

No. 8940. EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR). DONE AT GENEVA ON 30 SEPTEMBER 1957¹

ENTRY INTO FORCE of amendments to annexes A and B,² as amended, of the above-mentioned Agreement

Two sets of amendments respectively proposed by the Government of France and the Government of the United Kingdom of Great Britain and Northern Ireland were circulated by the Secretary-General on 21 October 1975. They came into force on 21 April 1976, in accordance with article 14 (3) of the Agreement.

[TRANSLATION — TRADUCTION]

AMENDMENTS ADOPTED UPON PROPOSAL BY THE GOVERNMENT OF FRANCE

I. Miscellaneous

Marginal 14 414 (2) c)

Sub-paragraph c) should be deleted.

Marginal 14 500

In marginal 14 500, Class Id, Section 5, number the existing paragraph as paragraph (1) and add the following new paragraph:

"(2) Fixed tanks containing substances listed in Appendix B.5 shall in addition bear on both sides and rear the following labels:

Air liquefied	3
Ammonia, anhydrous	4
Anhydrous sulphurous acid (see also sulphur dioxide, anhydrous)	4
Bromomethane (Methyl bromide)	4
Butadiene	2A
Butane	2A
Butylene	2A
Carbon oxychloride (see also phosgene)	3 + 4
Chlorine	4
Cyclopropane	2A
Dimethyl ether (see also methoxymethane)	2A
Ethyl chloride	2A
Ethylene (Ethene)	2A
Ethylene (Ethene), liquid (refrigerated)	2A
Ethylene oxide	2A + 4
Hydrocarbons, mixtures of (Mixtures A, A0, A1, B and C)	2A

¹ United Nations, *Treaty Series*, vol. 619, p. 77; for subsequent actions, see references in Cumulative Indexes Nos. 9 and 11, as well as annex A in volumes 774, 779, 827, 828, 848, 883, 892, 905, 907, 920, 921, 922, 926, 940, 943, 951, 966, 973, 982, 987 and 995.

² *Ibid.*, vol. 731, p. 1.

Hydrogen bromide, anhydrous	4 + 5
Hydrogen chloride	4 + 5
Isobutane	2A
Isobutene (Isobutylene)	2A
Laughing gas (see also nitrous oxide)	3
Methane, liquid (refrigerated)	2A
Methoxymethane	2A
Methylamine, anhydrous	4
Methyl chloride	2A + 4
Methyl vinyl ether	2A
Natural gas, liquid (refrigerated)	2A
Nitrogen dioxide (Dinitrogen tetroxide)	3 + 4
Nitrous oxide	3
Oxygen, liquid (refrigerated)	3
Phosgene	3 + 4
Propane	2A
Propylene (Propene)	2A
Sulphur dioxide, anhydrous	4
Trimethylamine, anhydrous	2A + 4
Vinyl chloride	2A "

Marginal 210 142 (1) e)

Should read:

"e) Tanks intended for the carriage of gases of 12° shall be so constructed that they can be electrically earthed."

Marginal 219 400 (6) d)

Read:

"d) Evaluation:

A visual examination is made:

If the visual examination reveals excessive attack (cracks, bubbles, pores, peeling off, swelling or roughness), the test is conclusive negatively;

If the visual examination reveals no abnormality, bending tests are made by the methods specified in marginal 219 400 (4) on the two specimens subjected to chemical attack and on the reference specimen. In this case the bending strength shall not be more than 20 per cent lower than the value ascertained for the test plate not subjected to any stress."

Marginal 220 000 (2) b)

Read:

- "b) Storage batteries. A master switch enabling all electrical circuits to be isolated shall be placed as near as possible to the battery. Facilities shall be provided to effect isolation of the battery from both inside and outside the driver's cab. Operation of the master switch can be optionally either by direct or remote control. The control placed outside the cab shall be readily accessible to persons outside the vehicle and shall be distinctively marked."

II. Numbering of classes in accordance with the Recommendations
of the Committee of Experts of the Economic and Social Council

ANNEX A - PROVISIONS CONCERNING DANGEROUS SUBSTANCES AND ARTICLES

Contents

Amend to read as follows:

Part I. DEFINITIONS AND GENERAL PROVISIONS

Unchanged

Part II. LIST OF SUBSTANCES AND SPECIAL PROVISIONS FOR THE
VARIOUS CLASSES

	Marginals
Class 1a Explosive substances and articles	2100 <u>et seq.</u>
Class 1b Articles filled with explosive substances	2130 "
Class 1c Igniters, fireworks and similar goods	2170 "
Class 2 Gases: compressed, liquefied or dissolved under pressure ...	2200 "
Class 3 Inflammable liquids	2300 "
Class 4.1 Inflammable solids	2400 "
Class 4.2 Substances liable to spontaneous combustion	2430 "
Class 4.3 Substances which give off inflammable gases on contact with water	2470 "
Class 5.1 Oxidizing substances	2500 "
Class 5.2 Organic peroxides	2550 "
Class 6.1 Toxic substances	2600 "
Class 6.2 Repugnant substances and substances liable to cause infection	2650 "
Class 7 Radioactive substances	2700 "
Class 8 Corrosive substances	2800 " "

Part III. APPENDICES TO ANNEX A

Existing text with the following amendments:

- Appendix A.2 - Replace Id by "2" (twice).
- Appendix A.3 - Replace IIIa and IVa by "3" and "6.1".
- Appendix A.5 - Replace 2513 by "2813".
- Appendix A.6 - Replace IVb by "7".

Part I

DEFINITIONS AND GENERAL PROVISIONS

2002 (1) In the third sentence, amend the texts in brackets to read:

"(Classes 1a, 1b, 1c, 2, 4.2, 4.3, 5.2, 6.2 and 7)" and

"(marginals 2101, 2131, 2171, 2201, 2431, 2471, 2551, 2651 and 2701)" respectively.

In the fourth sentence, amend the texts in brackets to read:

"(Classes 3, 4.1, 5.1, 6.1 and 8)" and

"(marginals 2301, 2401, 2501, 2601 and 2801)"

(2) Amend this paragraph to read:

"(2) The Classes of this Annex are as follows:

Definitions and general provisions

Class 1a	Explosive substances and articles	Restrictive
Class 1b	Articles filled with explosive substances	"
Class 1c	Igniters, fireworks and similar goods	"
Class 2	Gases: compressed, liquefied or dissolved under pressure	"
Class 3	Inflammable liquids	Non-restrictive
Class 4.1	Inflammable solids	"
Class 4.2	Substances liable to spontaneous combustion	Restrictive
Class 4.3	Substances which give off inflammable gases on contact with water	"
Class 5.1	Oxidizing substances	Non-restrictive
Class 5.2	Organic peroxides	Restrictive
Class 6.1	Toxic substances	Non-restrictive
Class 6.2	Repugnant substances and substances liable to cause infection	Restrictive
Class 7	Radioactive substances	"
Class 8	Corrosive substances	Non-restrictive"

2003 (3) In the fourth sub-paragraph, replace 2513(1)(c) by "2813(1)(c)".

