The format to read the requirements of the Regulations for a specific UN number and associated proper shipping name is outlined below. The regulatory requirements are included in full text format, with the subsequent paragraphs included below at an indentation. This format is repeated until the paragraphs have no further requirements to consider. When the requirement has been included in full the next requirement will not be indented.

In the situation where there is more than one requirement to consider, the paragraphs have been included in the order that they have been written in the paragraph. Where there are parts of requirements that do not apply to a specific UN number and associated proper shipping name, the text is white in colour. This means that there is no change to regulatory text.

The subsequent requirements are highlighted in colour for the user to identify the next requirement. The colour indicates the level of indentation and allows the users to see the flow of the requirements more clearly. The paragraph requirements highlighted in yellow relate to one level of indentation (and the parent paragraph has no highlighting therefore are requirements as directly stated in the SSG-33 document) the green colour relates to two levels of indentation and so forth.

![Figure 1. The colour coding of the requirements, when](image)

The examples have been included to aid users when reading the guidance document.

**Example 1**

A requirement of UN number 2909 is paragraph 618. In the regulations it states that:

*For radioactive material having other dangerous properties, the package design shall take into account those properties (see paras 110 and 507).*

In this guidance document the paragraphs 110 and 507 are included at an indent and below the parent paragraph. The format guides the user to follow the necessary subsequent requirements. When the requirement has been included in full the next requirement will not be indented.

618. For *radioactive material* having other dangerous properties, the *package design* shall take into account those properties (see paras [110 and 507]).

**110.** For radioactive material having subsidiary risks, and for transport of radioactive material with other dangerous goods, the relevant transport regulations for dangerous goods shall apply in addition to these Regulations.

**507.** In addition to the radioactive and fissile properties, any other dangerous properties of the contents of the package, such as explosiveness, flammability, pyrophoricity, chemical toxicity and corrosiveness, shall be taken into account in the packing, labelling, marking, placarding, storage and transport in order to be in compliance with the relevant transport regulations for dangerous goods of each of the countries through or into which the materials will be transported, and, where applicable, with the regulations of the cognizant transport organizations, as well as these Regulations.
Example 2

For paragraph 671, it states that:

"Where mixtures of different radionuclides are present, the provisions of paras 405–407 shall apply, except that for krypton-85 an effective \( A_2(i) \) value equal to 10\( A_2 \) may be used. For case (a), the assessment shall take into account the external contamination limits of para. 508."

The paragraphs 405 - 407 and 508 are included at an indent and below 671, the parent paragraph. The requirement as written in paragraph 406 states that the “formulas in paras 405 and 430” are required to be taken into consideration, these are included in full at a further indent. The format guides the user to follow the necessary subsequent requirements. When the requirement has been included in full the next requirement will not be indented.

671. A package shall be so designed that if it were at the maximum normal operating pressure and subjected to:

(a) The tests specified in paras 719–724, it would restrict the loss of radioactive contents to not more than \( 10^{-6} A_2 \) per hour.

(b) The test sequences in para. 734:

(i) It would retain sufficient shielding to ensure that the dose equivalent rate 1 m from the surface of the package would not exceed 10 mSv/h with the maximum radioactive contents that the package is designed to contain.

(ii) It would restrict the accumulated loss of radioactive contents in a period of one week to not more than \( 10 A_2 \) for krypton-85 and not more than \( A_2 \) for all other radionuclides.

Where mixtures of different radionuclides are present, the provisions of paras 405–407 shall apply, except that for krypton-85 an effective \( A_2(i) \) value equal to 10\( A_2 \) may be used. For case (a), the assessment shall take into account the external contamination limits of para. 508.

405. For mixtures of radionuclides, the basic radionuclide values referred to in para. 402 may be determined as follows:

\[
X_m = \frac{1}{\sum_i f(i) X(i)}
\]

where

\( f(i) \) is the fraction of activity or activity concentration of radionuclide i in the mixture.

\( X(i) \) is the appropriate value of \( A_1 \) or \( A_2 \), or the activity concentration limit for exempt material or the activity limit for an exempt consignment as appropriate for the radionuclide i.

