IAEA SAFETY STANDARDS
for protecting people and the environment

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DRAFT SAFETY GUIDE
DS461

Revision of TS-G-1.6

IAEA
International Atomic Energy Agency
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1. INTRODUCTION

BACKGROUND

1.1. The Regulations for the Safe Transport of Radioactive Material (IAEA Safety Standards Series No. SSR-6, 2012 Edition) [1], henceforth called ‘the Regulations’, establish standards of safety which provide an acceptable level of control of the radiation, criticality and thermal hazards to persons, property and the environment that are associated with the transport of radioactive material. Protection from harmful effects of radiation during the transport of radioactive material is achieved by means of a combination of limitations on the contents of a package according to the quantity and type of radioactivity, the package design, and certain simple handling, storage and stowage precautions that are to be followed during transport.

1.2. While some provisions of the Regulations concern administrative controls (e.g. the requirement for the carrier to apply segregation to limit the radiation level in occupied areas), in 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 Regulations are structured topically in terms of definitions, general provisions, activity limits and classification, requirements and controls for transport, requirements for radioactive materials and for packagings and packages, test procedures, and approval and administrative requirements.

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

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

1.6. Although much of the information may not apply, a user desiring to transport a particular type of consignment of radioactive material would need to study and assimilate requirements from all sections of the Regulations. This Safety Guide aims to aid such users by providing a consolidation of certain requirements of the Regulations for each type of radioactive material, package or shipment. Once a consignor has properly classified the radioactive material to be shipped (following the recommendations provided in Section 2 and Fig. 1 of this Safety Guide), the appropriate UN number can be assigned and the specific requirements for shipment can be found in the corresponding schedule. References are provided so that the Regulations can be readily consulted when necessary.

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

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

SCOPE

1.9. This Safety Guide can be used for all transport of radioactive material. It contains 26 schedules corresponding to the UN numbers and associated proper shipping names for the radioactive material to be shipped.

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

STRUCTURE

1.11. Section 2 describes how the material is to be classified and assigned to the appropriate UN number with the associated proper shipping name. The Safety Guide further contains 26 schedules corresponding to the number of UN numbers and associated proper shipping names for the radioactive material to be shipped.

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

1.13. Each schedule has the same eight subjects:
(1) General provisions;
(2) Contents limits for packages;
(3) Contamination;
(4) Maximum radiation levels;
(5) Categories of packages and overpacks;
(6) Marking and labelling;
(7) Requirements before shipment;
(8) Provisions concerning transport operations.

2. DEFINITIONS AND CLASSIFICATION

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

DEFINITIONS

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

Contamination

“214. Contamination shall mean the presence of a radioactive substance on a surface in quantities in excess of 0.4 Bq/cm² for beta and gamma emitters and low toxicity alpha emitters, or 0.04 Bq/cm² for all other alpha emitters.”

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

**Fissile nuclides and fissile material**

“222. **Fissile nuclides** shall mean uranium-233, uranium-235, plutonium-239, plutonium-241. **Fissile material** shall mean a material containing any of these 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 0.25g;
(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.”

**Low dispersible radioactive material**

“225. **Low dispersible radioactive material** shall mean either a solid **radioactive material** or a solid **radioactive material** in a sealed capsule, that has limited dispersibility and is not in powder form.”

**Low specific activity material**

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

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

**Package**

“231. **Package** shall mean the complete product of the packing operation, consisting of the packaging and its contents prepared for transport. The types of packages covered by these Regulations that are subject to the activity limits and material restrictions of Section IV and meet the corresponding requirements, are:

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

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

Radioactive material

“236. Radioactive material shall mean any material containing radionuclides where both the activity concentration and the total activity in the consignment exceed the values specified in paras 402–407 [of the Regulations].”

Special form radioactive material

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

Surface contaminated object

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

Unilateral approval

“205. 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.”

CLASSIFICATION

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

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

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

2.6. It is clear that it has to be verified that all of the requirements, limitations and prescriptions related to the UN number assigned can be complied with. If not, an alternative UN number will need to be assigned.
2.7. It is possible that for specific cases more than one UN number may be appropriate. In such cases the choice of UN number would be left to the operator or consignor. Two examples of such situations are set out in the following:

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

(2) If the amount of LSA material is such that the radiation level at 3m from the unshielded material is not lower than does not exceed 10 mSv/h, then the consigner has the choice of limiting the amount of LSA material per package accordingly and classifying the package as an IP package, or using a Type B package and assigning the appropriate UN number.
<table>
<thead>
<tr>
<th>UN No.</th>
<th>Proper shipping name</th>
<th>Paragraph number of the Regulations [1] in which contents limits and basic requirements are established</th>
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<tbody>
<tr>
<td>2908</td>
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<td>3507</td>
<td>URANIUM HEXAFLUORIDE — RADIOACTIVE MATERIAL, EXCEPTED PACKAGE, less than 0.1 kg per package, non-fissile or fissile excepted</td>
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<tr>
<td>2912</td>
<td>RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-I) non-fissile or fissile excepted</td>
<td>409 (a), 411, 417</td>
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<td>3321</td>
<td>RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-II) non-fissile or fissile excepted</td>
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<td>3322</td>
<td>RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-III) non-fissile or fissile excepted</td>
<td>409 (c), 410, 411, 417</td>
</tr>
<tr>
<td>3324</td>
<td>RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-II), FISSILE</td>
<td>409 (b), 410, 411, 417</td>
</tr>
<tr>
<td>3325</td>
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<td>409 (c), 410, 411, 417</td>
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<tr>
<td>3326</td>
<td>RADIOACTIVE MATERIAL, SURFACE CONTAMINATED</td>
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</tr>
<tr>
<td>UN No.</td>
<td>Proper shipping name</td>
<td>Paragraph number of the Regulations [1] in which contents limits and basic requirements are established</td>
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<td>3327</td>
<td>RADIOACTIVE MATERIAL, TYPE A PACKAGE, FISSILE, non-special form</td>
<td>417, 418, 429(b), 430</td>
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<td>3332</td>
<td>RADIOACTIVE MATERIAL, TYPE A PACKAGE, SPECIAL FORM, non-fissile or fissile-excepted</td>
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<td>RADIOACTIVE MATERIAL, TYPE A PACKAGE, SPECIAL FORM, FISSILE</td>
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<td><strong>TYPE B(U) PACKAGES</strong></td>
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<tr>
<td>2916</td>
<td>RADIOACTIVE MATERIAL, TYPE B(U) PACKAGE, non-fissile or fissile-excepted</td>
<td>417, 432, 433, 431, 432, 418, 431, 808(a) and 809, 810 (excluding 808(a))</td>
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<td>3328</td>
<td>RADIOACTIVE MATERIAL, TYPE B(U) PACKAGE, FISSILE</td>
<td>417, 432, 433, 431, 432, 418, 431, 808(a) and 809, 810 (excluding 808(a))</td>
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<tr>
<td></td>
<td><strong>TYPE B(M) PACKAGES</strong></td>
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<tr>
<td>2917</td>
<td>RADIOACTIVE MATERIAL, TYPE B(M) PACKAGE, non-fissile or fissile-excepted</td>
<td>417, 432, 433, 811–813</td>
</tr>
<tr>
<td>3329</td>
<td>RADIOACTIVE MATERIAL, TYPE B(M) PACKAGE, FISSILE</td>
<td>417, 432, 433, 418, 811–813</td>
</tr>
<tr>
<td></td>
<td><strong>TYPE C PACKAGES</strong></td>
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<td>3323</td>
<td>RADIOACTIVE MATERIAL, TYPE C PACKAGE, non-fissile or fissile-excepted</td>
<td>417, 432, 808–810 (excluding 808(a))</td>
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<td>3330</td>
<td>RADIOACTIVE MATERIAL, TYPE C PACKAGE, FISSILE</td>
<td>432–417, 418, 432, 808–810</td>
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**SPECIAL ARRANGEMENT**
<table>
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<th>UN No.</th>
<th>Proper shipping name</th>
<th>Paragraph number of the Regulations [1] in which contents limits and basic requirements are established</th>
</tr>
</thead>
<tbody>
<tr>
<td>2919</td>
<td>RADIOACTIVE MATERIAL, TRANSPORTED UNDER SPECIAL ARRANGEMENT, non-fissile or fissile-excepted</td>
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<td>3331</td>
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<td>310, 417, 418, 829–831</td>
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<td><strong>URANIUM HEXAFLUORIDE</strong></td>
<td></td>
</tr>
<tr>
<td>2977</td>
<td>RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE, FISSILE</td>
<td>417, 418, 419, 420, 807</td>
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<tr>
<td>2978</td>
<td>RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE, non-fissile or fissile-excepted</td>
<td>417, 419 (b), 420, 807</td>
</tr>
</tbody>
</table>
Figure 1: FLOW DIAGRAM FOR CLASSIFICATION OF RAM INTO APPROPRIATE UN NUMBER
Footnote:

(1) \( \leq \) Less than or equal to

(2) \( A_{ac} \) Activity limit for an exempt consignment in Tables 2 and 3 of the Regulations

(3) The number in ( ) is the paragraph number or table of the Regulations

(4) Manuf. UFF At least 250 mg of U(3+) or uranium or plutonium or natural thorium

(5) Fissile excepted by para 4.17 should be treated as "No"

(6) LDNM: Low Dispersible Radioactive Material
1. GENERAL PROVISIONS

110, 507 Other dangerous properties of contents and transport with other dangerous goods.
301–303 General provisions for radiation protection.
304, 305 Emergency response.
306 Management system.
311–315 Training.
502, 503 Requirements before each shipment.
515 Requirements — general.

If the excepted package contains fissile material, one of the fissile exceptions provided by para. 417 shall apply.
Fissile material excepted under para. 417 (f) is required to comply with para. 606 and requires multilateral approval by competent authority.

607–618 Design requirements for the packaging and the package.
619–621 Additional design requirements — air transport.
636 Minimum dimensions of a package containing fissile excepted material.
819 Transitional arrangements for packages designed under the provisions of the 1985 or 1985 (As Amended 1990) Editions of the Regulations.

2. CONTENTS LIMITS FOR PACKAGES

Only contamination is allowed (see below).

417 When the package is contaminated by fissile material, one of the fissile exceptions provided by para. 417 shall be complied with if the package contains fissile material, one of the fissile exceptions provided by para. 417 of the Regulations is required to be applied.
Fissile material excepted under para. 417 (f) is required to comply with para. 606 and requires multilateral approval by competent authority.

3. CONTAMINATION

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

508

Non-fixed contamination on the external surfaces of any package is required to be kept as low as practicable and is not allowed to exceed the following limits, averaged over any area of 300 cm\(^2\) of any part of the surface:

(a) Beta, gamma and low toxicity alpha emitters, \(4 \text{ Bq/cm}^2\);
(b) All other alpha emitters, \(0.4 \text{ Bq/cm}^2\).

4. MAXIMUM RADIATION LEVELS

516

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

5. CATEGORIES OF PACKAGES AND OVERPACKS

Not applicable.

6. MARKING AND LABELLING

507

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

531-533

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

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 2908”.

533

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

427(d)

Any labels that may have been displayed in conformity with para. 538 are required to be removed or covered.

545

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

7. REQUIREMENTS BEFORE SHIPMENT

502, 503(a)

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

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

(b) It is required to ensure that lifting attachments which do not meet the requirements of para. 608 of the Regulations have been removed or otherwise rendered incapable of
being used for lifting the package, in accordance with para. 609 of the Regulations.

The transport documents with each consignment (consignment note) are required to include the identification of the consignor and the consignee, including their names and addresses, and the UN number, UN2908.

8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

8.1 Modal requirements

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

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

8.2. Placarding

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

8.3. Stowage during transport, storage in transit and segregation

Not applicable.

8.4. Damaged or leaking packages

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

8.5. Decontamination

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

8.6. Other provisions

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

Transport of empty packaging is subject to additional requirements.

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

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

<table>
<thead>
<tr>
<th>Paragraph(s) of the Regulations [1]</th>
<th>Subject</th>
</tr>
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</table>

1. GENERAL PROVISIONS

110, 507 Other dangerous properties of contents and transport with other dangerous goods.
301–303 General provisions for radiation protection.
304, 305 Emergency response.
306 Management system.
311–315 Training.

426 Specific provision.

502, 503 Requirements before each shipment.
515 Requirements — general.
607–618 Design requirements for the packaging and the package.
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) Editions of the Regulations.

2. CONTENTS LIMITS FOR PACKAGES

426 There is no limit in the quantity of material, the limit is on the material itself and the outer surface.

3. CONTAMINATION

508 Non-fixed contamination on the external surfaces of any package is required to be kept as low as practicable and is not allowed to exceed the following limits, averaged over any area of 300 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 RADIATION LEVELS

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

5. CATEGORIES OF PACKAGES AND OVERPACKS

Not applicable.

6. MARKING AND LABELLING

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

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

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

Packages are required to bear the mark “UN 2909”.

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

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

A consignment may be accepted for international movement by post, subject to such additional requirements as those established in para. 580-581 of the Regulations and as prescribed by the Acts of the Universal Postal Union.

7. REQUIREMENTS BEFORE SHIPMENT

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

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

(b) It is required to ensure that lifting attachments which do not meet the requirements of para. 608 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 609 of the Regulations.

The transport documents with each consignment (consignment note) are required to include the identification of the consignor and consignee, including their names and addresses, and the UN number UN 2909.
8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

8.1. Modal requirements

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

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

8.2. Placarding

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

8.3. Stowage during transport, storage in transit and segregation

Not applicable.

8.4 Damaged or leaking packages

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

8.5 Decontamination

Not applicable.

8.6. Other provisions

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

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

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

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#### 2. CONTENTS LIMITS FOR PACKAGES

**417**

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

Fissile material excepted under para. 417 (f) is required to comply with para. 606 and requires multilateral approval by competent authority.
The activity limits in Table 4 of the Regulations are required to be met.

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 Regulations.

3. CONTAMINATION

Non-fixed contamination on the external surfaces of any package is required to be kept as low as practicable and is not allowed to exceed the following limits, averaged over any area of 300cm² 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 RADIATION LEVELS

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

5. CATEGORIES OF PACKAGES AND OVERPACKS

Not applicable.

6. MARKING AND LABELLING

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.

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, when it is impractical to mark an internal surface.

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

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

Packages are required to bear the mark “UN 2910”.

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

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

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

7. REQUIREMENTS BEFORE SHIPMENT

502, 503(a) Before each shipment of any package, the following requirements apply:
(a) For any package it is required to ensure that all the requirements specified in the relevant provisions of the Regulations have been satisfied.
(b) It is required to ensure that lifting attachments which do not meet the requirements of para. 608 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 609 of the Regulations.

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

8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

8.1. Modal requirements

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

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

8.2. Placarding

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

8.3. Stowage during transport, storage in transit and segregation

Not applicable.

8.4. Damaged or leaking packages

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

8.5. Decontamination
8.6. Other provisions

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

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

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**

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<td>If the excepted package contains fissile material, one of the fissile exceptions provided by para. 417 shall apply.</td>
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<td>801</td>
<td>The consignor is required to demonstrate on request that the package design complies with all applicable competent authority requirements.</td>
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<td>819</td>
<td>Transitional arrangements for packages designed under the provisions of the 1985 or 1985 (As Amended 1990) Editions of the Regulations.</td>
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#### 2. CONTENTS LIMITS FOR PACKAGES

**417**

If the package contains fissile material, one of the fissile exceptions provided by para. 417 of the Regulations is required to be applied. Fissile material excepted under para. 417 (f) is required to comply with para. 606 and requires multilateral approval by competent authority.

**422(b), 423, Table 4**

The activity limits in Table 4 of the 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).

423, Table 4
For transport by post, the total activity in each package does not exceed one tenth of the relevant limit in Table 4 of the Regulations.

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

3. CONTAMINATION

508 Non-fixed contamination on the external surfaces of any package is required to be kept as low as practicable and is not allowed to exceed the following limits, averaged over any area of 300 cm$^2$ 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 RADIATION LEVELS

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

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

5. CATEGORIES OF PACKAGES AND OVERPACKS

Not applicable

6. MARKING AND LABELLING

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

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. 423.512(b) of the Regulations.

531-533 All package markings are required to be legible and durable, and are required to be on the outside of the packaging.

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

532 Packages are required to bear the mark “UN 2911”.

22
Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass.

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

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

7. REQUIREMENTS BEFORE SHIPMENT

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

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

(b) It is required to ensure that lifting attachments which do not meet the requirements of para. 608 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 609 of the Regulations.

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

8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

8.1. Modal requirements

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

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

8.2. Placarding

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

8.3. Stowage during transport, storage in transit and segregation

Not applicable.

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

8.5. Decontamination

Not applicable.

8.6. Other provisions

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

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

Where a consignment is undeliverable, appropriate actions are required to be taken as soon as possible.
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2. CONTENTS LIMITS FOR PACKAGES
LSA-I definition and criteria.

If the package contains fissile material, one of the fissile exceptions provided by para. 417 of the Regulations is required to be applied. Fissile material excepted under para. 417 (f) is required to comply with para. 606 and requires multilateral approval by competent authority.

The contents are required to be restricted in accordance with the radiation levels specified in para. 517 of the Regulations.

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.

LSA-I and SCO-I may be transported unpackaged under the conditions as stated in para. 520 of the Regulations.