In the second sub-paragraph, replace Id by "2" (twice).
 In the third sub-paragraph, replace IIIa and IVa by "3" and "6.1".
 In the fifth sub-paragraph, replace IVb by "7".
 Renumber 2011-2019 as 2011-2099.

Part IILIST OF SUBSTANCES AND
SPECIAL PROVISIONS FOR THE VARIOUS CLASSES

CLASS Ia

Heading Read: "CLASS Ia. EXPLOSIVE SUBSTANCES AND ARTICLES".General amendments

Renumber the marginals as follows:

<u>Existing numbering</u>	<u>New numbering</u>
2020-2037	2100-2117
2038	2118
2039	2119
2040-2045	2120-2125
2046	2126
2047-2059	2127-2129

Replace Class Ia by "Class Ia" throughout the text.

Amendments to renumbered marginals

- 2100 (1) In the first sentence, replace 2021 by "2101".
- 2101 1°, note, 1. Replace IIIb by "4.1" and 2331 by "2401".
note, 2. Replace II by "4.2" and 2201 by "2431".
4°, note Replace IIIb by "4.1" and 2331 by "2401".
- 10°(a), note, 1.)
(b), note, 1.) Replace VII by "5.2" and 2701 by "2551".
(c), note, 1.)
- 2115 Replace 2021 by "2101".
- note Replace 2028 by "2108".
- 2119 (1) Replace 2021 by "2101".

CLASS Ib

Heading Read: "CLASS Ib. ARTICLES FILLED WITH EXPLOSIVE SUBSTANCES".General amendments

Renumber the marginals as follows:

<u>Existing numbering</u>	<u>New numbering</u>
2060-2077	2130-2147
2078-2082	2148-2162
2083	2163
2084-2099	2164-2169

Replace Class Ib by "Class Ib" throughout the text.

Amendments to renumbered marginals

- 2130 (1) In the first sentence, replace 2061 by "2131".
 (2) Replace 2061 by "2131" and 2021 by "2101".
- 2131 1° and 9° In the last line, replace 1c by "1c" and 2101 by "2171".
- 2143 (c) Replace 2069 by "2139".
- 2144 (1) Replace 2061 by "2131".
 (2)(a) In the first sentence, replace 2063 by "2133".
- 2147 (1) Replace 2061 by "2131".

CLASS 1c

Heading Read: "CLASS 1c. IGNITERS, FIREWORKS AND SIMILAR GOODS".

General amendments

Renumber the marginals as follows:

<u>Existing numbering</u>	<u>New numbering</u>
2100-2114	2170-2184
2115-2119	2185-2189
2120	2190
2121-2129	2191-2199

Replace Class 1c by "Class 1c" throughout the text.

Amendments to renumbered marginals

- 2170 In the first sentence, replace 2101 by "2171".
- 2171 3°, 23° and 27° Replace 2061 by "2131", and replace 1b by "1b".
- 2181 (2) In the table, in the column headed "Special provisions", replace "Classes II, IIIa and IIIb" by "Classes 3, 4.1 and 4.2" and 2109 by "2179" (twice).
- 2184 (1) Replace 2101 by "2171".

CLASS 1d

Heading Read: "CLASS 2. GASES: COMPRESSED, LIQUEFIED OR DISSOLVED UNDER PRESSURE".

General amendment

Renumber the marginals as follows:

<u>Existing numbering</u>	<u>New numbering</u>
2130-2156	2200-2226
2157-2166	2227-2236
2167 and 2168	2237 and 2238
2169-2179	2239-2299

Amendments to renumbered marginals

- 2200 (1), (2) note and (3) Replace Class 1d by "Class 2" (four times).
 (1) In the first sentence, replace 2131 by "2201".
- 2201 A., A.3°,
 B and B.7°, note
 B, 9° Replace 2131a by "2201a".
 Replace 2131a by "2210a".

- B.8°(a), note, 2. Replace Id by "2".
 E.16°, note) Replace 2138 by "2208".
 17°, note)
 note re 16° and 17° Replace IIIa by "3".
- 2202 (1) In the footnote, replace 2146 by "2216".
 (3) In the first sentence, replace 2148 (1)(a) by "2218 (1)(a)".
- 2202 (3) 6.(b) Replace 2145 by "2215", 2148 by "2218" and 2150 by "2220".
- 2205 (2) Replace 2152 by "2222".
- 2206 (1) Replace 2135, 2150 and 2133 by "2205", "2220" and "2203" respectively.
- 2210 Note in brackets below heading (b): replace 2135, 2136, 2137 and 2138 by "2205", "2206", "2207" and "2208" respectively.
- 2211 1. Heading of marginal. Replace 2168 by "2238".
 (1) Replace 2145, 2149 and 2150 by "2215", "2219" and "2220" respectively.
- 2212 (2)(a) Replace 2143 by "2213".
 (3)(a), note Replace 2149 by "2219".
 (3)(b) and (c) Replace Id by "2" (twice).
- 2213 (1) In the second and third sub-paragraphs, replace 2142 by "2212".
- 2215 (1) Replace "2146 and 2147" by "2216 and 2217".
 (2) Replace "2134 and 2151" by "2204 and 2221".
- 2216 (1) B.(d) Replace "2149-2151" by "2219-2221".
 (e) Replace 2148 by "2218".
- 2218 (1)(a) Replace 2132 by "2202".
 (c) Replace 2149, 2151, 2146 and 2147 by "2219", "2221", "2216" and "2217" respectively.
 (e) Replace 2149 by "2219".
 (g) Replace 2151 by "2221".
- 2219 Heading c. Replace 2168 by "2238".
- 2222 (1)(a) Replace 2135 by "2205".
 (b) Replace 2136 by "2206".
 (2) In the second column of the table, against "6° - 8°", replace 2136 by "2206".
- 2223 (1) Replace Id by "2".
- 2224 (1) Replace "2135 and 2136" by "2205 and 2206".
 (2) Replace 2137 by "2207".

- 2226 (1) Replace 2131 by "2201" and at the end read:
"[e.g. 2, 1°(a). ADR]".
- 2237 (2) In the description, replace Id by "2".
- 2238 (a) Replace 2146 by "2216" (twice) and 2147 by "2217".
- (a) 2. Replace 2151 by "2221".
- (b) Replace 2142 by "2212", 2143 by "2215" and 2146 by "2216".

CLASS Ie

Heading Read: "CLASS 4.3 SUBSTANCES WHICH GIVE OFF INFLAMMABLE GASES ON CONTACT WITH WATER".

General amendment

Renumber the marginals as follows:

<u>Existing numbering</u>	<u>New numbering</u>
2180-2190	2470-2480
2191-2197	2481-2497
2198	2498
2199	2499

Amendments to renumbered marginals

- 2470 Replace 2181 by "2471" and Ie by "4.3".
- 2471 3° Replace 2181a by "2471a".
- 2471 5°)
- 2478 (1)) Replace Ie by "4.3".
- 2480 Replace 2181 by "2471" and at the end read:
"[e.g. 4.3, 2°(a), ADR]".
- 2498 (2) In the description, replace Ie by "4.3".

CLASS II

Heading Read: "CLASS 4.2 SUBSTANCES LIABLE TO SPONTANEOUS COMBUSTION".

