permitted.
- 544, figs 6, 7 Where an exclusive use consignment in a freight container 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 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 Transport Regulations against the white background, or on the placard shown in fig. 7 of the Transport Regulations. If the placard shown in fig. 7 of the Transport Regulations is used, it is required to be fixed immediately adjacent to each main placard.
- 545 Consignor’s responsibilities.

- 571, figs 2–4, 6 Requirements on the location of placards and the use of placards with reduced dimensions on a road or rail vehicle.
- 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 Transport Regulations against the white background or on the placard shown in fig. 7 of the Transport Regulations. If the placard shown in fig. 7 of the Transport Regulations is used, it is required to be fixed immediately adjacent to each main placard.

8.3. Stowage during transport, storage in transit and segregation

- 506, 562 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 562(a)–(d) and 506 of the Transport Regulations.
- 563 Category II-YELLOW or category III-YELLOW packages or overpacks are not allowed to be carried in compartments occupied by passengers, except for compartments reserved for specially authorized couriers.
- 564 Consignments are required to be securely stowed.
- 565 A package or overpack may be carried or stored among packaged general cargo, subject to certain conditions.
- 566(a), table 10 TI limits for freight containers and conveyances.
- 566(b) Limits on the dose rates from freight containers and vehicles. Different limits apply for exclusive use; see remarks on para. 573 of the Transport Regulations in 8.1 above.
- 567 Any package or overpack having a TI greater than 10 is required to be transported under exclusive use.

- 576 For a special use vessel, the storage arrangements are excepted from the requirements of para. 566 of the Transport Regulations provided that the conditions stated in para. 576 of the Transport 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 that are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport.

8.5. Decontamination

- 505 Freight containers, intermediate bulk containers, tanks, packagings and overpacks used for the transport of radioactive material are not allowed to be used for the storage or transport of other goods, unless decontaminated below the levels specified in the Transport Regulations.
- 512 Periodic checking of conveyances and equipment is required to determine the level of contamination.
- 513 Decontamination of conveyances and equipment, or parts thereof that have become contaminated, is required.

8.6. Other provisions

- 309 In the event of non-compliance with any limit in the Transport Regulations applicable to dose rate or contamination, 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

Paragraph(s) of the Transport Regulations [1]	Subject
<hr/>	
1. GENERAL PROVISIONS	
<hr/>	
110, 507	Transport with other dangerous goods, and other dangerous properties of contents.
301–303	General provisions for radiation protection.
304, 305, 554(c)	Emergency response.
306	Management system.
311–315	Training.
504	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.
561	Possession of special form radioactive material certificates, and possession of instructions for the proper closing of the package and other preparations for shipment.
602–604	Design requirements for special form radioactive material.
607–618	Design requirements for all packagings and packages.
619–621	Additional design requirements — air transport.
635–651	Design requirements for Type A packages.

Schedule for UN 3333

- 673–685 Additional design requirements for packages containing fissile material.
- 802(a), 803, 804, 814–816 Special form radioactive material and package designs to contain fissile material — requirements for competent authority approval.
- 820 Transitional arrangements for packages approved under the 1985, 1985 (As Amended 1990), 1996, 1996 (Revised), 1996 (As Amended 2003), 2005, 2009 and 2012 Editions of the Transport Regulations.
- 823 Transitional arrangements for special form radioactive material approved under the 1985, 1985 (As Amended 1990), 1996, 1996 (Revised), 1996 (As Amended 2003), 2005, 2009 and 2012 Editions of the Transport Regulations.
- 824 Packaging serial numbers — informing the competent authority.

2. CONTENTS LIMITS FOR PACKAGES

- 417, 418 Classification and content limits for fissile material.
- 429(a), 430 The quantity of radioactive material is not allowed to exceed the limits specified in paras 429(a) and 430 of the Transport Regulations.
- When special form radioactive material and non-special form radioactive material are packed in the same Type A package, the quantity of radioactive material is not allowed to exceed the limits specified in para. 430 of the Transport Regulations. In that case, the schedule for UN 3327 is also applicable.