No Activity limits

3. Contamination

Non-fixed contamination on the external surfaces of any package and on the external and internal surfaces of overpacks, freight containers, tanks, intermediate bulk containers and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over 300 cm$^2$ 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$^2$.

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

4. Maximum Radiation Levels

(i) The radiation level for a package or overpack is required to be such that the transport index (TI) of the package or overpack does not exceed 10, except when transported under exclusive use, and

(ii) The maximum radiation level at any point on any external surface of the package or overpack is not allowed to exceed 2 mSv/h, except when the package or overpack is transported under exclusive use by rail or by road, or under exclusive use by sea$^1$, and

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

$^1$ Packages or overpacks having a surface radiation level greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels in accordance with Table 10 of the Regulations, footnote (a), provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel.
5. CATEGORIES OF PACKAGES AND OVERPACKS

521, Table 5  LSA material and SCO are required to be packaged in accordance with Table 5 of the Regulations.

523, 524  The TI is required to be derived in accordance with the procedure as stated in paras 523 and 524 of the 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.

531  Each package is required to be marked with an identification of either the consignor or the consignee, or both. All markings are required to be legible and durable, and are required to be on the outside of the packaging.

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.

534(a)  Each package which conforms to an IP-1 or IP-2 design is required to be marked with “TYPE IP-1” or “TYPE IP-2” as appropriate.

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

537  When the material is contained in receptacles or wrapping and is transported under exclusive use, it may be marked “RADIOACTIVE LSA-I”.

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

538, 543, Figs 2–4  Each package, overpack and freight container is required to bear the appropriate labels. Paragraph 543 of the Regulations sets out alternative provisions for large freight containers and tanks.

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 markings specified in paras 531–536 and para. 537 of the Regulations (see above).
The contents need to be marked on the label only as “LSA-I”.

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

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

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

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

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

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

7. REQUIREMENTS BEFORE SHIPMENT

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

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

(a) For any package it is required to ensure that all the requirements specified in the relevant provisions of the Regulations have been satisfied.
(b) It is required to ensure that lifting attachments which do not meet the requirements of para. 608 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 609 of the Regulations.

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

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

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

8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

8.1. Modal requirements

For transport by rail and by road: for consignments under exclusive use, the radiation level is not allowed to exceed:

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

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

(iii) There are no loading or unloading operations between the beginning and the end of the shipment;
(b) 2 mSv/h at any point on the outer surfaces of the vehicle, including the upper and lower surfaces, or, in the case of an open vehicle, at any point on the vertical planes projected from the outer edges of the vehicle, on the upper surface of the load, and on the lower external surface of the vehicle; and
(c) 0.1 mSv/h at any point 2 m from the vertical planes represented by the outer lateral surfaces of the vehicle, or, if the load is transported in an open vehicle, at any point 2 m from the vertical planes projected from the outer edges of the vehicle.

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.

For transport by vessels: packages or overpacks having a surface radiation level greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with Table 10 of the Regulations, footnote (a), are not allowed to be transported.

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 Regulations relating to T1 and radiation level provided that the conditions stated in para. 576 of the Regulations are met.

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

Transport by post is not permitted.

8.2. Placarding

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

Consignor’s responsibilities

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

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

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

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

8.3. Stowage during transport, storage in transit and segregation

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 para. 506 of the Regulations.

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

8.4. Damaged or leaking packages

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.

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

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

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

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

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

8.6. Other provisions

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

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

Where a consignment is undeliverable, appropriate actions are required to be taken as soon as possible.
SCHEDULE FOR UN 2913
RADIOACTIVE MATERIAL, SURFACE CONTAMINATED OBJECTS (SCO-I OR SCO-II) non-fissile or fissile-excepted

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<td>417</td>
<td>If the package contains fissile material, one of the fissile exceptions provided by para. 417 of the Regulations is required to be applied. Fissile material excepted under para. 417 (f) is required to comply with para. 606 and requires multilateral approval by competent authority.</td>
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2. CONTENTS LIMITS FOR PACKAGES

| 413                                    | SCO-I and II definition and criteria.                                   |
| 417                                    | If the package contains fissile material, one of the fissile exceptions provided by para. |

32
417. of the Regulations is required to be applied. Fissile material excepted under para. 417 (f) is required to comply with para. 606 and requires multilateral approval by competent authority.

414, 517

The contents are required to be restricted in accordance with the radiation levels specified in para. 517 of the Regulations.

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.

520

LSA-I and SCO-I may be transported unpackaged under the conditions as stated in para. 520 of the 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, tanks, intermediate bulk containers and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over 300cm² 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

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

4. MAXIMUM RADIATION LEVELS

526–528, 575

(i) The radiation level for a package or overpack is required to be such that the TI of the package or overpack does not exceed 10, except when transported under exclusive use, and

(ii) The maximum radiation level at any point on any external surface of the package or overpack is not allowed to exceed 2 mSv/h, except when transported under exclusive use by rail or by road, or under exclusive use by sea**, and

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

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

5. CATEGORIES OF PACKAGES AND OVERPACKS

521, Table5

LSA material and SCO are required to be packaged in accordance with Table 5 of the
The TI is required to be derived in accordance with the procedure as stated in paras 523 and 524 of the Regulations.

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

6. MARKING AND LABELLING

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.

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

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

Packages are required to bear the mark “UN 2913” and the proper shipping name, either “RADIOACTIVE MATERIAL, SURFACE CONTAMINATED OBJECTS (SCO-I)” or “RADIOACTIVE MATERIAL, SURFACE CONTAMINATED OBJECTS (SCO-II)”, depending on the contents.

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

Each package which conforms to an IP-1 or IP-2 design is required to be marked with “TYPE IP-1” or “TYPE IP-2” as appropriate.

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

When the material is contained in receptacles or wrapping and is transported under exclusive use, it may be marked “RADIOACTIVE SCO-I”.

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

Each package, overpack and freight container is required to bear the appropriate labels. Paragraph 543 of the Regulations sets out alternative provisions for large freight containers and tanks.

The labels are required to be fixed to two opposite sides of the outside of the package or overpack, or on all four sides of a freight container or tank. The labels are not allowed to cover the markings specified in paras 531–536 and para. 537 of the Regulations (see above).

Each label is required to be marked with the name(s) of the radionuclide(s), followed by either “SCO-I” or “SCO-II”, as applicable. Paragraph 540(a) of the Regulations also establishes requirements for labelling mixtures of radionuclides.
The maximum activity of the contents is required to be marked on the label.

Except for mixed loads, each label on a freight container or overpack is required to be marked with
(a) The radioactive contents; and
(b) The maximum activity of the total radioactive contents during transport.
For mixed loads such entries may read “See Transport Documents”.

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

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

7. REQUIREMENTS BEFORE SHIPMENT

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

Before each shipment of any package, the following requirements apply:
(a) For any package it is required to ensure that all the requirements specified in the relevant provisions of the Regulations have been satisfied.
(b) It is required to ensure that lifting attachments which do not meet the requirements of para. 608 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 609 of the Regulations.

Transport documents with each consignment (consignment note) are required to include all relevant particulars of the consignment.
The consignor is required to include a declaration in the transport documents.
The consignor is required to provide a statement regarding actions to be taken by the carrier.

Radiation protection programmes for shipments by special use vessel.
Competent authority authorization of transport without shipment approval.

8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

8.1. Modal requirements

For transport by rail and by road: for consignments under exclusive use, the radiation level is not allowed to exceed:
(a) 10 mSv/h at any point on the external surface of any package or overpack, and may
only exceed 2 mSv/h provided that:

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

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

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

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

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

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.

For transport by vessels: packages or overpacks having a surface radiation level greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with Table 10 of the Regulations, footnote (a), are not allowed to be transported.

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 Regulations relating to TI and radiation level provided that the conditions stated in para. 576 of the Regulations are met.

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

Transport by post is not permitted.

8.2. Placarding

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

Consignor’s responsibilities

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

As an alternative to the use of placards on large freight containers, enlarged labels are permitted.

Where the consignment in the freight container is unpackaged SCO-I, or where an exclusive use consignment in a freight container is packaged UN 2913 SCO-I or SCO-II, and no other UN number commodities are present, the UN number “UN 2913” is required to be displayed on all four sides of the freight container, in black digits not less
than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

571, Figs 2–4, Fig. 6

The location of placards and the use of placards with reduced dimensions on a road or rail vehicle are stipulated.

572, Figs 6, 7

Where the consignment in or on a road or rail vehicle is unpackaged UN 2913 SCO-I only, or where an exclusive use consignment is packaged UN 2913 SCO-I or SCO-II only, and no other UN number commodities are present, the UN number “UN 2913” is required to be displayed, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

8.3. Stowage during transport, storage in transit and segregation

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)–562(d) and para. 506 of the Regulations.

562(a)

Criteria for segregation from workers in regularly occupied working areas.

562(b)

Criteria for segregation from members of the public.

562(c)

Criteria for segregation from undeveloped photographic film.

562(d), 506

Criteria for segregation from other dangerous goods.

563

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

564

Consignments are required to be securely stowed.

565

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

566(a), Table 10

Transport index limits for freight containers and conveyances.

566(b)

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

567

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

576

For a special use vessel, the storage arrangements are excepted from the requirements of para. 566 of the Regulations provided that the conditions stated in para. 576 of the Regulations are met.

8.4. Damaged or leaking packages

510

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

8.5. Decontamination

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

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

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

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

8.6. Other provisions

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

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

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

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<th>Subject</th>
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<tr>
<td>311–315</td>
<td>Training.</td>
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<tr>
<td>417</td>
<td>If the package contains fissile material, one of the fissile exceptions provided by para. 417 of the Regulations is required to be applied. Fissile material excepted under para. 417(f) is required to comply with para. 606 and requires multilateral approval by competent authority.</td>
</tr>
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<td>651</td>
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<td>The consignor is required to demonstrate on request that the package design complies with all applicable competent authority requirements.</td>
</tr>
<tr>
<td>819</td>
<td>Transitional arrangements for packages designed under the provisions of the 1985 or 1985 (As Amended 1990) Editions of the Regulations.</td>
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</table>

2. CONTENTS LIMITS FOR PACKAGES

| 417                                    | If the package contains fissile material, one of the fissile exceptions provided by para. 417 of the Regulations is required to be applied. |
Fissile material excepted under para. 417 (f) is required to comply with para. 606 and requires multilateral approval by competent authority.

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

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

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

3. CONTAMINATION

Non-fixed contamination on the external surfaces of any package and on the external and internal surfaces of overpacks, freight containers, tanks, intermediate bulk containers and conveyances is required to be kept as low as practicable and not exceed the following limits, when averaged over any area of 300 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 RADIATION LEVELS

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

** Packages or overpacks having a surface radiation level greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels in accordance with Table 10 of the Regulations, footnote (a), provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel.

5. CATEGORIES OF PACKAGES AND OVERPACKS

The TI is required to be derived in accordance with the procedure as stated in paras 523 and 524 of the Regulations.

Packages and overpacks are required to be assigned to category I-WHITE, category II-
6. MARKING AND LABELLING

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

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

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

Packages are required to bear the mark “UN 2915” and the proper shipping name “RADIOACTIVE MATERIAL, TYPE A PACKAGE”.

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

Each package is required to be marked with “TYPE A”.

Each package is required to be marked with the international vehicle registration code (VRI Code) of the country of origin of design and either the name of the manufacturer or other identification of the packaging specified by the competent authority of the country of origin of the design.

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

Paragraph 543 of the Regulations sets out alternative provisions for large freight containers.

The labels are required to be fixed to two opposite sides of the outside of the package or overpack, or on all four sides of a freight container. The labels are not allowed to cover the markings specified in paras 531–536 of the Regulations.

Each label is required to be marked with the name(s) of the radionuclide(s), the maximum activity of the contents and the TI, except for category I-WHITE, for which the TI is not required. Paragraph 540(a) of the Regulations establishes requirements for labelling mixtures of radionuclides.

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

(a) The radioactive contents; and

(b) The maximum activity of the total radioactive contents during transport.

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

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

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

502, 503(a) Before each shipment of any package, the following requirements apply:
(a) For any package it is required to ensure that all the requirements specified in the relevant provisions of the Regulations have been satisfied.
(b) It is required to ensure that lifting attachments which do not meet the requirements of para. 608 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 609 of the Regulations.

546 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), 826 Radiation protection programmes for shipments by special use vessel.
Competent authority authorization of transport without shipment approval.

8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

8.1. Modal requirements

573(a)–(c) For transport by rail and by road, for consignments under exclusive use, the radiation level is not allowed to exceed:
(a) 10 mSv/h at any point on the external surface of any package or overpack, and may only exceed 2 mSv/h provided that:
(i) The vehicle is equipped with an enclosure which prevents unauthorized access during transport; and
(ii) The package or overpack is secured to retain its position within the enclosure during routine transport; and
(iii) There are no loading or unloading operations between the beginning and the end of the shipment;
(b) 2 mSv/h at any point on the outer surfaces of the vehicle, including the upper and lower surfaces, or, in the case of an open vehicle, at any point on the vertical planes projected from the outer edges of the vehicle, on the upper surface of the load, and on the lower external surface of the vehicle; and
(c) 0.1 mSv/h at any point 2 m from the vertical planes represented by the outer lateral surfaces of the vehicle, or, if the load is transported in an open vehicle, at any point 2 m from the vertical planes projected from the outer edges of the vehicle.

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

For transport by vessels: packages or overpacks having a surface radiation level greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with Table 10 of the Regulations, footnote (a), are not allowed to be transported.

For transport by vessels: the transport of consignments by means of a special use vessel may be excepted from the requirements of para. 566 of the Regulations provided that the conditions stated in para. 576 of the Regulations are met.

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

Transport by post is not permitted.

### 8.2. Placarding

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

**Consignor's responsibilities**

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

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

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

The location of placards and the use of placards with reduced dimensions on a road or rail vehicle are stipulated.

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

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

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)–562(d) and para. 506 of the Regulations.
562(a) Criteria for segregation from workers in regularly occupied working areas.

562(b) Criteria for segregation from members of the public.

562(c) Criteria for segregation from undeveloped photographic film.

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

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

564 Consignments are required to be securely stowed.

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

566(a), Table 10 Transport index limits for freight containers and conveyances.

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

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

576 For a special use vessel, the storage arrangements are excepted from the requirements of para. 566 of the Regulations provided that the conditions stated in para. 576 of the Regulations are met

8.4. Damaged or leaking packages

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

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

8.5. Decontamination

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

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

8.6. Other provisions

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

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

583 Where a consignment is undeliverable, appropriate actions are required to be taken as soon as possible.
### SCHEDULE FOR UN 2916

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

<table>
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<th>Subject</th>
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<tbody>
<tr>
<td>110, 507</td>
<td>General provisions for other dangerous properties of contents and transport with other dangerous goods.</td>
</tr>
<tr>
<td>301–303</td>
<td>General provisions for radiation protection.</td>
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<tr>
<td>304, 305, 554(c)</td>
<td>Emergency response.</td>
</tr>
<tr>
<td>306</td>
<td>Management system.</td>
</tr>
<tr>
<td>311–315</td>
<td>Training.</td>
</tr>
<tr>
<td>417</td>
<td>If the package contains fissile material, one of the fissile exceptions provided by para. 417 of the Regulations is required to be applied. Fissile material excepted under para. 417 (f) is required to comply with para. 606 and requires multilateral approval by competent authority.</td>
</tr>
<tr>
<td>501(a), (b)</td>
<td>Requirements before the first shipment.</td>
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<tr>
<td>502, 503</td>
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<tr>
<td>561</td>
<td>Possession of package design certificates, and instructions for (a) the proper closing of the package and (b) other preparations for shipment.</td>
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<tr>
<td>652</td>
<td>Design requirements for Type B(U) packages, summary.</td>
</tr>
<tr>
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2. CONTENTS LIMITS FOR PACKAGES

If the package contains fissile material, one of the fissile exceptions provided by para. 417 of the Regulations is required to be applied. Fissile material excepted under para. 417 (f) is required to comply with para. 606 and requires multilateral approval by competent authority.

The quantity of radioactive material is not allowed to exceed the limits specified in paras 432 and 433 of the Regulations.

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

3. CONTAMINATION

Non-fixed contamination on the external surfaces of any package and on the external and internal surfaces of overpacks, freight containers, tanks, intermediate bulk containers and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over any area of 300 cm$^2$ 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 RADIATION LEVELS

(i) The radiation level for a package or overpack is required to be such that the TI of the package or overpack does not exceed 10, except when transported under exclusive use; and

(ii) The maximum radiation level at any point on any external surface of the package or overpack is not allowed to exceed 2 mSv/h, except when transported under exclusive use by rail or by road, or under exclusive use by sea; and

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

$^1$ Packages or overpacks having a surface radiation level greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels in accordance with Table 10 of the Regulations, footnote (a), provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel.

5. CATEGORIES OF PACKAGES AND OVERPACKS

The TI is required to be derived in accordance with the procedure as stated in paras 523 and 524 of the Regulations.
Packages and overpacks are required to be assigned to category I-WHITE, category II-YELLOW or category III-YELLOW.

6. MARKING AND LABELLING

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

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

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

Packages are required to bear the mark “UN 2916” and the proper shipping name “RADIOACTIVE MATERIAL, TYPE B(U) PACKAGE”.