General amendment

Renumber the marginals as follows:

<u>Existing numbering</u>	<u>New numbering</u>
2200-2215	2430-2445
2216-2222	2446-2452
2223	2453
2284-2299	2454-2469

Amendments to renumbered marginals

- 2430 Replace 2201 by "2431" and II by "4.2".
- 2431 2°, note Replace 2401 by "2601" and IVa by "6.1".
- 3° Replace 2201a by "2431a".
- 5° Last line, same change.

6°	Last two lines, same change.
7°	Same change.
8°, 9° and 10°	Replace 2201a by "2431a" 2331 by "2401" and IIIb by "4.1".
12°	Replace 2201a by "2431a".
15°, note <u>re</u> 14° and 15°	Replace II by "4.2".
2431a (a)	Replace IIIa by "3".
(b)	Replace 2331 by "2401" and IIIb by "4.1".
2435 (4)	Replace 2141 by "2211" and 2146 by "2216".
2442 (2)	In the table, at the end, replace IIIb by "4.1".
2443 (1)	Replace 2206 (1) by "2436 (1)".
2445	Replace 2201 by "2431" and at the end read: "[e.g. 4.2, 5°(a), ADR]".
2453 (2)	In the description, replace II by "4.2".

CLASS IIIa

<u>Heading</u>	Read: "CLASS 3. INFLAMMABLE LIQUIDS".
2300 (3) and (5)	Replace IIIa by "3".
2301 1°(b), note 6°	Replace 2021 and 2331 by "2101" and "2401" respectively and IIIb by "4.1". Note Ia to read "1a". Replace IIIa by "3".
2306 (2)	Table, right-hand column: replace IIIa by "3", II by "4.2", IIIc by "5.1" and V by "8".
2309 (1)	At the end read: "[e.g. 3, 1°(a), ADR]".
2316 (2)	In the description, replace IIIa by "3".
2317-2329	To be replaced by "2317-2399".

CLASS IIb

<u>Heading</u>	Read: "CLASS 4.1 INFLAMMABLE SOLIDS".
<u>General amendment</u>	

Renumber the marginals as follows:

<u>Existing numbering</u>	<u>New numbering</u>
2330-2346	2400-2416
2347-2353	2417-2423
2354	2424
2355-2369	2425-2429

Amendments to renumbered marginals

2400	Replace 2331 by "2401" and IIIb by "4.1".
2401 1°	Replace 2201 and 2201a by "2431" and "2431a" respectively and II by "4.2".

	note, 1.	Replace 2346 by "2416".
	4.	Replace 2201 by "2431" and II by "4.2".
6°		Replace 2201 by "2431" and II by "4.2".
7°(a), note, 1.		Replace 2021 by "2101" and Ia by "1a".
	(b), note	Same change as above.
11°		Replace 2331a by "2401a".
2407 (3), 2408 (7), 2411 (3)		Replace 2346 by "2416".
2413		Table, right-hand column: replace II by "4.2" and IIIc by "5.1".
2414 (1)		Replace 2335, 2336, 2337 and 2338 by "2405", "2406", "2407" and "2408" respectively.
2416 (1)		Replace 2331 by "2401" and at the end read: "[e.g. 4.1, 7°(a), ADR]".
(4)		Replace 2341 by "2411".

CLASS IIIc

Read: "CLASS 5.1 OXIDIZING SUBSTANCES".

HeadingGeneral amendment

Renumber the marginals as follows:

<u>Existing numbering</u>	<u>New numbering</u>
2370-2383	2500-2513
2384-2390	2514-2520
2391	2521
2392-2399	2522-2549

Amendments to renumbered marginals

2500		Replace 2371 by "2501" and IIIc by "5.1".
2501	1°, note 1.	Replace 2501 by "2801".
	3°	Replace 2371a by "2501a".
	note	Replace 2501 by "2801".
	4°	Replace 2371a by "2501a".
	5°	Same change as above.
	6°(a), note	Replace 2021 by "2101" and 2371a by "2501a".
	7°(a)	Replace 2371a by "2501a".
	note, 2.	Replace 2201 by "2431" and II by "4.3".
	8°	Replace 2371a by "2501a".
	9° and 10°	Same change as above.
2510	9°(a) and (b)	Replace IIIa, IVa and IIIb by "3", "6.1" and "4.1".
	11°	Replace IIIc by "5.1".
2511 (1)		Replace IIIc by "5.1".

- 2513 Replace 2371 by "2501" and at the end read:
" [e.g. 5.1, 4°(a), ADR]".
- 2521 (2) In the description, replace IIIc by "5.1".
- (3) Replace 2211 by "2441" and II by "4.3".

CLASS IVa

Heading

Read: "CLASS 6.1 TOXIC SUBSTANCES".

General amendment

Remember the marginals as follows:

<u>Existing numbering</u>	<u>New numbering</u>
2400-2434	2600-2634
2435-2442	2635-2642
2443	2643
2444-2449	2644-2649

Amendments to renumbered marginals

- 2600 (1) Replace 2401 by "2601" and IVa by "6.1".
- (2) Replace IVa by "6.1".
- 2601 12°, note Replace 2131 by "2201" and Id by "2".
- 71°, note and Replace 2371 by "2501" and IIIc by "5.1".
- 72°, note
- 73°, note Replace 2501 by "2801" and V by "8".
- 74°, note Replace 2371 by "2501" and IIIc by "5.1".
- 75°, note Replace 2371 and 2501 by "2501" and "2801" respectively and IIIc and V by "5.1" and "8" respectively.
- 84°(a) and (b) Replace IVa by "6.1".
- 2602 (1) Replace 2418 by "2618".
- 2603 (1)(b) In the first sub-paragraph, replace Id by "2" and 2141, 2142 and "2143, 2145 and 2148" by "2211", "2212" and "2213, 2215 and 2218" respectively.
- In the fourth sub-paragraph, replace 2148 by "2218".
- (c) Replace 2434 by "2634".
- 2631 Table, right-hand column: replace "IIIc and V" by "5.1 and 8" (twice).
- 2634 (1) Replace 2401 by "2601" (three times) and IVa by "6.1" (twice).
- 2643 (4) In the description, replace IVa by "6.1".

CLASS IVb

Read: "CLASS 7 RADIOACTIVE SUBSTANCES".

HeadingGeneral amendment

Renumber the marginals as follows:

<u>Existing numbering</u>	<u>New numbering</u>
2450-2461	2700-2711
2462-2468	2712-2718
2469	2719
2470-2499	2720-2799

Introductory note 1. Replace IVb by "7".