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 and conveyances is required to

Schedule for UN 3333

508, 509
(cont.) be kept as low as practicable and is not allowed to exceed the following limits, when averaged over 300 cm² of any part of the surface:

- (a) Beta, gamma and low toxicity alpha emitters, 4 Bq/cm²;
- (b) All other alpha emitters, 0.4 Bq/cm².

4. MAXIMUM DOSE RATES, TRANSPORT INDEX (TI)
AND CRITICALITY SAFETY INDEX (CSI)

- 526–528
- (i) The dose rate for a package or overpack is required to be such that the transport index (TI) of the package or overpack does not exceed 10. The criticality safety index (CSI) is not allowed to exceed 50, except when transported under exclusive use.
 - (ii) The maximum dose rate 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.¹
 - (iii) The maximum dose rate 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

523, 524,
524A The TI is required to be derived in accordance with paras 523, 524 and 524A of the Transport Regulations.

525, 686 Determination of the CSI for packages containing fissile material, and for overpacks and freight containers.

¹ Packages or overpacks having a surface dose rate greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel (see footnote to table 10 of the Transport Regulations).

529, table 8 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 for dangerous goods.

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

532, table 9 Packages are required to bear the mark “UN 3333” and the proper shipping name “RADIOACTIVE MATERIAL, TYPE A PACKAGE, SPECIAL FORM, FISSILE”.

533 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass on the outside of the packaging.

534(b) Each package is required to be marked with “TYPE A”.

534(c) Each package is required to be marked with the international vehicle registration code (VRI Code) of the country of origin of the 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.

535 Each package that conforms to a competent authority approved design 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 that conforms to that design.

- 531–535 All marks are required to be legible and durable, and are required to be on the outside of the packaging.
- 536A Any mark on the package made in accordance with paras 534(a) and (b) and 535(c) of the Transport Regulations that does not relate to the UN number and proper shipping name assigned to the consignment is required to be removed or covered.
- 538, 541, 542,
figs 2–5 Each package, overpack and freight container is required to bear the appropriate labels.
- Any labels that do not relate to the contents are required to be removed or covered.
- 539 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 marks specified in paras 531–536 of the Transport Regulations.
- 540(a), (b) Each label is required to be marked with the name(s) of the radionuclide(s) and the maximum activity of the contents. The mass of fissile nuclides may be used instead of the activity. Paragraph 540(a) of the Transport Regulations also establishes requirements for labelling mixtures of radionuclides.
- 540(c) Except for mixed loads, each label on a freight container or overpack is required to be marked with:
- (i) The radioactive contents;
 - (ii) The maximum activity of the total radioactive contents during transport.
- For mixed loads, such entries may read “See Transport Documents”.
- 540(d) Each label is required to show the TI, except for category I-WHITE.

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

7. REQUIREMENTS BEFORE SHIPMENT

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

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

- (i) The content of the package is in accordance with the specifications of design regarding the radionuclide, its form and physical or chemical state.
- (ii) All the relevant requirements of the Transport Regulations and applicable certificates of approval have been fulfilled.
- (iii) Provisions on lifting attachments are complied with.
- (iv) For packages containing fissile material, the measurement specified in para. 677(b) of the Transport Regulations and the tests to demonstrate closure of each package as specified in para. 680 of the Transport Regulations are required to be performed where applicable.
- (v) For packages intended to be used for shipment after storage, it is required to take into account ageing mechanisms.

546 The transport documents with each consignment (consignment notes) are required to include all relevant particulars of the consignment.

547–553 The consignor is required to include a declaration in the transport documents.