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

Each package is required to be marked with:
(a) The identification mark allocated to that design by the competent authority;
(b) A serial number to uniquely identify each packaging which conforms to that design;
(c) “TYPE B(U)”

The outside of the outermost receptacle which is resistant to the effects of fire and water is required to be plainly marked by embossing, stamping, or other means resistant to the effects of fire and water, with the trefoil symbol shown in Fig. 1 of the Regulations.

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

Each package, overpack and freight container is required to bear the appropriate labels. Paragraph 543 of the Regulations sets out alternative provisions for large freight containers and tanks.

The labels are required to be fixed to two opposite sides of the outside of the package or overpack, or on all four sides of a freight container or tank, and are not allowed to cover the markings specified in paras 531-536 of the Regulations.

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

Except for mixed loads, each label on a freight container or overpack is required to be marked with
(a) The radioactive contents; and
(b) The maximum activity of the total radioactive contents during transport.

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

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

7. REQUIREMENTS BEFORE SHIPMENT

501(a), (b)

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

502, 503(a), (b), (c)

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

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

(b) It is required to ensure that lifting attachments which do not meet the requirements of para. 608 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 609 of the Regulations.

(c) For each package, it is required to ensure that all the requirements specified in the competent authority approval certificates have been satisfied.

(d) Each package is required to be held until equilibrium conditions have been approached closely enough to demonstrate compliance with the requirements for temperature and pressure unless an exemption from these requirements has received unilateral approval.

(e) For each package, it is required to ensure by inspection and/or appropriate tests that all closures, valves and other openings of the containment system through which the radioactive contents might escape are properly closed and, where appropriate, sealed in the manner for which the demonstrations of compliance with the requirements of paras 659 and 671 of the Regulations were made.

(f) For each special form radioactive material, it is required to ensure that all the requirements specified in the approval certificate and the relevant provisions of the Regulations have been satisfied.

(h) For each low dispersible radioactive material, it is required to ensure that all the requirements specified in the approval certificate and the relevant provisions of the Regulations have been satisfied.

546

Transport documents with each consignment (consignment note) 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

Before the first shipment, the consignor is required to ensure that copies of each competent authority certificate applying to that package design have been submitted to the competent authority of each country through or into which the consignment is to be transported. The consignor is not required to await an acknowledgement from the competent authority, nor is the competent authority required to make an acknowledgement of receiving the
For each shipment containing radioactive material with an activity greater than 3000\( \mu \)Ci or 3000\( \mu \)Ci, as appropriate, or 1000TBq, whichever is the lower, the consignor is required to notify the competent authority of each country through or into which the consignment is to be transported. This notification is required to have been received by each competent authority prior to the commencement of the shipment, and preferably at least 7 days in advance. See also para. 559 of the Regulations.

The notification referred to in para. 558 of the Regulations is required to include:

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

Radiation protection programmes for shipments by special use vessel.

Competent authority authorization of transport without shipment approval.

8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

8.1. Modal requirements

Conditions for air transport.

For transport by rail and by road: for consignments under exclusive use, the radiation level is not allowed to exceed:

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

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.

For transport by vessels: Packages or overpacks having a surface radiation level greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with Table 10 of the Regulations, footnote (a), are not allowed to be transported.

For transport by vessels: the transport of consignments by means of a special use vessel may be excepted from the requirements of para. 5.66 of the Regulations relating to TI and radiation level provided that the conditions stated in para. 5.76 of the Regulations are met.

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

Transport by post is not permitted.

8.2. Placarding

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

Consignor’s responsibilities

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

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

Where an exclusive use consignment in a freight container is UN 2916 Type B(U) packages, and no other UN number commodities are present, the UN number “UN 2916” is required to be displayed on all four sides of the freight container, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

The location of placards and the use of placards with reduced dimensions on a road or rail vehicle are stipulated.

Where an exclusive use consignment in or on a road or rail vehicle is UN 2916 Type B(U) packages only, and no other UN number commodities are present, the UN number “UN 2916” is required to be displayed, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

8.3. Stowage during transport, storage in transit and segregation
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)–562(d) and para. 506 of the Regulations.

562(a) Criteria for segregation from workers in regularly occupied working areas.

562(b) Criteria for segregation from members of the public.

562(c) Criteria for segregation from undeveloped photographic film.

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

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

564 Consignments are required to be securely stowed.

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

566(a), Table 10 Transport index limits for freight containers and conveyances.

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

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

576 For a special use vessel, the storage arrangements are excepted from the requirements of para. 566 of the Regulations provided that the conditions stated in para. 576 of the Regulations are met.

8.4. Damaged or leaking packages

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

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

8.5. Decontamination

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

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

8.6 Other Provisions

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

582 Customs operations may be carried out only in a place where adequate means of controlling radiation exposure are provided.
Where a consignment is undeliverable, appropriate actions are required to be taken as soon as possible.
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2. CONTENTS LIMITS FOR PACKAGES

If the package contains fissile material, one of the fissile exceptions provided by para. 417 of the Regulations is required to be applied. Fissile material excepted under para. 417 (f) is required to comply with para. 606 and requires multilateral approval by competent authority.

The quantity of radioactive material is not allowed to exceed the limits specified in paras 432 and 433 of the Regulations.

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

3. CONTAMINATION

Non-fixed contamination on the external surfaces of any package and on the external and internal surfaces of overpacks, freight containers, tanks, intermediate bulk containers and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over any area of 300 cm$^2$ 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 RADIATION LEVELS

(i) The radiation level for a package or overpack is required to be such that the TI of the package or overpack does not exceed 10, except when transported under exclusive use, and

(ii) The maximum radiation level at any point on any external surface of the package or overpack is not allowed to exceed 2 mSv/h, except when transported under exclusive use by rail or by road, or under exclusive use by sea**; and

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

** Packages or overpacks having a surface radiation level greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels in accordance with Table 10 of the Regulations, footnote (a), provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel.

5. CATEGORIES OF PACKAGES AND OVERPACKS
523, 524 The TI is required to be derived in accordance with the procedure as stated in paras 523 and 524 of the Regulations.

529, Table 8 Packages and overpacks are required to be assigned to category 1-WHITE, category 2-YELLOW or category 3-YELLOW.

6. MARKING AND LABELLING

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

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

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

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.

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 which conforms to that design;
(c) “TYPE B(M)”.

536, Fig. 1 The outside of the outermost receptacle which is resistant to the effects of fire and water is required to be plainly marked by embossing, stamping, or other means resistant to the effects of fire and water, with the trefoil symbol shown in Fig. 1 of the Regulations.

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

538, 543, Figs 2–4 Each package, overpack and freight container is required to bear the appropriate labels. Paragraph 543 of the Regulations sets out alternative provisions for large freight containers and tanks.

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 markings specified in paras 531–536 of the Regulations.

540(a), (b), (d), Table 2 Each label is required to be marked with the name(s) of the radionuclide(s), the maximum activity of the contents and the TI. Paragraph 540(a) of the Regulations 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
(a) The radioactive contents; and
(b) The maximum activity of the total radioactive contents during transport.
For mixed loads such entries may read “See Transport Documents”.

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

7. REQUIREMENTS BEFORE SHIPMENT

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

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

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

(b) It is required to ensure that lifting attachments which do not meet the requirements of para. 608 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 609 of the Regulations.

(c) For each package, it is required to ensure that all the requirements specified in the competent authority approval certificates have been satisfied.

(d) Each package is required to be held until equilibrium conditions have been approached closely enough to demonstrate compliance with the requirements for temperature and pressure unless an exemption from these requirements has received unilateral approval.

(e) For each package, it is required to ensure by inspection and/or appropriate tests that all closures, valves and other openings of the containment system through which the radioactive contents might escape are properly closed and, where appropriate, sealed in the manner for which the demonstrations of compliance with the requirements of paras 659 and 671 of the Regulations were made.

(f) For each special form radioactive material, it is required to ensure that all the requirements specified in the approval certificate and the relevant provisions of the Regulations have been satisfied.

(g) For each low dispersible radioactive material, it is required to ensure that all the requirements specified in the approval certificate and the relevant provisions of the Regulations have been satisfied.

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

For each shipment, the consignor is required to notify the competent authority of each country through or into which the consignment is to be transported. This notification is required to have been received by each competent authority prior to the commencement of the shipment, and preferably at least 7 days in advance. See also para. 559 of the Regulations.

The notification referred to in para. 558 of the Regulations is required to include:
(a) Clear identification of the package, including all applicable certificate numbers and identification marks;
(b) The date of shipment, the expected date of arrival and the proposed routeing;
(c) The names of the radioactive materials or nuclides;
(d) Descriptions of the physical and chemical forms of the radioactive material, or whether it is special form radioactive material or low dispersible radioactive material;
(e) The maximum activity of the radioactive contents during transport, expressed in becquerels (Bq) with the appropriate SI prefix symbol (see Annex II of the Regulations).

Separate notification is not required if the information has been included in the application for shipment approval (see para. 827 of the Regulations).

Shipments — competent authority approval.

Shipments — competent authority authorization of transport without shipment approval.

Radiation protection programmes for shipments by special use vessel.

Competent authority authorization of transport without shipment approval.

Information to be included in an application for shipment approval.

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

8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

8.1. Modal requirements

Conditions for air transport.

For transport by rail and by road: for consignments under exclusive use, the radiation level is not allowed to exceed:
(a) 10 mSv/h at any point on the external surface of any package or overpack, and may only exceed 2 mSv/h provided that:
   (i) The vehicle is equipped with an enclosure which prevents unauthorized access during transport; and
(ii) The package or overpack is secured to retain its position within the enclosure during routine transport; and

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

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

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

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.

For transport by vessels: packages or overpacks having a surface radiation level greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with Table 10 of the Regulations, footnote (a), are not allowed to be transported.

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 Regulations relating to T1 and radiation level provided that the conditions stated in this para. 576 of the Regulations are met.

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

Transport by post is not permitted.

8.2. Placarding

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

Consignor's responsibilities

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

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

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

8.3. Stowage during transport, storage in transit and segregation

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) to 562(d) and para. 506 of the Regulations.

Criteria for segregation from workers in regularly occupied working areas.

Criteria for segregation from members of the public.

Criteria for segregation from undeveloped photographic film.

Criteria for segregation from other dangerous goods.

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

Consignments are required to be securely stowed.

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

Transport index limits for freight containers and conveyances.

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

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

For a special use vessel, the storage arrangements are excepted from the requirements of para. 566 of the Regulations provided that the conditions stated in para. 576 of the Regulations are met.

8.4. Damaged or leaking packages
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.

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

8.5. Decontamination

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

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

8.6. Other provisions

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

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

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

Intermittent venting of Type B(M) packages may be permitted during transport under certain conditions.
### SCHEDULE FOR UN 2919
**RADIOACTIVE MATERIAL, TRANSPORTED UNDER SPECIAL ARRANGEMENT, non-fissile or fissile-excepted**

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<td>Management system.</td>
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<td>310</td>
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<td>311–315</td>
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</table>

**417**

If the package contains fissile material, one of the fissile exceptions provided by para. 417 of the Regulations is required to be applied. Fissile material excepted under para. 417(f) is required to comply with para. 606 and requires multilateral approval by competent authority.

| 501(a), (b)                           | Requirements before the first shipment. |
| 502, 503                              | Requirements before each shipment. |
| 561                                   | Possession of package design approval certificates, and possession of instructions for (a) the proper closing of the package and (b) other preparations for shipment. |
| 602–604                               | Additional design requirements for special form radioactive material. |
| 605                                   | Additional design requirements for low dispersible radioactive material. |
| 607–618                               | Design requirements for all packagings and packages. |
| 619–621                               | Additional design requirements — air transport. |
| 636–647, 648(b)                       | Additional design requirements for Type A packages. |
| 649                                   | Additional design requirements for packages containing liquids. |
| 653–666                               | Additional design requirements for Type B(U) packages. |
| 667                                   | Design requirements for Type B(M) packages, summary and exceptions. |
| 669                                   | Design requirements for Type C packages. |
| 802(b)                                | Special arrangements – competent authority approval. |
Design requirements for special form radioactive material and low dispersible radioactive material — competent authority approval.

Package design requirements — competent authority approval.


Packaging serial numbers — informing the competent authority.

**2. CONTENTS LIMITS FOR PACKAGES**

If the package contains fissile material, one of the fissile exceptions provided by para. 417 of the Regulations is required to be applied. Fissile material excepted under para. 417 (f) is required to comply with para. 606 and requires multilateral approval by competent authority.

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.

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

**3. CONTAMINATION**

Non-fixed contamination on the external surfaces of any package and on the external and internal surfaces of overpacks, freight containers, tanks, intermediate bulk containers and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over any area of 300cm² 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 RADIATION LEVELS**

(i) The radiation level for a package or overpack is required to be such that the TI of the package or overpack does not exceed 10, except when transported under exclusive use, and

(ii) The maximum radiation level at any point on any external surface of the package or overpack is not allowed to exceed 2 mSv/h, except when transported under exclusive use by rail or by road, or under special arrangement by air or by sea, and

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

5. CATEGORIES OF PACKAGES AND OVERPACKS

523, 524 The TI is required to be derived in accordance with the procedure as stated in paras 523 and 524 of the Regulations.

529, 530 A package, or an overpack containing packages, transported under special arrangement is required to be assigned to category III-YELLOW, except under certain provisions stated in para. 530 of the Regulations.

6. MARKING AND LABELLING

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

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

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

530, 532, Table 9 Except under certain provisions stated in para. 530 of the Regulations, and except in case of uranium hexafluoride where provisions in para 419 of the Regulations apply, packages are required to bear the mark “UN 2919” and the proper shipping name “RADIOACTIVE MATERIAL, TRANSPORTED UNDER SPECIAL ARRANGEMENT”. Packages are required to bear the mark “UN 2919” and the proper shipping name “RADIOACTIVE MATERIAL, TRANSPORTED UNDER SPECIAL ARRANGEMENT”.

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

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 which conforms to that design;
(c) In the case of a Type B(U) or Type B(M) package design, with “TYPE B(U)” or “TYPE B(M)”;
(d) In the case of a Type C package design, with “TYPE C”.
For Type B(U), Type B(M) or TYPE C packages, the outside of the outermost receptacle which is resistant to the effects of fire and water is required to be plainly marked by embossing, stamping, or other means resistant to the effects of fire and water, with the trefoil symbol shown in Fig. 1 of the Regulations.

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

Each package, overpack and freight container is required to bear the appropriate labels. Paragraph 543 of the Regulations sets out alternative provisions for large freight containers and tanks.

The labels are required to be fixed to two opposite sides of the outside of the package or overpack, or on all four sides of a freight container or tank. The labels are not allowed to cover the markings specified in paras 531-536 of the Regulations.

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

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

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

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

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

7. REQUIREMENTS BEFORE SHIPMENT

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

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

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

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

(c) For each package, it is required to ensure that all the requirements specified in the competent authority approval certificates have been satisfied.

(d) Each Type B(U), Type B(M) and Type C package is required to be held until equilibrium conditions have been approached closely enough to demonstrate compliance with the requirements for temperature and pressure unless an exemption from these requirements has received unilateral approval.

(e) For each Type B(U), Type B(M) and Type C package, it is required to ensure by inspection and/or appropriate tests that all closures, valves and other openings of the containment system through which the radioactive contents might escape are properly
closed and, where appropriate, sealed in the manner for which the demonstrations of compliance with the requirements of paras 657 and 669 of the Regulations were made.

(vi) For each special form radioactive material, it is required to ensure that all the requirements specified in the approval certificate and the relevant provisions of the Regulations have been satisfied.

(vii) For each low dispersible radioactive material, it is required to ensure that all of the requirements specified in the approval certificate and the relevant provisions of the Regulations have been satisfied.

546 Transport documents with each consignment (consignment note) 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) For each shipment, the consignor is required to notify the competent authority of each country through or into which the consignment is to be transported. This notification is required to have been received by each competent authority prior to the commencement of the shipment, and preferably at least 7 days in advance. See also para. 559 of the Regulations.

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

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

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

825(d), 826 Radiation protection programmes for shipments by special use vessel.

Competent authority authorization of transport without shipment approval.

829–831 Approval of shipments under special arrangement.

8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

8.1. Modal requirements

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

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

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

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

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

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

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

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

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 Regulations relating to TI and radiation level provided that the conditions stated in para. 576 of the Regulations are met.

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

580, 581 Transport by post is not permitted.

8.2 Placarding

507, 545

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

C ons ignor’s responsibilities

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.

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

543, Figs 2–4, Fig. 6 As an alternative to the use of placards on large freight containers and tanks, enlarged labels are permitted.
Where an exclusive use consignment in a freight container is a UN 2919 Special Arrangement, and no other UN number commodities are present, the UN number “UN 2919” is required to be displayed on all four sides of the freight container, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

The location of placards and the use of placards with reduced dimensions on a road or rail vehicle are stipulated.

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

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

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)–562(d) and para. 506 of the Regulations:

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

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

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

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

Consignments are required to be securely stowed.

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

Transport index limits for freight containers and conveyances.

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

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

For a special use vessel, the storage arrangements are excepted from the requirements of para. 568 of the Regulations provided that the conditions stated in para. 576 of the Regulations are met.

### 8.4 Damaged or leaking packages

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

8.5. Decontamination

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

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

8.6. Other provisions

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

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

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

110, 507  Uranium hexafluoride has corrosive properties (Class 8) and these are required to be taken into account during transport.