Amendments to renumbered marginals

2700		Replace 2451 by "2701" and IVb by "7".
	note, 2.	Replace "2132 and 2141 to 2148" by "2202 and 2211 to 2218".
	note, 3. and 5(a)	Replace 2452 by "2702".
2701	1°	Replace 2450 by "2700" and 2451a by "2701a".
	2°	Replace 2450 by "2700".
	3°	Replace 2451a by "2701a".
	5°	Replace 2457 and 2451a by "2707" and "2701a" respectively.
	6°	Replace 2451a by "2701a".
2701a		Replace 42 302 by "71 302".
	1. (a)	Replace 2453 by "2703".
	2.A.(i)	Replace 2450 by "2700".
	A.	In the sentence preceding the note, replace IVb, 2451a by "7, 2701a".
	2.B.	Replace 2450 by "2700".
	2.B.(iii)	Replace 2450 by "2700" and "IVb, 2451a" by "7, 2701a".
	2.C.	Replace 2452 and 2459 by "2702" and "2709".
		Replace IVb, 2451a by "7, 2701a".
2702 (1)		Replace 2457 by "2707".
	(3)(i)	Replace 2452 by "2702".
2703	{ (5)(e) and (6)(d) } { (1)(b) and (5)(b) }	Replace 2456 by "2706".
2704 (2)(b)		Replace 2450 by "2700".
2705 (4), (4)(a), (5)(a) and (b), (6)(a) and (b) and (7)(b)		Replace 2452 by "2702".
2706 (1)(a)		Replace 2454 by "2704" (twice) and 2450 by "2700".
	(b) and note	Replace 2455 by "2705" (four times).
	(11)(d)	In the footnote, replace 2452 by "2702".

- (12)(a) Replace 2455 by "2705".
 (b) Replace 2455 by "2705".
 1., 2. and 3. Replace 2456 and 2455 by "2706" and "2705" respectively.
- 2707 (1)(d)(iii) Replace 2456 by "2706" (twice) and 2451 by "2701".
 (2) Replace 2454 by "2704" (twice) and 2452 by "2702".
 (3) Replace "2452 and 2453" by "2702 and 2703".
- 2709 (1) Replace IVb by "7" and 2453 by "2703".
- 2711 (1) Read: "[e.g. 7, 1°(a), ADR]".
 (2)(b) Replace 2450 by "2700".
 (g)(i) and (ii) Replace 2456 by "2706".
 (3)(a) 1. Replace 2450 by "2700".
 2. Replace 2452 by "2702".
 3. Replace 2454 by "2704".
 4. Replace 2455 by "2705" (twice).
 5. Replace 2456 by "2706" (twice).
 (b) 1. Replace 2455 by "2705" (twice).
 2. Replace 2456 by "2706" (twice) and 2455 by "2705".
 3. Replace 2456 by "2706".
- 2719 (1) Replace 2451a by "2701a".

CLASS V

Heading

Read: "CLASS 8 CORROSIVE SUBSTANCES".

General amendment

Renumber the marginals as follows:

<u>Existing numbering</u>	<u>New numbering</u>
2500-2526	2800-2826
2527-2534	2827-2834
2535	2835
2536-2599	2836-3099

Amendments to renumbered marginals

- 2800 Replace 2501 by "2801" and V by "8".
 2801 1°(e), note Replace 2401 by "2601" and IVa by "6.1".
 (f) Replace 2501a by "2801a".
 2°, 3° and 4° Same change as above.
 4°, note Replace 2371 by "2501" and IIIc by "5.1".
 5° Replace 2501a by "2801a".
 note 2 Replace 2131 by "2201" and Id by "2".

- 6° and 6°, note 2 Replace 2131 by "2201", 2501a by "2801a" and Id by "2".
- 7° Replace 2501a by "2801a".
- 8°, 9°, 11°, 12°, 13°, Same change as above.
14°, 15°, 21°, 22°,
23°, 31°(a), 32°, 33°,
34°, 35°, 37°(b), 41°.
- 41°, note Replace IIIa by "5.1" and 2371 by "2501".
- 2802 (1) Replace 2504, 2516, 2520 and 2521 by "2804", "2816", "2820"
and "2821" respectively.
- 2810 (2)(d) Replace 2141, 2145 and 2146 by "2211", "2215" and "2216"
respectively.
- 2822 Table, right-hand column: replace V by "8", IIIc by "5.1",
Ie by "4.3" and II by "4.2".
- 2826 (1) Replace 2501 by "2801" and at the end read:
"[e.g. 8, 1°(a), ADR]".
- (2) Replace 2510 by "2810".
- 2835 (2) In the description, replace V by "8".

CLASS VI

Heading Read: "CLASS 6.2. REPUGNANT SUBSTANCES AND SUBSTANCES
LIABLE TO CAUSE INFECTION".

General amendment

Renumber the marginals as follows:

<u>Existing numbering</u>	<u>New numbering</u>
2600-2616	2650-2666
2617-2622	2667-2672
2623	2673
2624-2699	2674-2699

Amendments to renumbered marginals

- 2650 In the first sentence, replace Class VI by "Class 6.2"
and 2601 by "2651".
- 2651 12° Replace Class VI by "Class 6.2".
- 2663 Replace 2601 by "2651".
- 2666 Replace 2601 by "2651" and at the end read:
"[e.g. 6.2, 1°(a), ADR]".
- 2673 (2) In the description, replace VI by "6.2".

CLASS VII

Heading

Read: "CLASS 5.2 ORGANIC PEROXIDES".

General amendment

ReNUMBER the marginals as follows:

<u>Existing numbering</u>	<u>New numbering</u>
2700-2715	2550-2565
2716-2719	2566-2569
2720	2570
2721-3099	2571-2599

Amendments to renumbered marginals

2550	In the first sub-paragraph, replace VII by "5.2" and 2701 by "2551".
note	Replace 2021 by "2101" and 2701 by "2551". Replace Ia by "1a".
2551	Replace Class Ia by "Class 1a" and 2021 by "2101".
8°, note 1, 9°, note 1 and 17°, note 1. Group E note	Replace VII by "5.2".
2551 99°	At the end, read "Class 5.2".
2558	At the end, replace 2705 by "2555".
2562, 2563 (1)	Replace VII by "5.2".
2565	Replace 2701 by "2551" and at the end read: "[e.g. 5.2, 8°(a), ADR]".
2570 (2)	In the description, replace VII by "5.2".

APPENDIX A.1

Marginal

3101	First line, replace 2021 by "2101", 2101 by "2171" and 2331 by "2401".
3102	First line, replace 2021 by "2101" and 2331 by "2401".
3103, 3104, 3105, 3106	First line, replace 2021 by "2101".
3107	First line of both paragraphs, replace 2021 by "2101".
3108, 3109, 3110	First line, replace 2061 by "2131".
3111	First line, replace 2100 by "2170".
3112	First line, replace 2701 by "2551".
3150 (5)(a)	Replace 2021 by "2101" and 2331 by "2401".
(b)	Replace 2021 by "2101".
3150 (6)	Replace 2331 by "2401".
	At the end, read "(see also note to marginal 2550)".
	Replace 2021 by "2101".

APPENDIX A.2

In headings A. and C., replace Class Id by "Class 2".

Marginal

- 3200 At the beginning, replace 2133 by "2203".
- 3201 Replace 2145, 2146, 2147 by "2215, 2216, 2217".

APPENDIX A.3

In the heading, replace "Classes IIIa and IVa" by "Classes 3 and 6.1".

APPENDIX A.5

In the heading, replace 2513 by "2813".

APPENDIX A.6

In the heading, replace Class IVb by "Class 7".