\( X_m \) is the derived value of \( A_1 \) or \( A_2 \), or the activity concentration limit for exempt material or the activity limit for an exempt consignment in the case of a mixture.

402. The following basic values for individual radionuclides are given in Table 2:

(a) \( A_1 \) and \( A_2 \) in TBq;

(b) Activity concentration limits for exempt material in Bq/g;
(c) Activity limits for exempt consignments in Bq.

406. When the identity of each radionuclide is known but the individual activities of some of the radionuclides are not known, the radionuclides may be grouped and the lowest radionuclide value, as appropriate for the radionuclides in each group, may be used in applying the formulas in paras 405 and 430. Groups may be based on the total alpha activity and the total beta/gamma activity when these are known, using the lowest radionuclide values for the alpha emitters or beta/gamma emitters, respectively.

405. For mixtures of radionuclides, the basic radionuclide values referred to in para. 402 may be determined as follows:

\[ X_m = \frac{1}{\sum_i f(i)} \]

where

\( f(i) \) is the fraction of activity or activity concentration of radionuclide \( i \) in the mixture.

\( X(i) \) is the appropriate value of \( A_1 \) or \( A_2 \), or the activity concentration limit for exempt material or the activity limit for an exempt consignment as appropriate for the radionuclide \( i \).

\( X_m \) is the derived value of \( A_1 \) or \( A_2 \), or the activity concentration limit for exempt material or the activity limit for an exempt consignment in the case of a mixture.

402. The following basic values for individual radionuclides are given in Table 2:

(a) \( A_1 \) and \( A_2 \) in TBq;

(b) Activity concentration limits for exempt material in Bq/g;

(c) Activity limits for exempt consignments in Bq.

430. For mixtures of radionuclides whose identities and respective activities are known, the following condition shall apply to the radioactive contents of a Type A package:

\[ \sum_i B(i) A_1(i) + \sum_j C(j) A_2(j) \]

where

\( B(i) \) is the activity of radionuclide \( i \) as special form radioactive material;

\( A_1(i) \) is the \( A_1 \) value for radionuclide \( i \);

\( C(j) \) is the activity of radionuclide \( j \) as other than special form radioactive material;

\( A_2(j) \) is the \( A_2 \) value for radionuclide \( j \).

407. For individual radionuclides or for mixtures of radionuclides for which relevant data are not available, the values shown in Table 3 shall be used.

508. The non-fixed contamination on the external surfaces of any package shall be kept as low as practicable and, under routine conditions of transport, shall not exceed the following limits:

(a) 4 Bq/cm\(^2\) for beta and gamma emitters and low toxicity alpha emitters;

(b) 0.4 Bq/cm\(^2\) for all other alpha emitters.
These limits are applicable when averaged over any area of 300 cm$^2$ of any part of the surface.

Example 3

This example shows users how to recognise the use of brackets which indicate that a specific part of a requirements is not applicable to the UN number and associated proper shipping name.

566. Loading of freight containers and accumulation of packages, overpacks and freight containers shall be controlled as follows:

(a) Except under the condition of exclusive use, and for consignments of LSA-I material, the total number of packages, overpacks and freight containers aboard a single conveyance shall be so limited that the sum of the TIs aboard the conveyance does not exceed the values shown in Table 10.

(b) The dose equivalent rate under routine conditions of transport shall not exceed 2 mSv/h at any point on, and 0.1 mSv/h at 2 m from, the external surface of the vehicle or freight container, except for consignments transported under exclusive use by road or rail, for which the radiation limits around the vehicle are set forth in para. 573(b) and 573(c).

(c) The sum of the CSIs in a freight container and aboard a conveyance shall not exceed the values shown in Table 11.

573. For consignments under exclusive use, the dose equivalent rate shall not exceed:

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

(i) The vehicle is equipped with an enclosure that, during routine conditions of transport, prevents the access of unauthorized persons to the interior of the enclosure.

(ii) Provisions are made to secure the package or overpack so that its position within the vehicle enclosure remains fixed during routine conditions of transport.

(iii) There is no loading or unloading during 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.