301–303  General provisions for radiation protection.

304, 305, 554(c)  Emergency response

306  Management system.

310  Special arrangement (Fissile uranium hexafluoride transported under special arrangement)

311–315  Training.

417  Fissile material and exceptions.

501(a), (b), (c)  Requirements before the first shipment.

502, 503  Requirements before each shipment.

561  Possession of package design certificates, and instructions for (a) the proper closing of the package and (b) other preparations for shipment.

607–618  Design requirements for all packagings and packages.

619–621  Additional design requirements — air transport.

Uranium hexafluoride, fissile, is required to be transported, as appropriate, in:

624–626  Industrial packages of Type IP-2 or Type IP-3, as applicable.

635  Type A packages.

652  Type B(U) packages.

667  Type B(M) packages.

669  Type C packages.

631–634  Additional requirements for packages designed to transport 0.1 kg or more of uranium hexafluoride.

673–685  Additional requirements for packages containing fissile material.
2. CONTENTS LIMITS FOR PACKAGES

417 Fissile material and exceptions.
418 Fissile material
419 Classification for uranium hexafluoride

420 Contents of a package containing Uranium Hexafluoride

421 The quantity of uranium hexafluoride is not allowed to exceed the relevant limits specified in the Regulations, as appropriate for each type of package.

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

3. Contamination

508, 509 Non-fixed contamination on the external surfaces of any package and on the external and internal surfaces of overpacks, freight containers, tanks, intermediate bulk containers and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over any area of 300 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 RADIATION LEVELS

526–528, 575 (i) The radiation level for a package or overpack is required to be such that the TI of the package or overpack does not exceed 10, and the criticality safety index does not exceed 50, except when transported under exclusive use, and
(ii) The maximum radiation level at any point on any external surface of the package or
overpack is not allowed to exceed 2 mSv/h, except when the package or overpack is transported under exclusive use by rail or by road, or under exclusive use by sea, and

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

" Packages or overpacks having a surface radiation level greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels in accordance with Table 10 of the Regulations, footnote (a), provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel.

5. CATEGORIES OF PACKAGES AND OVERPACKS

521, 522  Table 5 - Type of package; Table 6 - Activity limits in case of LSA-II
523, 524  The TI is required to be derived in accordance with the procedure as stated in paras 523 and 524 of the Regulations.
525, 686  Criticality safety index (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 required also to be marked and labelled as required by the relevant transport regulations.

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

531  Each package is required to be marked with an identification of either the consignor or the consignee, or both.
531–535  All markings are required to be legible and durable, and are required to be on the outside of the packaging.
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.

534(a), (b), (c)  Each package which conforms to:
(a) An IP-2 or an IP-3 design is required to be marked with “TYPE IP-2” or “TYPE IP-3” as appropriate;
(b) A Type A package design is required to be marked with “TYPE A”;

(c) Each package which conforms to a TYPE IP-2, TYPE IP-3 or TYPE A package design is required to be marked with the international vehicle registration code (VRI Code) of the country of origin of design and either the name of the manufacturer or other identification of the packaging specified by the competent authority of the country.
Each package is required to be marked with:
(a) The identification mark allocated to that design by the competent authority;
(b) A serial number to uniquely identify each packaging which conforms to that design;
(c) In the case of a Type B(U) or Type B(M) package design, with “TYPE B(U)” or “TYPE B(M)”; and
(d) In the case of a Type C package design, with “TYPE C”.

For Type B(U), Type B(M) or Type C packages, the outside of the outermost receptacle which is resistant to the effects of fire and water is required to be plainly marked by embossing, stamping, or other means resistant to the effects of fire and water, with the trefoil symbol shown in Fig. 1 of the Regulations.

For all packages, any labels which do not relate to the contents are required to be removed or covered.

Each package, overpack and freight container is required to bear the appropriate labels. Paragraph 543 of the Regulations sets out alternative provisions for large freight containers and tanks.

The labels are required to be fixed to two opposite sides of the outside of the package or overpack, or on all four sides of a freight container or tank. The labels are not allowed to cover the markings specified in paras 531–536 of the Regulations.

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

Except for mixed loads, each label on a freight container or overpack is required to be marked with:
(a) The radioactive contents; and
(b) The maximum activity of the total radioactive contents during transport.
For mixed loads such entries may read “See Transport Documents”.

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

7. REQUIREMENTS BEFORE SHIPMENT

Before the first shipment, confirmation is required that the shielding, containment, heat transfer characteristics, confinement system and neutron poisons conform to the approved design.
Before each shipment of any package, the following requirements apply:

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

(b) It is required to ensure that lifting attachments which do not meet the requirements of para. 608 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 609 of the Regulations.

(c) For each package requiring competent authority approval, it is required to ensure that all the requirements specified in the approval certificates have been satisfied.

(d) Each Type B(U), Type B(M) and Type C package is required to be held until equilibrium conditions have been approached closely enough to demonstrate compliance with the requirements for temperature and pressure unless an exemption from these requirements has received unilateral approval.

(e) For each Type B(U), Type B(M) and Type C package, it is required to ensure by inspection and/or appropriate tests that all closures, valves and other openings of the containment system through which the radioactive contents might escape are properly closed and, where appropriate, sealed in the manner for which the demonstrations of compliance with the requirements of paras 659 and 671 of the Regulations were made.

(f) For packages containing fissile material, the measurement specified in para. 677(b) of the Regulations and the tests to demonstrate closure of each package specified in para. 680 of the Regulations are required to be performed where applicable.

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

558 For each shipment listed below:

(a) Type C or Type B(U) packages containing radioactive material with an activity greater than 3000A\textsubscript{1} or 3000A\textsubscript{2}, as appropriate, or 1000TBq, whichever is the lower;

(b) Type B(M) packages;

(c) Shipments under special arrangement;

the consignor is required to notify the competent authority of each country through or into which the consignment is to be transported. This notification is required to have been received by each competent authority prior to the commencement of the shipment, and preferably at least 7 days in advance. See also para. 560 of the Regulations.
The notification referred to in para. 558 of the Regulations is required to include:

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

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

Shipments — competent authority multilateral approval is required where the criticality safety index is greater than 50.

Radiation protection programmes for shipments by special use vessel. Competent authority authorization of transport without shipment approval.

Information to be included in an application for shipment approval.

Approval of shipments under special arrangement.

Provisions Concerning Transport Operations

Modal Requirements

For transport by rail and by road: for consignments under exclusive use, the radiation level is not allowed to exceed:

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

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

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

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.

For transport by vessels: packages or overpacks having a surface radiation level greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with Table 10 of the Regulations, footnote (a), are not allowed to be transported.

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 Regulations relating to TI, criticality safety index and radiation level provided that the conditions stated in para. 26.575 of the Regulations are met.

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

Transport by post is not permitted.

8.2. Placarding

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

C ons ignor’s responsibilities

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

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

Where an exclusive use consignment in a freight container is UN 2977 packaged fissile uranium hexafluoride and no other UN number commodities are present, the UN number “UN 2977” is required to be displayed on all four sides of the freight container, in black digits not less than 65 mm high, either in the lower half of the placards shown in Fig. 6 of the Regulations against the white background, or on the placards shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

The location of placards and the use of placards with reduced dimensions on a road or rail vehicle are stipulated.

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 Regulations against the white background or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.
8.3. Stowage during transport, storage in transit and segregation

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)–562(d) and para. 506 of the Regulations.

562(a) Criteria for segregation from workers in regularly occupied working areas.

562(b) Criteria for segregation from members of the public.

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

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

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

564 Consignments are required to be securely stowed.

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

566(a), Table 10 Transport index limits for freight containers and conveyances.

566(b) Limits on the radiation levels from freight containers and conveyances. See paras 572(b) and 573(c) of the Regulations for exceptions.

566(c), Table 11 Critical safety index limits for freight containers and conveyances.

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

568-569, Table 11 Segregation of packages during transport and storage in transit.

576 For a special use vessel, the storage arrangements are excepted from the requirements of para. 566 of the Regulations provided that the conditions stated in para. 576 of the Regulations are met.

8.4. Damaged or leaking packages

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

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

8.5. Decontamination

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

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

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

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

Where a consignment is undeliverable, appropriate actions are required to be taken as soon as possible.
# SCHEDULE FOR UN 2978

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

<table>
<thead>
<tr>
<th>Paragraph number of the Regulations [1]</th>
<th>Subject</th>
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<tr>
<td>110, 507</td>
<td>Uranium hexafluoride has corrosive properties (Class 8) and these are required to be taken into account during transport.</td>
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<tr>
<td>301–303</td>
<td>General provisions for radiation protection.</td>
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<tr>
<td>304, 305, 554(c)</td>
<td>Emergency response.</td>
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<tr>
<td>306</td>
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Package design requirements — competent authority approval.


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Approval of shipments under special arrangement.

2. CONTENTS LIMITS FOR PACKAGES

If the package contains fissile material, one of the fissile exceptions provided by para. 417 of the Regulations is required to be applied. Fissile material excepted under para. 417 (f) is required to comply with para. 606 and requires multilateral approval by competent authority.

Classification

The quantity of uranium hexafluoride is not allowed to exceed the relevant limits specified in the Regulations, as appropriate for each type of package.

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

3. CONTAMINATION

Non-fixed contamination on the external surfaces of any package and on the external and internal surfaces of overpacks, freight containers, tanks, intermediate bulk containers and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over any area of 300cm² 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 RADIATION LEVELS
526 – 528, 575 (i) The radiation level for a package or overpack is required to be such that the TI of the package or overpack does not exceed 10, except when transported under exclusive use; and

(ii) The maximum radiation level at any point on any external surface of the package or overpack is not allowed to exceed 2 mSv/h, except when transported under exclusive use by rail or by road, or under exclusive use by sea; and

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

† Packages or overpacks having a surface radiation level greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels in accordance with Table 10 of the Regulations, footnote (a), provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel.

5. CATEGORIES OF PACKAGES AND OVERPACKS

Table 5 - Type of package; Table 6 - Activity limits in case of LSA-II

The TI is required to be derived in accordance with the procedure as stated in paras 523 and 524 of the Regulations.

Package and overpacks are required to be assigned to category I-WHITE, category II-YELLOW or category III-YELLOW.

6. MARKING AND LABELLING

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.

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

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

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

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

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

Each package which conforms to:

(a) An IP-1, IP-2 or an IP-3 design is required to be marked with “TYPE IP-1, TYPE IP-2” or “TYPE IP-3” as appropriate;

(b) A Type A package design is required to be marked with “TYPE A”;

521, 522, 523, 524, 529, Table 8
Each package which conforms to a TYPE IP-2, TYPE IP-3 or TYPE A package design is required to be marked with the international vehicle registration code (VRI Code) of the country of origin of design and either the name of the manufacturer or other identification of the packaging specified by the competent authority of the country of origin of the design.

Each package is required to be marked with:

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

The outside of the outermost receptacle which is resistant to the effects of fire and water is required to be plainly marked by embossing, stamping, or other means resistant to the effects of fire and water, with the trefoil symbol shown in Fig. 1 of the Regulations.

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

Each package, overpack and freight container is required to bear the appropriate labels. Paragraph 543 of the Regulations sets out alternative provisions for large freight containers and tanks.

The labels are required to be fixed to two opposite sides of the outside of the package or overpack, or on all four sides of a freight container or tank. The labels are not allowed to cover the markings specified in paras 531–536 of the Regulations.

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

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

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

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

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

### 7. REQUIREMENTS BEFORE SHIPMENT

Before the first shipment, confirmation is required that the shielding, containment, and heat transfer characteristics of the containment system to conform to the approved design.
Before each shipment of any package, the following requirements apply:

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

(ii) It is required to ensure that lifting attachments which do not meet the requirements of para. 608 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 609 of the Regulations.

(iii) For each package requiring competent authority approval, it is required to ensure that all the requirements specified in the approval certificates have been satisfied.

(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 Regulations were made.

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

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

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

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

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

For each shipment listed below:

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

the consignor is required to notify the competent authority of each country through or into which the consignment is to be transported. This notification is required to have been received by each competent authority prior to the commencement of the shipment, and preferably at least 7 days in advance. See also para. 559 of the Regulations.

* Not applicable to excepted packages.
The notification referred to in para. 558 of the Regulations is required to include:

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

Separate notification is not required if the information has been included in the application for shipment approval (see para. 822–827 of the Regulations).

Radiation protection programmes for shipments by special use vessel.
Competent authority authorization of transport without shipment approval.

Shipments — competent authority authorization of transport without shipment approval.
Radiation protection programmes for shipments by special use vessel.
Competent authority authorization of transport without shipment approval.

Information to be included in an application for shipment approval.

Approval of shipments under special arrangement.

8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

8.1. Modal requirements

Restrictions on transport by air are set out in para. 416 and paras 577–579 of the Regulations.

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

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

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

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

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

575 For transport by vessels: packages or overpacks having a surface radiation level greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with Table 10 of the Regulations, footnote (a), are not allowed to be transported.

576 For transport by vessels: the transport of consignments by means of a special use vessel is excepted from the requirements of para. 566 of the Regulations relating to TI and radiation level provided that the conditions stated in para. 576 of the Regulations are met.

577-579 Restrictions on transport by air are set out in para. 577 and 579 of the Regulations.

580, 581 Transport by post is not permitted.

8.2. Placarding

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

543 Consignor’s responsibilities

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.

544, Figs 6, 7 Where an exclusive use consignment in a freight container is UN 2978 packaged non-fissile or fissile-exceptioned uranium hexafluoride and no other UN number commodities are present, the UN number “UN 2978” is required to be displayed on all four sides of the freight container, in black digits not less than 65 mm high, either in the lower half of the placards shown in Fig. 6 of the Regulations against the white background, or on the placards shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

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

572, Figs 6, 7 Where an exclusive use consignment in or on a road or rail vehicle is UN 2978 packaged non-fissile or fissile-exceptioned uranium hexafluoride only, and no other UN number commodities are present, the UN number “UN 2978” is required to be displayed in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background or on the placard shown in Fig. 7 of the
8.3. **Stowage during transport, storage in transit and segregation**

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)–562(d) and para. 506 of the Regulations:

562(a) Criteria for segregation from workers in regularly occupied working areas;
562(b) Criteria for segregation from members of the public;
562(c) Criteria for segregation from underdeveloped photographic film; and
562(d), 506 Criteria for segregation from other dangerous goods.

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

Consignments are required to be securely stowed.

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

8.4. **Damaged or leaking packages**

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.

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

8.5. **Decontamination**

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

8.6. Other provisions

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

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

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

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#### 2. CONTENTS LIMIT FOR PACKAGES
LSA-II definition and criteria.

A single package of non-combustible LSA-II material, if carried by air, is not allowed to contain an activity greater than 3000$\mu$A.

The contents are required to be restricted in accordance with the radiation levels specified in para. 517 of the Regulations.

If the package contains fissile material, one of the fissile exceptions provided by para. 417 of the Regulations is required to be applied. Fissile material excepted under para. 417 (f) is required to comply with para. 606 and requires multilateral approval by competent authority.

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

3. CONTAMINATION

Non-fixed contamination on the external surfaces of any package and on the external and internal surfaces of overpacks, freight containers, tanks, intermediate bulk containers and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over any area of 300cm$^2$ 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 RADIATION LEVELS

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

Packages or overpacks having a surface radiation level greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels in accordance with Table 10 of the Regulations, footnote (a), provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel.

5. CATEGORIES OF PACKAGES AND OVERPACKS

LSA material and SCO are required to be packaged in accordance with Table 5 of the
523, 524 The TI is required to be derived in accordance with the procedure as stated in paras 523 and 524 of the 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.

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

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

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.

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

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

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

538, 543, Figs 2–4 Each package, overpack and freight container is required to bear the appropriate labels. Paragraph 543 of the Regulations sets out alternative provisions for large freight containers and tanks.

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 markings specified in paras 531–536 of the Regulations.

540(a) Each label is required to be marked with the name(s) of the radionuclide(s), followed by “LSA-II”. Paragraph 540(a) of the Regulations establishes requirements for labelling mixtures of radionuclides.

540(b) The maximum activity of the contents is required to be marked on the label.
Except for mixed loads, each label on a freight container or overpack is required to be marked with
(a) The radioactive contents; and
(b) The maximum activity of the total radioactive contents during transport.
For mixed loads such entries may read “See Transport Documents”.

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

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

7. REQUIREMENTS BEFORE SHIPMENT

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

Before each shipment of any package, the following requirements apply:
(a) For any package it is required to ensure that all the requirements specified in the relevant provisions of the Regulations have been satisfied.
(b) It is required to ensure that lifting attachments which do not meet the requirements of para. 608 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 609 of the Regulations.

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

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

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

Radiation protection programmes for shipments by special use vessel.
Competent authority authorization of transport without shipment approval.

8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

8.1. Modal requirements

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

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

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

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.

For transport by vessels: packages or overpacks having a surface radiation level greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with Table 10 of the Regulations, footnote (a), are not allowed to be transported.

For transport by vessels: the transport of consignments by means of a special use vessel is excepted from requirements of para. 566 of the Regulations relating to TI and radiation level provided that the conditions stated in para. 576 of the Regulations are met.

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

Transport by post is not permitted.