Part AMarginal

- 3600, 3601, 3602 In the sub-headings, replace Class IVb by "Class 7".
- 3603 In the sub-heading, replace 2453 by "2703".
- 3604 In the sub-heading, replace 2451a by "2701a", 2452 by "2702" and 42 280 by "71 280".

Part B

In the sub-heading, replace 2456 by "2706".

- 3621 (a) and (d) Replace 2456 by "2706".

Part C

- 3642, 3648 In the heading preceding these marginals, replace 2452 by "2702", 2455 by "2705" and 2456 by "2706".
- 3647 In the heading and in paragraph (1)(a), replace 2452 by "2702".
- 3652 (b) 2. At the end, replace 2452 by "2702".
- 3661 In the reference preceding this marginal, replace 2450 by "2700".

APPENDIX A.9

(Marginal 3902)

Label

- No.1 Replace 2037 by "2117", 2075 by "2145" and 2713 by "2563".
- No.2A Replace 2154 by "2224", 2188 by "2478" and 2432 by "2632".
- No.2B Replace 2344 by "2414".
- No.2C Replace 2213 by "2443".
- No.2D Replace 2188 by "2478".
- No.3 Replace 2381 by "2511" and 2713 by "2563".

Nos. 4 and 4A	Replace 2432 by "2632" and 2443 by "2643".
No. 5	Replace 2381 by "2511", 2524 by "2824" and 2535 by "2835".
Nos. 6A, 6B and 6C.	Replace 2459 by "2709".
No. 7	Replace 2188 by "2478".
No. 8	Read: "prescribed in marginals 2117 (2), 2224 (2), 2307 (3), 2414 (2), 2443 (2) and (3), 2478 (3), 2511 (2), 2563 (2), 2632 (2), 2664, 2709 (3), 2824 (2) and (3);".
No. 9	Read: "prescribed in marginals 2117 (2), 2182, 2224 (1), (2) and (3), 2307 (3), 2414 (2), 2443 (3), 2478 (3), 2511 (2), 2562 (2), 2664, 2632 (2), 2709 (3), 2824 (2).".

ANNEX B. PROVISIONS CONCERNING TRANSPORT EQUIPMENT
AND TRANSPORT OPERATIONS

Contents

Amend the text relating to Chapter II to read:

CHAPTER II	SPECIAL PROVISIONS APPLICABLE TO THE CARRIAGE OF DANGEROUS SUBSTANCES OF CLASSES 1 TO 8		
Classes 1a, 1b and 1c	Explosive substances and articles; Articles filled with explosive substances; Igniters, fireworks and similar goods	11 000	<u>et seq.</u>
Class 2	Gases: compressed, liquefied or dissolved under pressure	21 000	"
Class 3	Inflammable liquids	31 000	"
Class 4.1	Inflammable solids	41 000	"
Class 4.2	Substances liable to spontaneous combustion	42 000	"
Class 4.3	Substances which give off inflammable gases on contact with water	43 000	"
Class 5.1	Oxidizing substances	51 000	"
Class 5.2	Organic peroxides	52 000	"
Class 6.1	Toxic substances	61 000	"
Class 6.2	Repugnant substances and substances liable to cause infection	62 000	"
Class 7	Radioactive substances	71 000	"
Class 8	Corrosive substances	81 000	"

amend the text headed "APPENDICES" as follows:

Appendix B.1a Replace Id by "2" and, in the right hand column, replace the figure 212 000 by "212 299".

Appendix B.4 Replace IVb by "7".

Plan of the Annex

10 000 (1)(b)	Replace "I to VII" by "1 to 8".
(c)	Replace Id by "2" and IVb by "7".
10 002 (b)	Reword the beginning to read: "(b) the provisions of marginal 10 403(1) shall ...".

Chapter I

GENERAL PROVISIONS APPLICABLE TO THE CARRIAGE
OF DANGEROUS SUBSTANCES OF ALL CLASSES

10 100 (1)	Replace "2131a, 2181a, 2201a, 2301a, 2331a, 2371a and 2501a" by "2201a, 2301a, 2401a, 2431a, 2471a, 2501a and 2801a". Replace 2451a by "2701a" and 42 302 by "71 302".
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- (2)(a) Replace 41 185, 14 212, 14 407, 41 407, 14 515 and 41 515 by "61 185", "21 212", "21 407", "61 407", "21 515" and "61 515" respectively.
- (b) 1. Replace Ia, Ic, Ie, II, IIIa, IIIb, IIIc, IVa, V, VI and VII by "1a", "1c", "4.3", "4.2", "3", "4.1", "5.1", "6.1", "8", "6.2" and "5.2" respectively and 51 104 by "81 104".
Rearrange the text in the numerical order of the classes.
2. Replace Ib, Ic, Id, Ie, IIIa, IIIb, IVa, V and VII by "1b", "1c", "2", "4.3", "3", "4.1", "6.1", "8" and "5.2" respectively and 2709, 2711, 2703, 2706 and 2708 by "2559", "2561", "2553", "2556" and "2558" respectively.
Rearrange the text in the numerical order of the classes.
3. Replace Id, Ic, II, IIIa, IIIb, IVa, V and VI by "2", "4.3", "4.2", "3", "4.1", "6.1", "8" and "6.2" respectively.
Rearrange the text in the numerical order of the classes.
- 10 102 (1) Replace 2142 by "2212".

Chapter II

Heading Read: "Chapter II. SPECIAL PROVISIONS APPLICABLE TO THE CARRIAGE OF DANGEROUS SUBSTANCES OF CLASSES 1 TO 8".

Classes 1a, 1b, 1c

Heading Read: "Classes 1a.... 1b.... 1c....".

Throughout the text of marginals 11 104 to 11 610, replace Ia by "1a", Ib by "1b" and Ic by "1c".

At the end, read "11 611-20 999" (instead of 11 611-13 999).

Class 2

Heading Read: "Class 2 Gases: compressed, liquefied or dissolved under pressure"

General amendment

Marginals 14 000 to 14 999 are renumbered 21 000 to 30 999.

Amendments to renumbered marginals

- 21 118 Replace 2135 by "2205".
- 21 121 (1) and (2) Replace Id by "2".
- 21 128 Replace 2131 by "2201".
- 21 260 Replace 210 140 by "210 200" (twice).
- 21 403 Replace Id by "2" and "Ia, Ib or Ic" by "1a, 1b or 1c".
- 21 414 (2)(a) Replace 2142 by "2212".
- 21 500, 21 509 Replace Id by "2".
- 21 605 (2) Replace 210 140 by "210 200".
- (3)(a) Replace Id by "2" and 14 121 by "21 121".
- (3)(c) Replace 210 140 by "210 200".
- 21 610 Replace Id by "2".

Class Ia

Heading Read: "Class 4.3 Substances which give off inflammable gases on contact with water".

General amendment

Marginals 15 000 to 15 600 are renumbered 43 000 to 43 600 and the last marginal of the class becomes 50 999 (instead of 20 999).