- 554, 555 The consignor is required to provide a statement regarding actions to be taken by the carrier.
- 556 The consignor is required to make competent authority certificates available to the carrier(s) before loading and unloading.
- 557 Delivery of the approval certificate before the first shipment of any package requiring competent authority approval to all competent authorities involved in the shipment, i.e. the competent authority of the country of origin and of each country through or into which the consignment is to be transported.
- 825(c) Multilateral approval is required for shipments where the sum of the CSIs of the packages in a single freight container or in a single conveyance is greater than 50.
- 825(d) Multilateral approval is required for radiation protection programmes for shipments by special use vessels.
- 826 Competent authority authorization of transport without shipment approval.
- 827 Information to be included in an application for shipment approval.
- 828 Shipment approval certificate (as applicable).

8. PROVISIONS CONCERNING
TRANSPORT OPERATIONS

8.1. Modal requirements

- 573 For transport by rail and by road: for consignments under exclusive use, the dose rate 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:

573
(cont.)

- (i) The vehicle is equipped with an enclosure that prevents unauthorized access during transport;
 - (ii) The package or overpack is secured to retain its position within the enclosure during routine transport;
 - (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.
- (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 dose rate greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with table 10 of the Transport Regulations, footnote (a), are not allowed to be transported except 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. 566 of the Transport Regulations relating to TI, CSI and dose rate provided that the conditions stated in para. 576 of the Transport Regulations are met.

579 For transport by air: packages or overpacks having a surface dose rate greater than 2 mSv/h are not allowed to be transported, except under special arrangement.

580, 581 Transport by post is not allowed.

8.2. Placarding

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

543, 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. Any placards that do not relate to the contents are required to be removed.

543, figs 2–6 As an alternative to the use of placards on large freight containers, enlarged labels are permitted.

544, figs 6, 7 Where an exclusive use consignment in a freight container 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 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 Transport Regulations against the white background, or on the placard shown in fig. 7 of the Transport Regulations. If the placard shown in fig. 7 of the Transport Regulations is used, it is required to be fixed immediately adjacent to each main placard.

545 Consignor’s responsibilities.

571, figs 2–6 Requirements on the location of placards and the use of placards with reduced dimensions on a road or rail vehicle.

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

572, figs 6, 7
(cont.) “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 Transport Regulations against the white background or on the placard shown in fig. 7 of the Transport Regulations. If the placard shown in fig. 7 of the Transport Regulations is used, it is required to be fixed immediately adjacent to each main placard.

8.3. Stowage during transport, storage in transit and segregation

506, 562 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 562(a)–(d) and 506 of the Transport Regulations.

563 Category II-YELLOW or category III-YELLOW packages or overpacks are not allowed to be carried in compartments occupied by passengers, except for compartments reserved for specially authorized couriers.

564 Consignments are required to be securely stowed.

565 A package or overpack may be carried or stored among packaged general cargo, subject to certain conditions.

566(a), table 10 TI limits for freight containers and conveyances.

566(b) Limits on the dose rates from freight containers and vehicles. Different limits apply for exclusive use; see remarks on para. 573 of the Transport Regulations in 8.1 above.

566(c), table 11 CSI limits for freight containers and conveyances.

567 Any package or overpack having a TI greater than 10, or any consignment having a CSI greater than 50, is required to be transported under exclusive use.

568, 569,
table 11 Segregation of packages containing fissile material during transport and during storage in transit.

576 For a special use vessel, the storage arrangements are excepted from the requirements of para. 566 of the Transport Regulations provided that the conditions stated in para. 576 of the Transport 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 that are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport.

8.5. Decontamination

505 Freight containers, intermediate bulk containers, tanks, packagings and overpacks used for the transport of radioactive material are not allowed to be used for the storage or transport of other goods, unless decontaminated below the levels specified in the Transport Regulations.