8.2. Placarding

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

Consignor's responsibilities

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

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

Where an exclusive use consignment in a freight container is packaged UN 3321 LSA-II, and no other UN number commodities are present, the UN number “UN 3321” is required to be displayed on all four sides of the freight container, in black digits not less than 65mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

The location of placards and the use of placards with reduced dimensions on a road or rail vehicle are stipulated.

For carriage in or on a road or rail vehicle, where an exclusive use consignment is
8.3 Stowage During Transport, Storage in Transit and Segregation

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)–562(d) and para. 506 of the Regulations.

- Criteria for segregation from workers in regularly occupied working areas.
- Criteria for segregation from members of the public.
- Criteria for segregation from undeveloped photographic film.
- Criteria for segregation from other dangerous goods.

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

Consignments are required to be securely stowed.

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

Transport index limits for freight containers and conveyances.

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

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

For a special use vessel, the storage arrangements are excepted from the requirements of para. 566 of the Regulations provided that the conditions stated in para. 576 of the Regulations are met.

8.4 Damaged or leaking packages

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.

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

8.5 Decontamination

Tanks and intermediate bulk containers used for the transport of radioactive material are not allowed to be used for storage or transport of other goods, unless decontaminated below one tenth of the levels specified in paras 508 and 509 of the Regulations.
Periodic checking of conveyances and equipment is required to determine the level of contamination.

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

**8.6. Other provisions**

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

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

Where a consignment is undeliverable, appropriate actions are required to be taken as soon as possible.
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801 The consignor is required to demonstrate 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) Editions of the Regulations.
2. CONTENTS LIMITS FOR PACKAGES

LSA-III definition and criteria.

A single package of non-combustible LSA-III material, if carried by air, is not allowed to contain an activity greater than 3000\(\text{Ci}\).

The contents are required to be restricted in accordance with the radiation levels specified in para. 417 of the Regulations.

If the package contains fissile material, one of the fissile exceptions provided by para. 417 of the Regulations is required to be applied. Fissile material excepted under para. 417 (f) is required to comply with para. 606 and requires multilateral approval by competent authority.

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

3. CONTAMINATION

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

(a) Beta, gamma and low toxicity alpha emitters, \(4 \text{ Bq/cm}^2\);
(b) All other alpha emitters, \(0.4 \text{ Bq/cm}^2\).

4. MAXIMUM RADIATION LEVELS

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

** Packages or overpacks having a surface radiation level greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels in accordance with Table 10 of the Regulations, footnote (a), provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel.

5. CATEGORIES OF PACKAGES AND OVERPKACS

LSA material and SCO are required to be packaged in accordance with Table 5 of the Regulations.
The TI is required to be derived in accordance with the procedure as stated in paras 523 and 524 of the Regulations.

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

6. MARKING AND LABELLING

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.

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

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

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

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

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

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

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

Each package, overpack and freight container is required to bear the appropriate labels. Paragraph 543 of the Regulations sets out alternative provisions for large freight containers and tanks.

The labels are required to be fixed to two opposite sides of the outside of the package or overpack, or on all four sides of a freight container or tank. The labels are not allowed to cover the markings specified in paras 531–536 of the Regulations.

Each label is required to be marked with the name(s) of the radionuclide(s), followed by “LSA-III”. Paragraph 540(a) of the Regulations establishes requirements for labelling mixtures of radionuclides.

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

Except for mixed loads, each label on a freight container or overpack is required to be marked with
(a) The radioactive contents; and
(b) The maximum activity of the total radioactive contents during transport.
For mixed loads such entries may read “See Transport Documents”.

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

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

7. REQUIREMENTS BEFORE SHIPMENT

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

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

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

(b) It is required to ensure that lifting attachments which do not meet the requirements of para. 608 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 609 of the Regulations.

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

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

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

Radiation protection programmes for shipments by special use vessel.
Competent authority authorization of transport without shipment approval.

8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

8.1. Modal requirements

For transport by rail and by road: for consignments under exclusive use, the radiation level is not allowed to exceed:

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

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

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

(iii) There are no loading or unloading operations between the beginning and the end of the shipment;
(b) 2 mSv/h at any point on the outer surfaces of the vehicle, including the upper and lower surfaces, or, in the case of an open vehicle, at any point on the vertical planes projected from the outer edges of the vehicle, on the upper surface of the load, and on the lower external surface of the vehicle; and

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

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

575 For transport by vessels: packages or overpacks having a surface radiation level greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with Table 10 of the Regulations, footnote (a), are not allowed to be transported.

576 For transport by vessels: the transport of consignments by means of a special use vessel is excepted from the requirements of para. 566 of the Regulations provided that the conditions stated in para. 576 of the Regulations are met.

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

580 Transport by post is not permitted.

8.2. Placarding

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

545 Consignor’s responsibilities

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.

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

543, Figs 2–4, Fig. 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, and no other UN number commodities are present, the UN number “UN 3322” is required to be displayed on all four sides of the freight container, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

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

572, Figs 6, 7 For carriage in or on a road or rail vehicle, where an exclusive use consignment is packaged UN 3322 LSA-III only, and no other UN number commodities are present, the UN number “UN 3322” is required to be displayed, in black digits not less than 65 mm
8.3. Stowage during transport, storage in transit and segregation

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)–562(d) and para. 506 of the Regulations:

562(a) Criteria for segregation from workers in regularly occupied working areas.

562(b) Criteria for segregation from members of the public.

562(c) Criteria for segregation from undeveloped photographic film.

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

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

564 Consignments are required to be securely stowed.

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

566(a), Table 10 Transport index limits for freight containers and conveyances.

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

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

576 For a special use vessel, the storage arrangements are excepted from the requirements of para. 566 of the Regulations provided that the conditions stated in para. 576 of the Regulations are met.

8.4. Damaged or leaking packages

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

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

8.5. Decontamination

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

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

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

8.6. Other provisions

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

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

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

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2. CONTENTS LIMITS FOR PACKAGES

If the package contains fissile material, one of the fissile exceptions provided by para. 417 of the Regulations is required to be applied. Fissile material excepted under para. 417 (f) is required to comply with para. 606 and requires multilateral approval by competent authority.

The quantity of radioactive material is not allowed to exceed the limits specified in para. 432 of the Regulations.

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

3. CONTAMINATION

Non-fixed contamination on the external surfaces of any package and on the external and internal surfaces of overpacks, freight containers, tanks, intermediate bulk containers and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over any area of 300cm$^2$ 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 RADIATION LEVELS

(i) The radiation level for a package or overpack is required to be such that the T1 of the package or overpack does not exceed 10, except when transported under exclusive use; and

(ii) The maximum radiation level at any point on any external surface of the package or overpack is not allowed to exceed 2 mSv/h, except when transported under exclusive use by rail or by road, or under exclusive use by sea**; and

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

** Packages or overpacks having a surface radiation level greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels in accordance with Table 10 of the Regulations, footnote (a), provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel.

5. CATEGORIES OF PACKAGES AND OVERPACKS
The TI is required to be derived in accordance with the procedure as stated in paras 523 and 524 of the Regulations.

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

6. MARKING AND LABELLING

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

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

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

Packages are required to bear the mark “UN 3323” and the proper shipping name “RADIOACTIVE MATERIAL, TYPE C PACKAGE”.

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

Each package is required to be marked with:

(a) The identification mark allocated to that design by the competent authority;
(b) A serial number to uniquely identify each packaging which conforms to that design;
(c) **“TYPE C”. Not applicable.**
(d) **“TYPE C”.**

The outside of the outermost receptacle which is resistant to the effects of fire and water is required to be plainly marked by embossing, stamping, or other means resistant to the effects of fire and water, with the trefoil symbol shown in Fig. 1 of the Regulations.

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

Each package, overpack and freight container is required to bear the appropriate labels. Paragraph 543 of the Regulations sets out alternative provisions for large freight containers and tanks.

The labels are required to be fixed to two opposite sides of the outside of the package or overpack, or on all four sides of a freight container or tank. The labels are not allowed to cover the markings specified in paras 531-536 of the Regulations.

Each label is required to be marked with the name(s) of the radionuclide(s), the maximum activity of the contents and the TI. Paragraph 540(a) of the Regulations establishes requirements for labelling mixtures of radionuclides.
Except for mixed loads, each label on a freight container or overpack is required to be marked with:

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

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

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

7. REQUIREMENTS BEFORE SHIPMENT

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

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

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

(bii) It is required to ensure that lifting attachments which do not meet the requirements of para. 608 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 609 of the Regulations.

(iii) For each package, it is required to ensure that all the requirements specified in the competent authority approval certificates have been satisfied.

(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 Regulations were made.

(vi) For each special form radioactive material, it is required to ensure that all the requirements specified in the approval certificate and the relevant provisions of the Regulations have been satisfied.

(vii) For each low dispersible radioactive material, it is required to ensure that all the requirements specified in the approval certificate and the relevant provisions of the Regulations have been satisfied.

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

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

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

The consignor is required to make competent authority certificates available to the carrier(s) before loading and unloading.
Before the first shipment, the consignor is required to ensure that copies of each competent authority certificate applying to that package design have been submitted to the competent authority of each country through or into which the consignment is to be transported. The consignor is not required to await an acknowledgement from the competent authority, nor is the competent authority required to make an acknowledgement of receiving the certificate.

For each shipment containing radioactive material with an activity greater than 3000A\textsubscript{Bq} or 3000A\textsubscript{A}, as appropriate, or 1000 TBq, whichever is the lower, the consignor is required to notify the competent authority of each country through or into which the consignment is to be transported. This notification is required to have been received by each competent authority prior to the commencement of the shipment, and preferably at least 7 days in advance. See also para. 559 of the Regulations.

The notification referred to in para. 558 of the Regulations is required to include:

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

Radiation protection programmes for shipments by special use vessel.
Competent authority authorization of transport without shipment approval.

8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

8.1. Modal requirements

For transport by rail and by road: for consignments under exclusive use, the radiation level is not allowed to exceed:

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

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

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

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

575 For transport by vessels: packages or overpacks having a surface radiation level greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with Table 10 of the Regulations, footnote (a), are not allowed to be transported.

576 For transport by vessels: The transport of consignments by means of a special use vessel is excepted from the requirements of para. 566 of the Regulations relating to TI and radiation level provided that the conditions stated in para. 576 of the Regulations are met.

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

580, 581 Transport by post is not permitted.

8.2. Placarding

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

545 Consignor’s responsibilities

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.

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

543, Figs 2–4, Fig. 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, and no other UN number commodities are present, the UN number “UN 3323” is required to be displayed on all four sides of the freight container, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

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

572, Figs 6-7 Where an exclusive use consignment in or on a road or rail vehicle is UN 3323 Type C packages only, and no other UN number commodities are present, the UN number “UN 3323” is required to be displayed, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.
8.3. Stowage during transport, storage in transit and segregation

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)–562(d) and para. 506 of the Regulations.

562(a) Criteria for segregation from workers in regularly occupied working areas.

562(b) Criteria for segregation from members of the public.

562(c) Criteria for segregation from undeveloped photographic film.

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

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

Consignments are required to be securely stowed.

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

8.4. Damaged or leaking packages

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.

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

8.5. Decontamination

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

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

8.6. Other provisions

In the event of non-compliance, appropriate actions are required to be taken as soon as possible including communication and remedy.
Customs operations may be carried out only in a place where adequate means of controlling radiation exposure are provided.

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**

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301–303 General provisions for radiation protection.

304, 305, 554(c) Emergency response.

306 Management system.

311–315 Training.

#### Fissile material and exceptions

501(a), (b), (c) Requirements before the first shipment.

502, 503(a), (d) Requirements before each shipment.

522, Table 6 Activity limits.

561 Possession of package design approval certificates, and possession of instructions for (a) the proper closing of the package and (b) 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.

636 Minimum dimensions of the package.

673–685 Additional design requirements for packages containing fissile material.

802(a), 814–816 Package design requirements — competent authority approval.


824 Packaging serial numbers — informing the competent authority.

### 2. CONTENTS LIMIT FOR PACKAGES
LSA-II definition and criteria.

A single package of non-combustible LSA-II material, if carried by air, is not allowed to contain an activity greater than 3000A$_2$.

The contents are required to be restricted in accordance with the radiation levels specified in para. 517 of the Regulations.

Fissile material and exceptions.

Fissile material.

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

3. CONTAMINATION

Non-fixed contamination on the external surfaces of any package and on the external and internal surfaces of overpacks, freight containers, tanks, intermediate bulk containers and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over any area of 300 cm$^2$ 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 RADIATION LEVELS

(i) The radiation level for a package or overpack is required to be such that the TI of the package or overpack does not exceed 10, and the criticality safety index is not allowed to exceed 50, except when transported under exclusive use; and

(ii) The maximum radiation level at any point on any external surface of the package or overpack is not allowed to exceed 2 mSv/h, except when transported under exclusive use by rail or by road, or under exclusive use by sea”, and

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

“ Packages or overpacks having a surface radiation level greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels in accordance with Table 10 20 of the Regulations, footnote (a), provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel.

5. CATEGORIES OF PACKAGES AND OVERPACKS

LSA material and SCO is required to be packaged in accordance with Table 5 of the Regulations.

The TI is required to be derived in accordance with the procedure as stated in paras 523 and 524 of the Regulations.
Criticality safety index (CSI) for packages containing fissile material, and overpacks and freight container.

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

6. MARKING AND LABELLING

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.

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

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

Packages are required to bear the mark “UN 3324” and the proper shipping name “RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-II), FISSILE”.

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

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

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

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 which conforms to that design.

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

Each package, overpack and freight container is required to bear the appropriate labels. Paragraph 543 of the Regulations sets out alternative provisions for large freight containers and tanks.

The labels are required to be fixed to two opposite sides of the outside of the package or overpack, or on all four sides of a freight container or tank. The labels are not allowed to cover the markings specified in paras 531–536 of the Regulations.

Each label is required to be marked with the name(s) of the radionuclide(s), followed by “LSA-II”. Paragraph 540(a) of the Regulations establishes requirements for labelling mixtures of radionuclides.
540(b) The maximum activity of the contents is required to be marked on the label. The mass of fissile material, in units of grams (g), or multiples of grams, may be used instead of the activity.

540(c) Except for mixed loads, each label on a freight container or overpack is required to be marked with
(a) The radioactive contents; and
(b) The maximum activity of the total radioactive contents during transport.
For mixed loads such entries may read “See Transport Documents”.

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

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

7. REQUIREMENTS BEFORE SHIPMENT

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

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

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

(bii) It is required to ensure that lifting attachments which do not meet the requirements of para. 608 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 609 of the Regulations.

(ciii) For each package, it is required to ensure that all the requirements specified in the competent authority approval certificates have been satisfied.

(dvi) For packages containing fissile material, the measurement specified in para. 677(b) of the Regulations and the tests to demonstrate closure of each package as specified in para. 680 of the Regulations are required to be performed where applicable.

546 Transport documents with each consignment (consignment note) 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 Before the first shipment, the consignor is required to ensure that copies of each competent authority certificate applying to that package design have been submitted to the competent authority of each country through or into which the consignment is to be transported. The consignor is not required to await an acknowledgement from the competent authority, nor is the competent authority required to make an acknowledgement of receiving the certificate.
Shipments — competent authority multilateral approval is required where the criticality safety index is greater than 50.

Radiation protection programmes for shipments by special use vessel.

Competent authority authorization of transport without shipment approval.

Information to be included in an application for shipment approval.

8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

8.1. Modal requirements

For transport by rail and by road: for consignments under exclusive use, the radiation level is not allowed to exceed:

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

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

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

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.

For transport by vessels: packages or overpacks having a surface radiation level greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with Table 10 of the Regulations, footnote (a), are not allowed to be transported.

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 Regulations relating to TI, criticality safety index and radiation level provided that the conditions stated in this paragraph are met.

For transport by air: packages or overpacks having a surface radiation level greater than 2 mSv/h are not allowed to be transported, except by special arrangement.
Transport by post is not permitted.

8.2 Placarding

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

Consignor's responsibilities

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

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

Where an exclusive use consignment in a freight container is packaged UN 3324 LSA-II, and no other UN number commodities are present, the UN number “UN 3324” is required to be displayed on all four sides of the freight container, in black digits not less than 65mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

The location of placards and the use of placards with reduced dimensions on a road or rail vehicle are stipulated.

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 65mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

8.3 Stowage During Transport, Storage in Transit and Segregation

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) to 562(d) and para. 506 of the Regulations.

Criteria for segregation from workers in regularly occupied working areas.

Criteria for segregation from members of the public.

Criteria for segregation from undeveloped photographic film.

Criteria for segregation from other dangerous goods.

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

Consignments are required to be securely stowed.

A package or overpack may be carried or stored among packaged general cargo.
Transport index limits for freight containers and conveyances.

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

Criticality safety index limits for freight containers and conveyances.

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

Segregation of packages during transport and storage in transit.

For a special use vessel, the storage arrangements are excepted from the requirements of para. 566 of the Regulations provided that the conditions stated in para. 576 of the Regulations are met.

**8.4. Damaged or leaking packages**

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.

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

**8.5. Decontamination**

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

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

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

**8.6. Other provisions**

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

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

Where a consignment is undeliverable, appropriate actions are required to be taken as soon as possible.
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2. CONTENTS LIMITS FOR PACKAGES

LSA-III definition and criteria.

A single package of non-combustible LSA-III material, if carried by air, is not allowed to contain an activity greater than 3000 A2.