Amendments to renumbered marginals

- 43 104 Replace Ia by "4.3".
 43 111 Replace 2182 by "2472".
 43 118 Replace 15 111 by "43 111".
 45 171 (1) Replace Ia by "4.3".
 43 403 Replace Ia by "4.3" and "Ia, Ib or Ic" by "1a, 1b or 1c".
 43 500 Replace Ia by "4.5".

Class II

Heading Read: "Class 4.2 Substances liable to spontaneous combustion".

General amendment

Marginals 21 000 to 21 600 are renumbered 42 000 to 42 600 and the last marginal of the class becomes 42 999 (instead of 30 999).

Amendments to renumbered marginals

- 42 121 (1) Replace II by "4.2".
 and (2),
 42 251
 42 403 (1) Replace II by "4.2" and "Ia, Ib or Ic" by "1a, 1b or 1c".
 (2) Replace IIIc by "5.1", VII by "5.2" and V by "8".

Class IIIa

Heading Read: "Class 3 Inflammable liquids"

- 31 121 (1) Replace IIIa by "3".
 and (2),
 31 128 (1),
 31 251
 31 403 (1) Replace IIIa by "3" and "Ia, Ib or Ic" by "1a, 1b, or 1c".
 (2) Replace IIIa by "3", IIIc by "5.1", VII by "5.2" and V by "8".
 31 610 Replace IIIa by "3".
 31 611-
 31 999 Renumber 31 611-40 999.

Class IIIb

Heading Read: "Class 4.1 Inflammable solids"

General amendment

Marginals 32 000 to 32 999 are renumbered 41 000 to 41 999.

Amendments to renumbered marginals

- 41 121 (2) (Does not affect the English text).
 41 403 (1) Replace IIIb by "4.1" and "Ia, Ib or Ic" by "1a, 1b or 1c".
 (2) Replace IIIb by "4.1", IIIc by "5.1", VII by "5.2" and V by "8".

Class IIIc

Heading Read "Class 5.1 Oxidizing substances".

General amendment

Marginals 33 000 to 33 600 are renumbered 51 000 to 51 600. The last marginal of the class becomes 51 999 (instead of 40 999).

Amendments to renumbered marginals

- 51 111 Replace 33 118 (2) by "51 118 (2)".
 51 121 (2) }
 51 128 (1) } Replace IIIc by "5.1".
 51 171 (1) }
 51 403 (1) Replace IIIc by "5.1" and "Ia, Ib or Ic" by "1a, 1b or 1c".
 (2) Replace IIIc by "5.1", II by "4.2", IIIa by "3", IIIb by "4.1" and V by "8".
 51 414 (1) Replace IIIc by "5.1" (twice).

Class IVa

Heading Read: "Class 6.1 Toxic Substances".

General amendment

Marginals 41 000 to 41 999 are renumbered 61 000 to 61 999.

Amendments to renumbered marginals

- 61 121 (3) Replace 2401 by "2601".
 61 171 (1) Replace IVa by "6.1".
 61 185 (B) Replace 41 260 by "61 260".
 61 240 Replace IVa by "6.1".
 61 251 Replace IVa by "6.1" and 210 410 by 210 610".
 61 260, 61 302 Replace 41 105 by "61 185".
 61 303 Replace IVa by "6.1".
 61 400 Replace 2404 by "2604" and 2423 by "2623".
 61 403 Replace IVa by "6.1" and "Ia, Ib or Ic" by "1a, 1b or 1c".

Class IVb

Heading Read: "Class 7 Radioactive substances".

General amendment

Marginals 42 000 to 42 599 are renumbered 71 000 to 71 599 and the last marginal in the Class becomes 80 999 (instead of 50 999).

Amendments to renumbered marginals:

- 71 111 Replace 2457 by "2707".
- 71 118 (2) Replace 2457 by "2707" (twice).
- (2)(c) Replace 42 401 by "71 401" and 2456 by "2706".
- (3) and
(4) Replace 2457 by "2707".
- 71 121 Replace 2457 by "2707" (three times).
- 71 181 Replace 2461 by "2711".
- 71 192 Replace 2455 by "2705" and 2456 by "2706".
- 71 207 Replace 2452 by "2702" and 2455 by "2705".
- 71 304 (1) Replace 42 405 by "71 403".
- 71 400 Replace 2453 by "2703", 2455 by "2705" and 2457 by "2707".
- 71 401(2)(b) Replace 2456 by "2706".
- (c) Same change (twice). In addition, replace 2457 by "2707".
- 71 403 Replace IVb by "7" and "Ia, Ib or Ic" by "1a, 1b or 1c".
- 71 405 Replace 42 403 by "71 403".
- 71 414 Replace 2457 by "2707".
- 71 415 Same change. In addition, replace 42 280 by "71 280".
- 71 507 Replace 42 302 by "71 302".

Class V

Heading Read: "Class 8 Corrosive substances".

General amendment

Marginals 51 000 to 51 600 are renumbered 81 000 to 81 600 throughout and the last marginal of the class becomes 199 999 (instead of 60 999).

Amendments to renumbered marginals:

- 81 121 (2) Replace 2501 by "2801".
- 81 171 (1),
81 240, 81 251 Replace V by "8".
- 81 403^m(1) Replace V by "8" and "Ia, Ib or Ic" by "1a, 1b or 1c".
- (2) Replace V by "8".
- (2)(a) Replace "II, IIIa or IIIb" by "3, 4.1 or 4.2".
- (2)(b) Replace "IIIc or VII" by "5.1 or 5.2".

Class VI

Heading Read: "Class 6.2 Repugnant substances and substances liable to cause infection".

General amendment

Marginals 61 000 to 70 999 are renumbered 62 000 to 70 999.

Amendments to renumbered marginals

62 100 Replace VI by "6.2".
 62 303 Replace VI by "6.2" and 2609 by "2659".
 61 403 Replace VII by "5.2".
 61 415 Replace VI by "6.2".

Class VII

Heading Read: "Class 5.2 Organic peroxides".

General amendment

Marginals 71 000 to 71 600 are renumbered 52 000 to 52 600. The last marginal becomes 60 999 (instead of 199 999).

Amendments to renumbered marginals

52 104 (2) Replace 71 400 by "52 400" and 71 248 by "52 248".
 52 248 Replace 71 400 by "52 400" (twice).
 52 403 Replace VII by "5.2", "Ia, Ib or Ic" by "1a, 1b or 1c", "II, IIIa or IIIb" by "5, 4.1 or 4.2", and v by "8".
 52 413, 52 414 (1) and (2) Replace VII by "5.2".
 52 414 (5) At the end, replace 71 400 (1) by "52 400 (1)".
 52 500 Replace VII by "5.2".

Appendix B.1

Part I Amend marginal 210 000 to read as follows:

"The conditions governing approval and, where appropriate, periodic inspection of tank vehicles and tanks are given in Annex B, marginal 10 182, and in this Appendix, marginals 210 200 (1)(a) 7 and 8, 210 201, 210 202 (5) 210 310 (4), 210 320 (3), 210 440 (2)(c), 210 560 (c), 210 610 (3)(a) 2. and (b) 3., and 210 810 (4)(c), (5)(f) and (g) and (6)".

Part II In the heading, replace "CLASS Id" by "CLASS 2".