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

513 Decontamination of conveyances and equipment, or parts thereof that have become contaminated, is required.

8.6. Other provisions

309 In the event of non-compliance with any limit in the Transport Regulations applicable to dose rate or contamination, 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 3507

URANIUM HEXAFLUORIDE, RADIOACTIVE MATERIAL,
EXCEPTED PACKAGE, less than 0.1 kg per package, non-fissile or
fissile-excepted

**Paragraph(s) of
the Transport
Regulations [1]**

Subject

1. GENERAL PROVISIONS

110, 507	Transport with other dangerous goods, and other dangerous properties of contents. Uranium hexafluoride has toxic and corrosive properties. When in an excepted package, this material is classified in Class 6 “Toxic and infectious substances”, Division 6.1 “Toxic substances”, with Class 8 “Corrosive substances” and Class 7 “Radioactive material” being subsidiary hazards. This classification has to be taken into account to comply with the applicable transport regulations for dangerous goods.
301–303	General provisions for radiation protection.
304, 305	Emergency response.
306	Management system.
311–315	Training.
419(c)	Classification as uranium hexafluoride, excepted package, less than 0.1 kg per package, non-fissile or fissile-excepted.
424(a)	Retention of contents under routine conditions of transport.

- 504 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.
- 515 Requirements for excepted packages.
- 619–621 Design requirements for all packagings and packages.
- 619–621 Additional design requirements — air transport.
- 801 The consignor is required to demonstrate on request that the package design complies with all applicable competent authority requirements.
- 819 Transitional arrangements for packages designed under the provisions of the 1985 or 1985 (As Amended 1990), 1996, 1996 (Revised), 1996 (As Amended 2003), 2005, 2009 and 2012 Editions of the Transport Regulations.

2. CONTENTS LIMITS FOR PACKAGES

- 420 Contents limits for a package containing uranium hexafluoride.
- 422(e), table 4 The activity limits in table 4 of the Transport Regulations are required to be met.
- 422(e), 425 The package is required to contain less than 0.1 kg of uranium hexafluoride, and to retain its contents under routine conditions of transport.

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 and conveyances is required to be kept as low as practicable and

508, 509
(cont.) is not allowed to exceed the following limits, when averaged over 300 cm² of any part of the surface:

- (a) Beta, gamma and low toxicity alpha emitters, 4 Bq/cm²;
- (b) All other alpha emitters, 0.4 Bq/cm².

4. MAXIMUM DOSE RATES

516 The dose rate 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

424(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; or on the outside of the package, where it is impractical to mark an internal surface.

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 for dangerous goods.

515 Labelling for radioactive contents is not applicable.

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

532 Packages are required to bear the mark “UN 3507”.

- 533 Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass on the outside of the packaging.
- 531–533 All marks are required to be legible and durable, and are required to be on the outside of the packaging.
- 545 It is the consignor's responsibility to comply with the requirements of marking and labelling.

7. REQUIREMENTS BEFORE SHIPMENT

- 503(a), (e) Before each shipment of any package, the following requirements apply:
- (i) The content of the package is in accordance with the specifications of design regarding the radionuclide, its form and physical or chemical state.
 - (ii) All the relevant requirements of the Transport Regulations and applicable certificates of approval have been fulfilled.
 - (iii) Provisions on lifting attachments are complied with.
 - (iv) For packages intended to be used for shipment after storage, it is required to take into account ageing mechanisms.
- 546(a) The transport documents with each consignment (consignment notes) are required to include all relevant particulars of the consignment.

8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

8.1. Modal requirements

- 580, 581 Transport of uranium hexafluoride by post is not allowed.

8.2. Placarding

- 507 Placards may be required for other dangerous properties of the contents, but not for the radioactive properties.
- 545 Consignor's responsibilities.

8.3. Stowage during transport, storage in transit and segregation

Not applicable.

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

8.5. Decontamination

- 505 Freight containers, intermediate bulk containers, tanks, packagings and overpacks used for the transport of radioactive material are not allowed to be used for the storage or transport of other goods, unless decontaminated below the levels specified in the Transport Regulations.
- 512 Periodic checking of conveyances and equipment is required to determine the level of contamination.
- 513 Decontamination of conveyances and equipment, or parts thereof that have become contaminated, is required.

8.6. Other provisions

- 309 In the event of non-compliance with any limit in the Transport

Schedule for UN 3507

- 309
(cont.) Regulations applicable to dose rate or contamination, 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.

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