The contents are required to be restricted in accordance with the radiation levels specified in para. 517 of the Regulations.

Fissile material and exceptions.

Fissile material.

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

3. CONTAMINATION

Non-fixed contamination on the external surfaces of any package and on the external and internal surfaces of overpacks, freight containers, tanks, intermediate bulk containers and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over any area of 300 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 RADIATION LEVELS

(i) The radiation level for a package or overpack is required to be such that the TI of the package or overpack does not exceed 10, and the criticality safety index is not allowed to exceed 50, except when transported under exclusive use, and

(ii) The maximum radiation level at any point on any external surface of the package or overpack is not allowed to exceed 2 mSv/h, except when transported under exclusive use by rail or by road, or under exclusive use by sea*, and

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

* Packages or overpacks having a surface radiation level greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels in accordance with Table 10 of the Regulations, footnote (a), provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel.

5. CATEGORIES OF PACKAGES AND OVERPACKS

LSA material and SCO is required to be packaged in accordance with Table 5 of the Regulations.
The TI is required to be derived in accordance with the procedure as stated in paras 523 and 524 of the Regulations.

Criticality safety index (CSI) for packages containing fissile material, and overpacks and freight containers.

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

6. MARKING AND LABELLING

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.

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

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

Packages are required to bear the mark “UN 3325” and the proper shipping name “RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-III), FISSILE”

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

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

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

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 which conforms to that design.

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

Each package, overpack and freight container is required to bear the appropriate labels. Paragraph 543 of the Regulations sets out alternative provisions for large freight containers and tanks.

The labels are required to be fixed to two opposite sides of the outside of the package or overpack, or on all four sides of a freight container or tank. The labels are not allowed to cover the markings specified in paras 531–536 of the Regulations.

Each label is required to be marked with the name(s) of the radionuclide(s), followed by “LSA-III”. Paragraph 540(a) of the Regulations establishes requirements for labelling mixtures of radionuclides.
The maximum activity of the contents is required to be marked on the label. The mass of fissile material, in units of grams (g), or multiples of grams, may be used instead of the activity.

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

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

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

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

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

7. REQUIREMENTS BEFORE SHIPMENT

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

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

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

(bii) It is required to ensure that lifting attachments which do not meet the requirements of para. 608 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 609 of the Regulations.

(ciii) For each package, it is required to ensure that all the requirements specified in the competent authority approval certificates have been satisfied.

(iv) For packages containing fissile material, the measurement specified in para. 677(b) of the Regulations and the tests to demonstrate closure of each package as specified in para. 680 of the Regulations are required to be performed where applicable.

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

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

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

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

Before the first shipment, the consignor is required to ensure that copies of each competent authority certificate applying to that package design have been submitted to the competent authority of each country through or into which the consignment is to be transported. The consignor is not required to await an acknowledgement from the competent authority, nor is the competent authority required to make an
825(c) Shipment — competent authority multilateral approval is required where the criticality safety index is greater than 50.

825(d), 826 Radiation protection programmes for shipments by special use vessel.

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

8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

8.1. Modal requirements

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

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

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

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

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

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

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

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

575 For transport by vessels: packages or overpacks having a surface radiation level greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with Table 10 of the Regulations, footnote (a), are not allowed to be transported.

576 For transport by vessels: the transport of consignments by means of a special use vessel is excepted from the requirements of para. 566 of the Regulations relating to TI, criticality safety index and radiation level provided that the conditions stated in para. 576 of the Regulations are met.

579 For transport by air: packages or overpacks having a surface radiation level greater than 2 mSv/h are not allowed to be transported, except by special arrangement.
Transport by post is not permitted.

8.2. Placarding

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

Consignor's responsibilities

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

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

Where an exclusive use consignment in a freight container is packaged UN 3325 LSA-III, and no other UN number commodities are present, the UN number “UN 3325” is required to be displayed on all four sides of the freight container, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

The location of placards and the use of placards with reduced dimensions on a road or rail vehicle are stipulated.

For carriage in or on a road or rail vehicle, where an exclusive use consignment is packaged UN 3325 LSA-III only, and no other UN number commodities are present, the UN number “UN 3325” is required to be displayed, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

8.3. Stowage during transport, storage in transit and segregation

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)–562(d) and para. 506 of the Regulations.

Criteria for segregation from workers in regularly occupied working areas.

Criteria for segregation from members of the critical group of the public.

Criteria for segregation from undeveloped photographic film.

Criteria for segregation from other dangerous goods.

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

Consignments are required to be securely stowed.
A package or overpack may be carried or stored among packaged general cargo.

Transport index limits for freight containers and conveyances.

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

Criticality safety index limits for freight containers and conveyances.

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

Segregation of packages during transport and storage in transit.

For a special use vessel, the storage arrangements are excepted from the requirements of para. 566 of the Regulations provided that the conditions stated in para. 576 of the Regulations are met.

8.4. Damaged or leaking packages

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.

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

8.5. Decontamination

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

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

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

8.6. Other provisions

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

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

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

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### 2. CONTENTS LIMITS FOR PACKAGES
SCO-I and SCO-II definition and criteria.
The contents are required to be restricted in accordance with the radiation levels specified in para. 517 of the Regulations.

Fissile material and exceptions.
Fissile material.

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

3. CONTAMINATION

Non-fixed contamination on the external surfaces of any package and on the external and internal surfaces of overpacks, freight containers, tanks, intermediate bulk containers and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over 300 cm$^2$ 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$^2$.

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

4. MAXIMUM RADIATION LEVELS

(i) The radiation level for a package or overpack is required to be such that the TI of the package or overpack does not exceed 10, and the criticality safety index is not allowed to exceed 50, except when transported under exclusive use; and

(ii) The maximum radiation level at any point on any external surface of the package or overpack is not allowed to exceed 2 mSv/h, except when transported under exclusive use by rail or by road, or under exclusive use by sea**; and

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

** Packages or overpacks having a surface radiation level greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels in accordance with Table 10 of the Regulations, footnote (a), provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel.

5. CATEGORIES OF PACKAGES AND OVERPACKS

LSA material and SCO are required to be packaged in accordance with Table 5 of the Regulations.
The TI is required to be derived in accordance with the procedure as stated in paras 523 and 524 of the Regulations.

Criticality safety index (CSI) for packages containing fissile material, and for overpacks and freight containers.

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

6. MARKING AND LABELLING

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

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

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

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.

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

Each package which conforms to an IP-1 or IP-2 design is required to be marked with “TYPE IP-1” or “TYPE IP-2” as appropriate.

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

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 which conforms to that design.

When the material is contained in receptacles or wrapping and is transported under exclusive use, it may be marked “RADIOACTIVE SCO-I”.

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

Each package, overpack and freight container is required to bear the appropriate labels. Paragraph 543 of the Regulations sets out alternative provisions for large freight containers and tanks.

The labels are required to be fixed to two opposite sides of the outside of the package or overpack, or on all four sides of a freight container or tank. The labels are not allowed to
cover the markings specified in paras 531–536.

540(a) Each label is required to be marked with the name(s) of the radionuclide(s), followed by either “SCO-I” or “SCO-II”, as applicable. Paragraph 540(a) of the Regulations establishes requirements for labelling mixtures of radionuclides.

540(b) The maximum activity of the contents is required to be marked on the label. The mass of fissile material, in grams (g), or multiples of grams, may be used instead of the activity.

540(c) Except for mixed loads, each label on a freight container or overpack is required to be marked with
(a) The radioactive contents; and
(b) The maximum activity of the total radioactive contents during transport.

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

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

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

7. REQUIREMENTS BEFORE SHIPMENT

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

502, 503 (a), (d) Before each shipment of any package, the following requirements apply:
(a) For any package it is required to ensure that all the requirements specified in the relevant provisions of the Regulations have been satisfied.
(b) It is required to ensure that lifting attachments which do not meet the requirements of para. 608 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 609 of the Regulations.
(c) For each package, it is required to ensure that all the requirements specified in the competent authority approval certificates have been satisfied.
(d) For packages containing fissile material, the measurement specified in para. 677(b) of the Regulations and the tests to demonstrate closure of each package as specified in para. 680 of the Regulations are required to be performed where applicable.

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

Shipment — competent authority multilateral approval is required where the criticality safety index is greater than 50.

Radiation protection programmes for shipments by special use vessel.

Competent authority authorization of transport without shipment approval.

Information to be included in an application for shipment approval.

8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

8.1. Modal requirements

For transport by rail and by road: for consignments under exclusive use, the radiation level is not allowed to exceed:

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

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

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

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.

For transport by vessels: packages or overpacks having a surface radiation level greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with Table 10 of the Regulations, footnote (a), are not allowed to be transported.

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 Regulations relating to TI,
criticality safety index and radiation level provided that the conditions stated in para. 576 of the Regulations are met.

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

580, 581 Transport by post is not permitted.

8.2. Placarding

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

Consignor’s responsibilities

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.

543 Any placards which 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, or where an exclusive use consignment in a freight container is packaged UN 3326 SCO-I or SCO-II, and no other UN number commodities are present, the UN number “UN 3326” is required to be displayed on all four sides of the freight container, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

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

572, Figs 6, 7 Where the consignment in or on a road or rail vehicle is unpackaged UN 3326 SCO-I only, or where an exclusive use consignment is packaged UN 3326 SCO-I or SCO-II only, and no other UN number commodities are present, the UN number “UN 3326” is required to be displayed, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

8.3. Stowage during transport, storage in transit and segregation

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)–562(d) and para. 506 of the Regulations.

562(a) Criteria for segregation from workers in regularly occupied working areas.

562(b) Criteria for segregation from members of the public.

562(c) Criteria for segregation from undeveloped photographic film.
Criteria for segregation from other dangerous goods.

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

Consignments are required to be securely stowed.

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

Transport index limits for freight containers and conveyances.

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

Criticality safety index limits for freight containers and conveyances.

Any package or overpack having a TI greater than 10, or any consignment having a criticality safety index greater than 50, is required to be transported only under exclusive use.

Segregation of packages during transport and storage in transit.

For a special use vessel, the storage arrangements are excepted from the requirements of para. 566 of the Regulations provided that the conditions stated in para. 576 of the Regulations are met.

**8.4. Damaged or leaking packages**

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.

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

**8.5. Decontamination**

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

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

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

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

**8.6. Other provisions**

In the event of non-compliance, appropriate actions are required to be taken as soon as possible including communication and remedy.
Customs operations may be carried out only in a place where adequate means of controlling radiation exposure are provided.

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**

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2. CONTENTS LIMITS FOR PACKAGES
Fissile material and exceptions.

Fissile material.

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

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

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

3. CONTAMINATION

Non-fixed contamination on the external surfaces of any package and on the external and internal surfaces of overpacks, freight containers, tanks, intermediate bulk containers and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over any area of 300cm$^2$ 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 RADIATION LEVELS

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

† Packages or overpacks having a surface radiation level greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels in accordance with Table 20-10 of the Regulations, footnote (a), provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel.

5. CATEGORIES OF PACKAGES AND OVERPACKS

The TI is required to be derived in accordance with the procedure as stated in paras 523 and 524 of the Regulations.

Criticality safety index (CSI) for packages containing fissile material, and for overpacks and freight containers.
Packages and overpacks are required to be assigned to category I-WHITE, category II-YELLOW or category III-YELLOW.

6. MARKING AND LABELLING

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.

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

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

Packages are required to bear the mark “UN 3327” and the proper shipping name “RADIOACTIVE MATERIAL, TYPE A PACKAGE, FISSIONES”. Packages with a gross mass exceeding 50 kg are required to be marked with their permissible gross mass.

Each package is required to be marked with “TYPE A”.

Each package is required to be marked with the international vehicle registration code (VRI Code) of the country of origin of design and either the name of the manufacturer or other identification of the packaging specified by the competent authority of the country of origin of the design.

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 which conforms to that design;

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

Paragraph 543 of the Regulations sets out alternative provisions for large freight containers.

The labels are required to be fixed to two opposite sides of the outside of the package or overpack, or on all four sides of a freight container or tank. The labels are not allowed to cover the markings specified in paras 531–536 of the Regulations.

Each label is required to be marked with the name(s) of the radionuclide(s), the maximum activity of the contents and the TI, except for category I-WHITE, for which the TI is not required. Paragraph 540(a) of the Regulations establishes requirements for labelling mixtures of radionuclides. The mass of fissile material, in grams (g), or multiples of grams, may be used instead of the activity.
Except for mixed loads, each label on a freight container or overpack is required to be marked with:

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

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

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

7. REQUIREMENTS BEFORE SHIPMENT

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

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

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

(b) It is required to ensure that lifting attachments which do not meet the requirements of para. 608 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 609 of the Regulations.

(c) For each package, it is required to ensure that all the requirements specified in the competent authority approval certificates have been satisfied.

(d) For packages containing fissile material, the measurement specified in para. 677(b) of the Regulations and the tests to demonstrate closure of each package as specified in para. 680 of the Regulations are required to be performed where applicable.

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

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

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

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

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

Shipments — competent authority multilateral approval is required where the criticality safety index is greater than 50.

Shipments — competent authority authorization of transport without shipment approval.
8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

8.1. Modal requirements

For transport by rail and by road: for consignments under exclusive use, the radiation level is not allowed to exceed:

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

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

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

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.

For transport by vessels: packages or overpacks having a surface radiation level greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with Table 10 of the Regulations, footnote (a), are not allowed to be transported.

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 Regulations relating to TI and radiation level provided that the conditions stated in para. 576 of the Regulations are met.

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

Transport by post is not permitted.

8.2. Placarding

Placards may be required for other dangerous properties of the contents.
Consignor’s responsibilities

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

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

Where an exclusive use consignment in a freight container is UN 3327 Type A packages, and no other UN number commodities are present, the UN number “UN 3327” is required to be displayed on all four sides of the freight container, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

The location of placards and the use of placards with reduced dimensions on a road or rail vehicle are stipulated.

Where an exclusive use consignment in or on a road or rail vehicle is UN 3327 Type A packages only, and no other UN number commodities are present, the UN number “UN 3327” is required to be displayed, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

8.3. Stowage during transport, storage in transit and segregation

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)–562(d) and para. 506 of the Regulations.

Criteria for segregation from workers in regularly occupied working areas.

Criteria for segregation from members of the public.

Criteria for segregation from undeveloped photographic film.

Criteria for segregation from other dangerous goods.

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

Consignments are required to be securely stowed.

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

Transport index limits for freight containers and conveyances.

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

Any package or overpack having a TI greater than 10, or any consignment having a criticality safety index greater than 50, is required to be transported only under exclusive use.

Segregation of packages during transport and storage in transit.

For a special use vessel, the storage arrangements are excepted from the requirements of para. 566 of the Regulations provided that the conditions stated in para. 576 of the Regulations are met.

8.4. Damaged or leaking packages

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.

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

8.5. Decontamination

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

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

8.6. Other provisions

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

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

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

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2. CONTENTS LIMITS FOR PACKAGES

The quantity of radioactive material is not allowed to exceed the limits specified in paras 423 and 424 of the Regulations.

Fissile material and exceptions.

Fissile material.

The quantity of radioactive material is not allowed to exceed the limits specified in paras 432 and 433 of the Regulations.

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

3. CONTAMINATION

Non-fixed contamination on the external surfaces of any package and on the external and internal surfaces of overpacks, freight containers, tanks, intermediate bulk containers and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over any area of 300 cm$^2$ 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 RADIATION LEVELS

(i) The radiation level for a package or overpack is required to be such that the TI of the package or overpack does not exceed 10, and the criticality safety index is not allowed to exceed 50, except when transported under exclusive use; and

(ii) The maximum radiation level at any point on any external surface of the package or overpack is not allowed to exceed 2 mSv/h, except when transported under exclusive use by rail or by road, or under exclusive use by sea**; and

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

** Packages or overpacks having a surface radiation level greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels in accordance with Table 10 of the Regulations, footnote (a), provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel.
5. CATEGORIES OF PACKAGES AND OVERPACKS

523, 524 The TI is required to be derived in accordance with the procedure as stated in paras 523 and 524 of the Regulations.

525, 686 Criticality safety index (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.

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

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

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

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

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

536, Fig. 1 The outside of the outermost receptacle which is resistant to the effects of fire and water is required to be plainly marked by embossing, stamping, or other means resistant to the effects of fire and water, with the trefoil symbol shown in Fig. 1 of the Regulations.

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

538, 541–543, Figs 2–5 Each package, overpack and freight container is required to bear the appropriate labels. Paragraph 543 of the Regulations sets out alternative provisions for large freight containers and tanks.

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 markings specified in paras 531-536 of the Regulations.

540(a), (b), (d), Table 2 Each label is required to be marked with the name(s) of the radionuclide(s), the maximum activity of the contents and the TI. Paragraph 540(a) of the Regulations establishes requirements for labelling mixtures of radionuclides. The mass of fissile
material, in grams (g), or multiples of grams, may be used instead of the activity.

540(c) Except for mixed loads, each label on a freight container or overpack is required to be marked with
(a) The radioactive contents; and
(b) The maximum activity of the total radioactive contents during transport.
For mixed loads such entries may read “See Transport Documents”.

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

7. REQUIREMENTS BEFORE SHIPMENT

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

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

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

(ii) It is required to ensure that lifting attachments which do not meet the requirements of para. 608 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 609 of the Regulations.