In marginal 210 021, in the third line, replace "Class Id" by "Class 2".
 At the end, replace "210 022-210 139" by "210 022-210 199".

Part III

Class Id Heading to read: "Class 2".

Remember the marginals relating to this Class as follows:

<u>Existing numbering</u>	<u>New numbering</u>
210 140-210 146	210 200-210 206
210 147-210 149	210 207-210 299

Amendments to renumbered marginals

210 200 (1) Replace 2132 by "2202", 2133 by "2203" and 2151 by "2221".

(1)(a)1. Replace 2133 by "2203".

(1)(a)2. Replace 2141 by "2211".

(1)(a)8. Replace 2143 by "2216".

(2) Replace 2132 by "2202".

(2)(b), Replace 210 141 by "210 201".

(c) and
note

210 201 (1) Replace 2149 by "2219" (twice)

(2)(a) Replace 2150 by "2220".

and

(3)(a)

(3)(b) Replace 210 140 by "210 200".

and */

210 202 (1) Replace 2141 by "2211", 2143 by "2213" and 2145 by "2215".

210 203 Replace 2148 by "2218".

210 203 (1)(d) Replace 210 140 by "210 200" and 210 142 by "210 202".

Class Ie Heading to read: "Class 4.3".

Remember as follows:

<u>Existing numbering</u>	<u>New numbering</u>
	Insert in the margin at the beginning of the class:
	210 470-210 479
210 150	210 480
210 151-210 199	210 481-210 499

210 480(2) Replace 2182 by "2472".

Class II Heading to read: "Class 4.2".

Remember the marginals relating to this class as follows:

<u>Existing numbering</u>	<u>New numbering</u>
210 200-210 209	210 430-210 439
210 210	210 440
210 211-210 299	210 441-210 469

- Class IIIa Heading to read: "Class 3".
 210 310 (2)(a)3. Replace 2133 by "2203" and 2141 by "2211".
 (2)(c) At the end, replace 210 140 by "210 200".
 note In the third line, replace IIIa by "3".
 210 312 Replace IIIa by "3".
 210 314-210 319 Read "210 314-210 399".

Class IIIb Heading to read: "Class 4.1".

Renumber as follows:

<u>Existing numbering</u>	<u>New numbering</u>
	Insert in the margin at the beginning of the class:
210 320	210 400-210 409
	210 410
210 321-210 329	210 411-210 429

Class IIIc Heading to read: "Class 5.1".

Replace the number of marginal 210 330 by "210 500".
 At the end, replace 210 331-210 399 by "210 501-210 549".

Class IVa Heading to read: "Class 6.1".

Renumber as follows:

<u>Existing numbering</u>	<u>New numbering</u>
210 400-210 409	210 600-210 609
210 410	210 610
210 411-210 419	210 611-210 699

Class IVb Heading to read: "Class 7".

Renumber as follows:

<u>Existing numbering</u>	<u>New numbering</u>
	Insert in the margin at the beginning of the class:
	210 700-210 709
210 420	210 710
210 421-210 499	210 711-210 799

Class V Heading to read: "Class 8".

Renumber as follows:

<u>Existing numbering</u>	<u>New numbering</u>
210 500-210 509	210 800-210 809
210 510	210 810
210 511-210 699	210 811-211 049

210 810 (2) Replace 2503 by "2803".

Class VII Heading to read: "Class 5.2".

Renumber as follows:

	<u>Existing numbering</u>	<u>New numbering</u>
	210 700-210 709	210 550-210 559
	210 710	210 560
	210 711-211 049	210 561-210 599
210 560 (e)	Replace 210 140 by "210 200".	

Appendix B.1a

In the heading, replace "CLASS Id" by "CLASS 2".

Appendix B.1b

Chapter II Replace the sub-heading "CLASS Id" by "CLASS 2".

213 501 (1) Replace 2149 by "2219".

(2) and (3) Replace 2150 by "2220" and 210 141 by "210 201".

(4) Replace 210 141 by "210 201".

213 503 Replace 2150 by "2220" and 210 141 by "210 201".

213 706 Replace 2149 by "2219", 2150 by "2220" and 210 141 by "210 201".

CLASS IIIa Read "CLASS 3".

CLASS Ie Read "CLASS 4.3".

CLASS II Read "CLASS 4.2".

CLASS IIIb Read "CLASS 4.1".

215 200 Replace 2181 by "2471" and 2201 by "2431".

215 300 Replace 2181 by "2471".

215 301 Replace 2201 by "2431".

215 302 Replace 2331 by "2401".

215 500, 215 700, Same corrections as for 215 300 to 215 302 above.

215 701, 215 702,
215 703, 215 704

CLASS IIIc Read "CLASS 5.1".

CLASS VII Read "CLASS 5.2".

216 200 Replace 2371 by "2501" and 2701 by "2551".

216 300 Replace 2371 by "2501".

216 302, 216 303 Replace 2701 by "2551".

216 500, 216 700, Replace 2371 by "2501" and 2701 by "2551".

216 701

- CLASS IVa Read "CLASS 6.1".
- 217 200 Replace 2401 by "2601".
- 217 201,
217 300 (1) Replace 41 121 by "61 121".
- 217 500, 217 700, 217 701 Replace 2401 by "2601".
- CLASS V Read "CLASS 8".
- 218 202, 218 500 Replace 51 121 by "81 121".
- Appendix B.1c
- 219 000 (2) Replace IIIa by "3".
- (3) Replace V by "8" and 210 510 by "210 810".
- Appendix 2
- 220 002 At the beginning, replace "Class Id" by "Class 2" and 14 251 by "21 251".
- 220 002(a) 2131 to read "2201".
- Appendix B.3
- Item 16,
note 3 Replace 14 605 by "21 605" and 41 605 by "61 605".
- Appendix B.4
- In the heading, replace "CLASS IVb" by "CLASS 7".
- 240 000 Replace 42 300 by "71 300".
- 240 001 Replace 42 304 by "71 304" and 42 414 by "71 414".
- 240 010 Replace 42 500 by "71 500".
- Appendix B.5
- 250 000 Table, column (b): replace Id by "2", IIIa by "3", IIIB by "4.1", IIIC by "5.1", IVa by "6.1", V by "8" and VII by "5.2".

AMENDMENTS ADOPTED UPON PROPOSAL BY THE GOVERNMENT OF THE UNITED KINGDOM
OF GREAT BRITAIN AND NORTHERN IRELAND

ANNEX A

Part I

DEFINITIONS AND GENERAL PROVISIONS

Marginal 2003 (1)

Alter preamble to:

"(1) This Annex contains for each Class other than Class IVb:"

Marginal 2003 (3)

Replace entry concerning Appendix A.6 by:

"Regulations relating to radioactive substances of Class IVb."

Marginal 2003 (4) - New

Add a new paragraph:

"(4) For Class IVb, the details concerning conditions of packing, mixed packing, labelling and marking of packages as well as provisions governing storage, despatch and carriage, including in bulk, in containers and in tanks, are specified in the schedules of Annex A listed in marginal 2452. Some of the detailed and technical provisions affecting this Class are elaborated in Appendix A.6 which also includes the complete table of radionuclides and method of testing packagings intended for substances of Class IVb."