(iii) For each package, it is required to ensure that all the requirements specified in the competent authority approval certificates have been satisfied.

(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 pars 659 and 671 of the Regulations were made.

(vi) For each special form radioactive material, it is required to ensure that all the requirements specified in the approval certificate and the relevant provisions of the Regulations have been satisfied.

(vii) For each low dispersible radioactive material, it is required to ensure that all the requirements specified in the approval certificate and the relevant provisions of the Regulations have been satisfied.

(viii) For packages containing fissile material, the measurement specified in para. 677(b) of the Regulations and the tests to demonstrate closure of each package as specified in para. 680 of the Regulations are required to be performed where applicable.

546 Transport documents with each consignment (consignment note) are required to include all relevant particulars of the consignment.
The consignor is required to include a declaration in the transport documents.

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

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

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

For each shipment containing radioactive material with an activity greater than 3000 Ci, or 3000 Ci, as appropriate, or 1000 TBq, whichever is the lower, the consignor is required to notify the competent authority of each country through or into which the consignment is to be transported. This notification is required to have been received by each competent authority prior to the commencement of the shipment, and preferably at least 7 days in advance. See also para. 559 of the Regulations.

The notification referred to in para. 558 of the Regulations is required to include:
(a) Clear identification of the package, including all applicable certificate numbers and identification marks;
(b) The date of shipment, the expected date of arrival and the proposed routeing;
(c) The names of the radioactive materials or nuclides;
(d) Descriptions of the physical and chemical forms of the radioactive material, or whether it is special form radioactive material or low dispersible radioactive material;
(e) The maximum activity of the radioactive contents during transport, expressed in becquerels (Bq) with the appropriate SI prefix symbol (see Annex II of the Regulations). The mass of fissile material in grams (g), or multiples of grams, may be used in place of activity.

Separate notification is not required if the information has been included in the application for shipment approval (see para. 827 of the Regulations).

Shipments — competent authority multilateral approval is required where the criticality safety index is greater than 50.

Shipments — competent authority authorization of transport without shipment approval.

Radiation protection programmes for shipments by special use vessel.

Competent authority authorization of transport without shipment approval.

Information to be included in an application for shipment approval.

8. PROVISIONS CONCERNING TRANSPORT OPERATIONS
8.1. Modal requirements

Conditions for air transport.

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

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

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

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

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

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

For transport by rail and by road: for consignments under exclusive use, the radiation level is not allowed to exceed:

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.

For transport by vessels: packages or overpacks having a surface radiation level greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with Table 10 of the Regulations, footnote (a), are not allowed to be transported.

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 Regulations relating to TI, criticality safety index and radiation level provided that the conditions stated in para. 576 of the Regulations are met.

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

Transport by post is not permitted.

8.2. Placarding

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

Consignor’s responsibilities

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 which do not relate to the contents are required to be removed.
As an alternative to the use of placards on large freight containers and tanks, enlarged labels are permitted.

Where an exclusive use consignment in a freight container is UN 3328 Type B(U) packages, and no other UN number commodities are present, the UN number “UN 3328” is required to be displayed on all four sides of the freight container, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

The location of placards and the use of placards with reduced dimensions on a road or rail vehicle are stipulated.

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

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

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)–562(d) and para. 506 of the Regulations.

- **Criteria for segregation from workers in regularly occupied working areas.**
- **Criteria for segregation from members of the public.**
- **Criteria for segregation from undeveloped photographic film.**
- **Criteria for segregation from other dangerous goods.**

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

Consignments are required to be securely stowed.

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

Transport index limits for freight containers and conveyances.

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

Criticality safety index limits for freight containers and conveyances.

Any package or overpack having a TI greater than 10, or any consignment having a criticality safety index greater than 50, is required to be transported only under exclusive use.

Segregation of packages during transport and storage in transit.
For a special use vessel, the storage arrangements are excepted from the requirements of para. 566 of the Regulations provided that the conditions stated in para. 576 of the Regulations are met.

8.4. Damaged or leaking packages

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.

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

8.5. Decontamination

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

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

8.6. Other provisions

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

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

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, FISSION**

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2. CONTENTS LIMITS FOR PACKAGES

The quantity of radioactive material is not allowed to exceed the limits specified in paras 432 and 433 of the Regulations.

Fissile material and exceptions.

Fissile material.

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

3. CONTAMINATION

Non-fixed contamination on the external surfaces of any package and on the external and internal surfaces of overpacks, freight containers, tanks, intermediate bulk containers and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over any area of 300 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 RADIATION LEVELS

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

** Packages or overpacks having a surface radiation level greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels in accordance with Table 10 of the Regulations, footnote (a), provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel.

5. CATEGORIES OF PACKAGES AND OVERPACKS

The TI is required to be derived in accordance with the procedure as stated in paras 523 and 524 of the Regulations.
Criticality safety index (CSI) for packages containing fissile material, and for overpacks and freight containers.

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

6. MARKING AND LABELLING

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.

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

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

Packages are required to bear the mark "UN 3329" and the proper shipping name "RADIOACTIVE MATERIAL, TYPE B(M) PACKAGE, FISSILE".

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

Each package is required to be marked with:
(a) The identification mark allocated to that design by the competent authority;
(b) A serial number to uniquely identify each packaging which conforms to that design;
(c) "TYPE B(M)".

The outside of the outermost receptacle which is resistant to the effects of fire and water is required to be plainly marked by embossing, stamping, or other means resistant to the effects of fire and water, with the trefoil symbol shown in Fig. 1 of the Regulations.

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

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

The labels are required to be fixed to two opposite sides of the outside of the package or overpack, or on all four sides of a freight container or tank. The labels are not allowed to cover the markings specified in paras 531-536 of the Regulations.

Each label is required to be marked with the name(s) of the radionuclide(s), the maximum activity of the contents and the TI. Paragraph 540(a) of the Regulations establishes requirements for labelling mixtures of radionuclides. The mass of fissile material, in grams (g), or multiples of grams, may be used instead of the activity.
Except for mixed loads, each label on a freight container or overpack is required to be marked with
(a) The radioactive contents; and
(b) The maximum activity of the total radioactive contents during transport.
For mixed loads such entries may read “See Transport Documents”.

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

7. REQUIREMENTS BEFORE SHIPMENT

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

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

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

(bii) It is required to ensure that lifting attachments which do not meet the requirements of para. 608 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 609 of the Regulations.

(cii) For each package, it is required to ensure that all the requirements specified in the competent authority approval certificates have been satisfied.

(ivd) 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.

(ve) 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 Regulations were made.

(vii) For each special form radioactive material, it is required to ensure that all the requirements specified in the approval certificate and the relevant provisions of the Regulations have been satisfied.

(gvii) For each low dispersible radioactive material, it is required to ensure that all the requirements specified in the approval certificate and the relevant provisions of the Regulations have been satisfied.

(viiik) For packages containing fissile material, the measurement specified in para. 677(b) of the Regulations and the tests to demonstrate closure of each package as specified in para. 680 of the Regulations are required to be performed where applicable.

Transport documents with each consignment (consignment note) are required to include all relevant particulars of the consignment.
The consignor is required to include a declaration in the transport documents.

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

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

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

For each shipment, the consignor is required to notify the competent authority of each country through or into which the consignment is to be transported. This notification is required to have been received by each competent authority prior to the commencement of the shipment, and preferably at least 7 days in advance. See also para. 559 of the Regulations.

The notification referred to in para. 558 of the Regulations is required to include:

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

Separate notification is not required if the information has been included in the application for shipment approval (see para. 827 of the Regulations).

Shipment — competent authority approval.

Shipment — competent authority authorization of transport without shipment approval.

Radiation protection programmes for shipments by special use vessel.

Competent authority authorization of transport without shipment approval.

Information to be included in an application for shipment approval.

8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

8.1. Modal requirements

Conditions for air transport
For transport by rail and by road: for consignments under exclusive use, the radiation level is not allowed to exceed:

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

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

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

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

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

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

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.

For transport by vessels: packages or overpacks having a surface radiation level greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with Table 10 of the Regulations, footnote (a), are not allowed to be transported.

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 Regulations relating to TI, criticality safety index and radiation level provided that the conditions stated in para. 576 of the Regulations are met.

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

Transport by post is not permitted.

8.2. Placarding

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

Consignor’s responsibilities

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

As an alternative to the use of placards on large freight containers and tanks, enlarged labels are permitted.
Where an exclusive use consignment in a freight container is UN 3329 Type B(M) packages, and no other UN number commodities are present, the UN number “UN 3329” is required to be displayed on all four sides of the freight container, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

The location of placards and the use of placards with reduced dimensions on a road or rail vehicle are stipulated.

Where an exclusive use consignment in or on a road or rail vehicle is UN 3329 Type B(M) packages only, and no other UN number commodities are present, the UN number “UN 3329” is required to be displayed, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

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

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)–562(d) and para. 506 of the Regulations.

- **562(a)** Criteria for segregation from workers in regularly occupied working areas.
- **562(b)** Criteria for segregation from members of the public.
- **562(c)** Criteria for segregation from undeveloped photographic film.
- **562(d), 506** Criteria for segregation from other dangerous goods.

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

Consignments are required to be securely stowed.

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

**566(a), Table 10** Transport index limits for freight containers and conveyances.

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

**566(c), Table 11** Criticality safety index limits for freight containers and conveyances.

Any package or overpack having a TI greater than 10, or any consignment having a criticality safety index greater than 50, is required to be transported only under exclusive use.

**568, 569, Table 11** Segregation of packages during transport and storage in transit.

For a special use vessel, the storage arrangements are excepted from the requirements of para. 566 of the Regulations provided that the conditions stated in para. 576 of the
Regulations are met.

8.4. Damaged or leaking packages

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.

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

8.5. Decontamination

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

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

8.6. Other provisions

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

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

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

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

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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 Regulations.

417 Fissile material and exceptions.

418 Fissile material.

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.

3. CONTAMINATION

508, 509 Non-fixed contamination on the external surfaces of any package and on the external and internal surfaces of overpacks, freight containers, tanks, intermediate bulk containers and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over any area of 300 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 RADIATION LEVELS

526–528, 575 (i) The radiation level for a package or overpack is required to be such that the TI of the package or overpack does not exceed 10, and the criticality safety index is not allowed to exceed 50, except when transported under exclusive use, and

(ii) The maximum radiation level at any point on any external surface of the package or overpack is not allowed to exceed 2 mSv/h, except when transported under exclusive use by rail or by road, or under exclusive use by sea**, and

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

** Packages or overpacks having a surface radiation level greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels in accordance with Table 10 of the Regulations, footnote (a), provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel.

5. CATEGORIES OF PACKAGES AND OVERPACKS

523, 524 The TI is required to be derived in accordance with the procedure as stated in paras 523 and 524 of the Regulations.
Criticality safety index (CSI) for packages containing fissile material, and for overpacks and freight containers.

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

6. MARKING AND LABELLING

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.

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

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

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

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

Each package is required to be marked with:

(a) The identification mark allocated to that design by the competent authority;
(b) A serial number to uniquely identify each packaging which conforms to that design;
(c) “TYPE C” Not applicable.
(d) “TYPE C”

The outside of the outermost receptacle which is resistant to the effects of fire and water is required to be plainly marked by embossing, stamping, or other means resistant to the effects of fire and water, with the trefoil symbol shown in Fig. 1 of the Regulations.

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

Each package, overpack and freight container is required to bear the appropriate labels. Paragraph 543 of the Regulations sets out alternative provisions for large freight containers and tanks.

The labels are required to be fixed to two opposite sides of the outside of the package or overpack, or on all four sides of a freight container or tank. The labels are not allowed to cover the markings specified in paras 531 to 536 of the Regulations.

Each label is required to be marked with the name(s) of the radionuclide(s), the maximum activity of the contents and the TI. Paragraph 540(a) of the Regulations establishes requirements for labelling mixtures of radionuclides. The mass of fissile material, in grams (g), or multiples of grams, may be used instead of the activity.
Except for mixed loads, each label on a freight container or overpack is required to be marked with
(a) The radioactive contents; and
(b) The maximum activity of the total radioactive contents during transport.
For mixed loads such entries may read “See Transport Documents”.

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

7. REQUIREMENTS BEFORE SHIPMENT

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

Before each shipment of any package, the following requirements apply:
(a) For any package it is required to ensure that all the requirements specified in the relevant provisions of the Regulations have been satisfied.
(b) It is required to ensure that lifting attachments which do not meet the requirements of para. 608 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 609 of the Regulations.
(c) For each package, it is required to ensure that all the requirements specified in the competent authority approval certificates have been satisfied.
(d) Each package is required to be held until equilibrium conditions have been approached closely enough to demonstrate compliance with the requirements for temperature and pressure unless an exemption from these requirements has received unilateral approval.
(e) For each package, it is required to ensure by inspection and/or appropriate tests that all closures, valves and other openings of the containment system through which the radioactive contents might escape are properly closed and, where appropriate, sealed in the manner for which the demonstrations of compliance with the requirements of paras 659 and 671 of the Regulations were made.
(f) For each special form radioactive material, it is required to ensure that all the requirements specified in the approval certificate and the relevant provisions of the Regulations have been satisfied.
(g) For each low dispersible radioactive material, it is required to ensure that all the requirements specified in the approval certificate and the relevant provisions of the Regulations have been satisfied.
(h) For packages containing fissile material, the measurement specified in para. 677(b) of the Regulations and the tests to demonstrate closure of each package as specified in para. 680 of the Regulations are required to be performed where applicable.

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

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

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

558(a) For each shipment containing radioactive material with an activity greater than 3000$A_1$ or 3000$A_2$, as appropriate, or 1000 TBq, whichever is the lower, the consignor is required to notify the competent authority of each country through or into which the consignment is to be transported. This notification is required to have been received by each competent authority prior to the commencement of the shipment, and preferably at least 7 days in advance. See also para. 559 of the Regulations.

559 The notification referred to in para. 558 of the Regulations is required to include:

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

560 Separate notification is not required if the information has been included in the application for shipment approval (see para. 827 of the Regulations).

825(c) Shipments — competent authority multilateral approval is required where the criticality safety index is greater than 50.

826 Shipments — competent authority authorization of transport without shipment approval.

825(d), 826 Radiation protection programmes for shipments by special use vessel.

Competent authority authorization of transport without shipment approval.

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

8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

8.1. Modal requirements

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

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

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

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

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

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

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

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.

For transport by vessels: packages or overpacks having a surface radiation level greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with Table 10 of the Regulations, footnote (a), are not allowed to be transported.

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 Regulations relating to T1, criticality safety index and radiation level provided that the conditions stated in para. 576 of the Regulations are met.

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

Transport by post is not permitted.

8.2. Placarding

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

Consignor’s responsibilities

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

As an alternative to the use of placards on large freight containers and tanks, enlarged labels are permitted.
Where an exclusive use consignment in a freight container is UN 3330 Type C packages, and no other UN number commodities are present, the UN number “UN 3330” is required to be displayed on all four sides of the freight container, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

The location of placards and the use of placards with reduced dimensions on a road or rail vehicle are stipulated.

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 65mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

8.3. Stowage during transport, storage in transit and segregation

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)–562(d) and para. 506 of the Regulations.

Criteria for segregation from workers in regularly occupied working areas.

Criteria for segregation from members of the public.

Criteria for segregation from undeveloped photographic film.

Criteria for segregation from other dangerous goods.

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

Consignments are required to be securely stowed.

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

Transport index limits for freight containers and conveyances.

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

Criticality safety index limits for freight containers and conveyances.

Any package or overpack having a TI greater than 10, or any consignment having a criticality safety index greater than 50, is required to be transported only under exclusive use.

Segregation of packages during transport and storage in transit.

For a special use vessel, the storage arrangements are excepted from the requirements of para. 566 of the Regulations provided that the conditions stated in para. 576 of the
Regulations are met.

8.4. Damaged or leaking packages

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.

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

8.5. Decontamination

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

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

8.6. Other provisions

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

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

Where a consignment is undeliverable, appropriate actions are required to be taken as soon as possible.
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Package design requirements — competent authority approval.


Packaging serial numbers — informing the competent authority.

2. CONTENTS LIMITS FOR PACKAGES

Fissile material and exceptions.

The quantity of radioactive material is not allowed to exceed the limit given in the competent authority approval certificate.

3. CONTAMINATION

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

(a) Beta, gamma and low toxicity alpha emitters, $4 \text{ Bq/cm}^2$;

(b) All other alpha emitters, $0.4 \text{ Bq/cm}^2$.

4. MAXIMUM RADIATION LEVELS

(i) The radiation level for a package or overpack is required to be such that the TI of the package or overpack does not exceed 10, and the criticality safety index is not allowed to exceed 50, except when transported under exclusive use, and

(ii) The maximum radiation level at any point on any external surface of the package or overpack, except when transported under exclusive use by rail or by road is not allowed to exceed 2 mSv/h, or under special arrangement by air or by sea, and

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

5. CATEGORIES OF PACKAGES AND OVERPACKS

The TI is required to be derived in accordance with the procedure as stated in paras 523 and 524 of the Regulations.

The criticality safety index (CSI) for packages containing fissile material is required to be obtained in accordance with paras 528 and 529 of the Regulations.
A package or an overpack containing packages, transported under special arrangement is required to be assigned to category III-YELLOW, except under certain provisions stated in para. 530 of the Regulations.

6. MARKING AND LABELLING

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.

Except under certain provisions stated in para. 530 of the Regulations, and except in case of uranium hexafluoride where provisions in para 419 of the Regulations apply, packages are required to bear the mark “UN 3331” and the proper shipping name “RADIOACTIVE MATERIAL, TRANSPORTED UNDER SPECIAL ARRANGEMENT, FISSILE”.

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

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

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

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

Any labels which do not relate to the contents are required to be removed or covered. The labels are required to be fixed to two opposite sides of the outside of the package or overpack, or on all four sides of a freight container or tank. The labels are not allowed to cover the markings specified in paras 531-536 of the Regulations.

Each label is required to be marked with the name(s) of the radionuclide(s), the maximum activity of the contents and the TL. Paragraph 540(a) of the Regulations establishes requirements for labelling mixtures of radionuclides. For fissile materials, the mass of fissile material, in grams (g), or multiples of grams, may be used instead of the activity.

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

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

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

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

The labels are required to be fixed to two opposite sides of the outside of the package or overpack, or on all four sides of a freight container or tank. The labels are not allowed to cover the markings specified in paras 531-536 of the Regulations.
It is the consignor’s responsibility to comply with the requirements of marking, labelling and placarding.

**CS-47300 recommends to organize references to paras 538 to 544 into more user-friendly manner.**

### 7. REQUIREMENTS BEFORE SHIPMENT

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

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

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

(b) It is required to ensure that lifting attachments which do not meet the requirements of para. 608 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 609 of the Regulations.

(c) For each package, it is required to ensure that all the requirements specified in the competent authority approval certificates have been satisfied.

(d) Each package is required to be held until equilibrium conditions have been approached closely enough to demonstrate compliance with the requirements for temperature and pressure unless an exemption from these requirements has received unilateral approval.

(e) For each package, it is required to ensure by inspection and/or appropriate tests that all closures, valves and other openings of the containment system through which the radioactive contents might escape are properly closed and, where appropriate, sealed in the manner for which the demonstrations of compliance with the requirements of paras 659 and 671 of the Regulations were made.

(f) For each special form radioactive material, it is required to ensure that all the requirements specified in the approval certificate and the relevant provisions of the Regulations have been satisfied.

(g) For packages containing fissile material, the measurement specified in para. 677(b) of the Regulations and the tests to demonstrate closure of each package as specified in para. 680 of the Regulations are required to be performed where applicable.

(h) For each low dispersible radioactive material, it is required to ensure that all of the requirements specified in the approval certificate and the relevant provisions of the Regulations have been satisfied.

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

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

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

The consignor is required to make competent authority certificates available to the carrier(s) before loading and unloading.
For each shipment, the consignor is required to notify the competent authority of each country through or into which the consignment is to be transported. This notification is required to have been received by each competent authority prior to the commencement of the shipment, and preferably at least 7 days in advance. See also para. 560 of the Regulations.

The notification referred to in para. 558 of the Regulations is required to include:

(a) Clear identification of the package, including all applicable certificate numbers and identification marks;

(b) The date of shipment, the expected date of arrival and the proposed routeing;

(c) The names of the radioactive materials or nuclides;

(d) Descriptions of the physical and chemical forms of the radioactive material, or whether it is special form radioactive material or low dispersible radioactive material;

(e) The maximum activity of the radioactive contents during transport, expressed in becquerels (Bq) with the appropriate SI prefix symbol (see Annex II of the Regulations). For fissile material, the mass of fissile material in grams (g), or multiples of grams, may be used in place of activity.

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

825(d), 826 Radiation protection programmes for shipments by special use vessel.

Competent authority authorization of transport without shipment approval.

829–831 Approval of shipments under special arrangement.

8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

8.1. Modal requirements

For transport by rail and by road: for consignments under exclusive use, the radiation level is not allowed to exceed:

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

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

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

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

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

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

580, 581  Transport by post is not permitted.

8.2. Placarding

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

545  **Consignor’s responsibilities**

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.

543  Any placards which 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, and no other UN number commodities are present, the UN number “UN 3331” is required to be displayed on all four sides of the freight container, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

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

572, Figs 6, 7  Where an exclusive use consignment in or on a road or rail vehicle is a UN 3331 Special Arrangement only, and no other UN number commodities are present, the UN number “UN 3331” is required to be displayed, in black digits not less than 65mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

8.3. Stowage during transport, storage in transit and segregation

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)–
562(d) and para. 506 of the Regulations:

562(a) Criteria for segregation from workers in regularly occupied working areas;
562(b) Criteria for segregation from members of the public;
562(c) Criteria for segregation from undeveloped photographic film; and
562(d), 506 Criteria for segregation from other dangerous goods.

563 Category II-YELLOW or category III-YELLOW packages or overpacks may be carried in compartments occupied by passengers under specific conditions.
564 Consignments are required to be securely stowed.
565 A package or overpack may be carried or stored among packaged general cargo, under certain conditions.
566(a), Table 10 Transport index limits for freight containers and conveyances.
566(b) Limits on the radiation levels from freight containers and conveyances. See para. 573 of the Regulations for exceptions.
566(c), Table 11 Critical safety index limits for freight containers and conveyances.
567 Any package or overpack having a TI greater than 10, or any consignment having a criticality safety index greater than 50, is required to be transported only under exclusive use.
568, 569, Table 11 Segregation of packages during transport and storage in transit.
576 For a special use vessel, the storage arrangements are excepted from the requirements of para. 566 of the Regulations provided that the conditions stated in para. 576 of the Regulations are met.

8.4. Damaged or leaking packages

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

8.5. Decontamination

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

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

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

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-exceptioned

Paragraph number of the Regulations [1]

Subject

1. GENERAL PROVISIONS

110, 507 Other dangerous properties of contents and transport with other dangerous goods.

301–303 General provisions for radiation protection.

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306 Management system.

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

Fissile material excepted under para. 417 (f) is required to comply with para. 606 and requires multilateral approval by competent authority.

501(a) Requirements before the first shipment.

502, 503(a) Requirements before each shipment.

561 Possession of special form material certificates, and instructions for 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 Design requirements for Type A packages, summary.

636–648 Additional design requirements for Type A packages.

649, 650 Additional design requirements for packages containing liquids.

651 Additional design requirements for packages containing gases.

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

802(a), 803, 804 Design requirements for special form radioactive material — competent authority approval.

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

2. CONTENTS LIMITS FOR PACKAGES

If the package contains fissile material, one of the fissile exceptions provided by para. 417 of the Regulations is required to be applied. Fissile material excepted under para. 417 (f) is required to comply with para. 606 and requires multilateral approval by competent authority.

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

When special form and non-special form radioactive material are packed in a same Type A package, the quantity of radioactive material is not allowed to exceed the limits specified in para. 430 of the Regulations. In that case schedule for UN 2915 is also applicable.

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

3. CONTAMINATION

Non-fixed contamination on the external surfaces of any package and on the external and internal surfaces of overpacks, freight containers, tanks, intermediate bulk containers and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over any area of 300cm² 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 RADIATION LEVELS

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

** Packages or overpacks having a surface radiation level greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels in
According to Table 10 of the Regulations, footnote (a), provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel.

5. CATEGORIES OF PACKAGES AND OVERPACKS

523, 524 The TI is required to be derived in accordance with the procedure as stated in paras 523 and 524 of the 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.

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

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

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.

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 (VRID Code) of the country of origin of design and either the name of the manufacturer or other identification of the packaging specified by the competent authority of the country of origin of the design.

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

538, 543, Figs 2–4 Each package, overpack and freight container is required to bear the appropriate labels. Paragraph 543 of the Regulations sets out alternative provisions for large freight containers.

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 markings specified in paras 531–536 of the Regulations.

540(a), (b), (d), Table 2 Each label is required to be marked with the name(s) of the radionuclide(s), the maximum activity of the contents and the TI, except for category I-WHITE, for which the TI is not required. Paragraph 540(a) of the Regulations 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
(a) The radioactive contents; and
(b) The maximum activity of the total radioactive contents during transport.

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

7. REQUIREMENTS BEFORE SHIPMENT

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

502, 503(a)  Before each shipment of any package, the following requirements apply:
(a) It is required to ensure that all the requirements specified in the relevant provisions of the Regulations have been satisfied.
(b) It is required to ensure that lifting attachments which do not meet the requirements of para. 608 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 609 of the Regulations.
(c) For each special form radioactive material, it is required to ensure that all the requirements specified in the approval certificate and the relevant provisions of the Regulations have been satisfied.

546  Transport documents with each consignment (consignment note) 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), 826  Radiation protection programmes for shipments by special use vessel.
Competent authority authorization of transport without shipment approval.

8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

8.1. Modal requirements
For transport by rail and by road: for consignments under exclusive use, the radiation level is not allowed to exceed:

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

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

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

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

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

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

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.

For transport by vessels: packages or overpacks having a surface radiation level greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with Table 10 of the Regulations, footnote (a), are not allowed to be transported.

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

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

Transport by post is not permitted.

8.2. Placarding

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

Consignor's responsibilities

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

As an alternative to the use of placards on large freight containers, enlarged labels
are permitted.

Where an exclusive use consignment in a freight container is UN 3332 Type A packages, and no other UN number commodities are present, the UN number “UN 3332” is required to be displayed on all four sides of the freight container, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

The location of placards and the use of placards with reduced dimensions on a road or rail vehicle are stipulated.

Where an exclusive use consignment in or on a road or rail vehicle is UN 3332 Type A packages only, and no other UN number commodities are present, the UN number “UN 3332” is required to be displayed, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

8.3. Stowage during transport, storage in transit and segregation

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)–562(d) and para. 506 of the Regulations.

562(a) Criteria for segregation from workers in regularly occupied working areas.

562(b) Criteria for segregation from members of the public.

562(c) Criteria for segregation from undeveloped photographic film.

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

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

564 Consignments are required to be securely stowed.

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

566(a), Table 10 Transport index limits for freight containers and conveyances.

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

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

576 For a special use vessel, the storage arrangements are excepted from the requirements of para. 566 of the Regulations provided that the conditions stated in para. 576 of the Regulations are met.

8.4. Damaged or leaking packages
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.

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

8.5. Decontamination

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

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

8.6. Other provisions

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

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

Where a consignment is undeliverable, appropriate actions are required to be taken as soon as possible.
### 1. GENERAL PROVISIONS

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2. CONTENTS LIMITS FOR PACKAGES

Fissile material and exceptions.

429(a), 430

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

When special form and non-special form radioactive material are packed in a same Type A package, the quantity of radioactive material is not allowed to exceed the limits specified in para. 430 of the Regulations. In that case schedule for UN 3327 is also applicable.

Fissile material.

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

3. CONTAMINATION

Non-fixed contamination on the external surfaces of any package and on the external and internal surfaces of overpacks, freight containers, tanks, intermediate bulk containers and conveyances is required to be kept as low as practicable and is not allowed to exceed the following limits, when averaged over any area of 300 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 RADIATION LEVELS

526–528, 575

(i) The radiation level for a package or overpack is required to be such that the TI of the package or overpack does not exceed 10, and the criticality safety index is not allowed to exceed 50, except when transported under exclusive use; and

(ii) The maximum radiation level at any point on any external surface of the package or overpack is not allowed to exceed 2 mSv/h, except when transported under exclusive use by rail or by road, or under exclusive use by sea**; and

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

** Packages or overpacks having a surface radiation level greater than 2 mSv/h carried in or on a vehicle under exclusive use may be transported by vessels in accordance with Table 10 of the Regulations, footnote (a), provided that such packages or overpacks are not removed from the vehicle at any time while on board the vessel.
5. CATEGORIES OF PACKAGES AND OVERPACKS

523, 524 The TI is required to be derived in accordance with the procedure as stated in paras 523 and 524 of the Regulations.

525, 686 Criticality safety index (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.

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

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

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

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

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 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 which conforms to that design.

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

538, 541–543, Figs 2–5 Each package, overpack and freight container is required to bear the appropriate labels. Paragraph 543 of the Regulations sets out alternative provisions for large freight containers.

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 markings specified in paras 531–536 of the Regulations.
Each label is required to be marked with the name(s) of the radionuclide(s), the maximum activity of the contents and the TI, except for category 1-WHITE, for which the TI is not required. Paragraph 540(a) of the Regulations establishes requirements for labelling mixtures of radionuclides. The mass of fissile material, in grams (g), or multiples of grams, may be used instead of the activity.

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

(a) The radioactive contents; and

(b) The maximum activity of the total radioactive contents during transport.

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

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

7. REQUIREMENTS BEFORE SHIPMENT

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

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

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

(b) It is required to ensure that lifting attachments which do not meet the requirements of para. 608 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 609 of the Regulations.

(c) For each package, it is required to ensure that all the requirements specified in the competent authority approval certificates have been satisfied.

(d) For each special form radioactive material, it is required to ensure that all the requirements specified in the approval certificate and the relevant provisions of the Regulations have been satisfied.

(e) For each low dispersible radioactive material, it is required to ensure that all the requirements specified in the approval certificate and the relevant provisions of the Regulations have been satisfied.

(f) For packages containing fissile material, the measurement specified in para. 677(b) of the Regulations and the tests to demonstrate closure of each package as specified in para. 680 of the Regulations are required to be performed where applicable.

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

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

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

The consignor is required to make competent authority certificates available to the carrier.
825(c) Shipments — competent authority multilateral approval is required where the criticality safety index is greater than 50.

826 Shipments — competent authority authorization of transport without shipment approval.

825(d), 826 Radiation protection programmes for shipments by special use vessel.

Competent authority authorization of transport without shipment approval.

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

8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

8.1. Modal requirements

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

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

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

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

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

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

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

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

575 For transport by vessels: packages or overpacks having a surface radiation level greater than 2 mSv/h, unless being carried in or on a vehicle under exclusive use in accordance with Table 10 of the Regulations, footnote (a), are not allowed to be transported.
For transport by vessels: the transport of consignments by means of a special use vessel is excepted from the requirements of para. 567 of the Regulations relating to TI, criticality safety index and radiation level provided that the conditions stated in para. 576 of the Regulations are met.

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

Transport by post is not permitted.

8.2. Placarding

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

Consignor’s responsibilities

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

As an alternative to the use of placards on large freight containers, enlarged labels are permitted.

Where an exclusive use consignment in a freight container is UN 3333 Type A packages, and no other UN number commodities are present, the UN number “UN 3333” is required to be displayed on all four sides of the freight container, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background, or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

The location of placards and the use of placards with reduced dimensions on a road or rail vehicle are stipulated.

Where an exclusive use consignment in or on a road or rail vehicle is UN 3333 Type A packages only, and no other UN number commodities are present, the UN number “UN 3333” is required to be displayed, in black digits not less than 65 mm high, either in the lower half of the placard shown in Fig. 6 of the Regulations against the white background or on the placard shown in Fig. 7 of the Regulations. If the placard shown in Fig. 7 of the Regulations is used, it is required to be fixed close to each main placard.

8.3. Stowage during transport, storage in transit and segregation

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)–562(d) and para. 506 of the Regulations.

Criteria for segregation from workers in regularly occupied working areas.
Criteria for segregation from members of the public.

Criteria for segregation from undeveloped photographic film.

Criteria for segregation from other dangerous goods.

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

Consignments are required to be securely stowed.

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

Transport index limits for freight containers and conveyances.

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

Criticality safety index limits for freight containers and conveyances.

Any package or overpack having a TI greater than 10, or any consignment having a criticality safety index greater than 50, is required to be transported only under exclusive use.

Segregation of packages during transport and storage in transit.

For a special use vessel, the storage arrangements are excepted from the requirements of para. 566 of the Regulations provided that the conditions stated in para. 576 of the Regulations are met.

8.4. Damaged or leaking packages

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.

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

8.5. Decontamination

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

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

8.6. Other provisions

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

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

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

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2. CONTENTS LIMITS FOR PACKAGES

If the package contains fissile material, one of the fissile exceptions provided by para. 417 of the Regulations is required to be applied. Fissile material excepted under para. 417 (f) is required to comply with para. 606 and requires multilateral approval by competent authority.

Requirements for contents of package containing uranium hexafluoride.

The activity limits in Table 4 of the Regulations are required to be met.

Additional requirements for transport of less than 0.1 kg of uranium hexafluoride.

3. CONTAMINATION

Non-fixed contamination on the external surfaces of any package is required to be kept as low as practicable and is not allowed to exceed the following limits, averaged over any area of 300 cm$^2$ 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 RADIATION LEVELS

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

5. CATEGORIES OF PACKAGES AND OVERPACKS

Not applicable.
6. MARKING AND LABELLING

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.

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, when it is impractical to mark an internal surface.

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

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

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

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

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

7. REQUIREMENTS BEFORE SHIPMENT

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

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

(b) It is required to ensure that lifting attachments which do not meet the requirements of para. 608 of the Regulations have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with para. 609 of the Regulations.

The transport documents with each consignment (consignment note) are required to include the identification of the consignor and consignee, including their names and addresses, and the UN number UN 3507.

8. PROVISIONS CONCERNING TRANSPORT OPERATIONS

8.1. Modal requirements
Transport by post is not permitted.

8.2. Placarding

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

Consignor’s responsibilities

8.3. Stowage during transport, storage in transit and segregation

Not applicable.

8.4. Damaged or leaking packages

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

8.5. Decontamination

Not applicable.

8.6. Other provisions

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

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

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