Part II

LIST OF SUBSTANCES AND SPECIAL PROVISIONS FOR THE VARIOUS CLASSES

"Introductory Notes" of Class IVb and marginals 2450 to 2499 should be replaced by the provisions and schedules reproduced hereafter.

CLASS IVb

RADIOACTIVE SUBSTANCES

Introduction2450 (1) Scope

(a) Among the substances with a specific activity of more than 0.002 microcurie per gramme and articles containing such substances, only those indicated in the schedules of marginal 2453 are to be accepted for carriage and then only under the conditions set out in the appropriate schedules of the said marginal and in appendix A.6 (marginals 3600 to 3699).

(b) The substances and articles referred to in (a) are substances and articles of ADR.

NOTE Cardiac pacemakers containing radioactive substances, when they have been surgically implanted in medical patients, or radiopharmaceuticals being carried inside patients in the course of medical treatment, are not subject to ADR.

(2) Definitions and explanationsA₁ and A₂

"A₁" means the maximum activity of special form radioactive substances permitted in a Type A package. "A₂" means the maximum activity of radioactive substances, other than special form radioactive substances, permitted in a Type A package. These values either are listed in Appendix A.6 Table XXI or may be derived in accordance with the procedure described in marginals 3690 and 3691 of Appendix A.6.

Allowable number of packages

"Allowable number $\frac{1}{N}$ of packages" means the maximum number of Fissile Class II or Fissile Class III packages which may be grouped together in one place during carriage or during transit storage.

$\frac{1}{N}$ When the group is made up of packages of different designs, the maximum number of packages shall be such that the following formula is satisfied:

$$\frac{n_1}{N_1} + \frac{n_2}{N_2} + \frac{n_3}{N_3} + \dots \text{ shall not exceed } 1. \text{ In this formula, } n_1, n_2, n_3, \dots$$

are the numbers of packages for which the corresponding allowable numbers are N_1, N_2, N_3, \dots respectively.

Containment system

"Containment system" means the components of the packaging specified by the designer as intended to retain the radioactive substance during carriage.

Design

"Design" means the description of a special form substance, or of a package or a packaging of a particular kind, which enables it to be fully identified. The description may include specifications, engineering drawings, reports demonstrating compliance with regulatory requirements, and other relevant documentation.

Fissile substances

"Fissile substance" means plutonium-238, plutonium-239, plutonium-241, uranium-233, uranium-235, and all substances containing any \rightarrow of these radionuclides. Unirradiated natural and depleted uranium do not come under this definition.

Low-level solid radioactive substances

"Low-level solid radioactive substance" (LLS) means any of the following:

- (a) Solids (e.g. consolidated wastes, activated substances) in which:
- (i) the activity in normal carriage is and remains distributed throughout the solid or the collection of solids or is and remains uniformly distributed in a solid compact binding agent (such as concrete, bitumen, ceramic);
 - (ii) the activity is and remains insoluble so that even under loss of packaging the loss of radioactive substance per package resulting from the effects of wind, rain, etc., or from total immersion in water is limited to less than $0.1 A_2$ in a period of one week; and
 - (iii) the activity averaged throughout the radioactive substance does not exceed $2 \times 10^{-3} A_2/g$.
- (b) Articles of non-radioactive substance which are contaminated with a radioactive substance, provided that the radioactive contamination is in a non-readily-dispersible form and that the level of contamination averaged over $1 m^2$ (or over the area of the surface if that area is less than $1 m^2$) does not exceed
- $20 \mu Ci/cm^2$ for beta and gamma emitters and the low-toxicity alpha emitters indicated in Table XIX of Appendix A.6; and $2 \mu Ci/cm^2$ for other alpha emitters.

Low specific activity substances (I)

"Low specific activity substances (I)" (LSA) means any of the following:

- (a) Uranium or thorium ores and physical or chemical concentrates of those ores;
- (b) Unirradiated natural or depleted uranium or unirradiated natural thorium;
- (c) Tritium oxide in aqueous solutions, provided that the concentration does not exceed 10 Ci/litre;
- (d) Substances in which the activity is uniformly distributed and which if they were reduced to their minimum volume in conditions likely to be encountered in carriage, such as dissolution in water with subsequent recrystallization; precipitation; evaporation; combustion; abrasion; etc., would have an average specific activity of not more than 10^{-4} A₂/g;
- (e) Articles of non-radioactive substance which are contaminated with a radioactive substance, provided that the non-fixed surface contamination does not exceed ten times the values in Table XIX of Appendix A.6 and that the contaminated article or the contamination on the article, if it was reduced to its minimum volume in conditions likely to be encountered in carriage, such as dissolution in water with subsequent recrystallization; precipitation; evaporation; combustion; abrasion; etc., would have an average specific activity of not more than 10^{-4} A₂/g.

Low specific activity substances (II)

"Low specific activity substances (II)" (LSA) means any of the following:

- (a) Substances in which the activity in normal carriage is and remains uniformly distributed and in which the average specific activity does not exceed 10^{-4} A₂/g;
- (b) Articles of non-radioactive substance which are contaminated with a radioactive substance, provided that the radioactive contamination is in a non-readily-dispersible form and that the level of contamination averaged over 1 m² (or over the area of the surface if that area is less than 1 m²) does not exceed
 - 1 µCi/cm² for beta and gamma emitters and the low-toxicity alpha emitters indicated in Table XIX of Appendix A.6; and 0.1 µCi/cm² for other alpha emitters.

Maximum normal operating pressure

"Maximum normal operating pressure" means the maximum pressure above atmospheric pressure at mean sea-level that would develop in the containment system in a period of one year in conditions of temperature and solar radiation corresponding to environmental conditions of transport in the absence of venting, external cooling by an ancillary system, or operational controls during carriage.

Multilateral approval

"Multilateral approval" means approval by the competent authority of the country of origin and by the competent authority of each country in whose territory the consignment is to be carried.

Package

"Type A package" means a Type A packaging together with its limited radioactive contents. As the contents of a Type A package are limited to A_1 or A_2 , such a package does not require approval by the competent authority.

"Type B(U) package" means a Type B packaging, together with its radioactive contents, which since it is designed in accordance with specified design and containment criteria requires unilateral approval only of the package design and of any stowage provisions that may be necessary for heat dissipation.

"Type B(M) package" means a Type B packaging, together with its radioactive contents, which since its design fails to meet one or more of the specific additional design criteria for Type B(U) packages (see marginal 3603 of Appendix A.6) requires multilateral approval of the package design and, in certain circumstances, of the conditions of despatch.

Packaging

"Packaging" means the assembly of components necessary to ensure compliance with the packaging requirements of this Class. It may, in particular, consist of one or more receptacles, absorbent materials, spacing structures, radiation shielding, and devices for cooling, for absorbing mechanical shocks and for thermal insulation. These devices may include the vehicle with the tie-down system when these are intended to form an integral part of the packaging.

"Type A packaging" means a packaging which in normal carriage is able to prevent any loss or dispersal of the radioactive content and to retain its shielding function. The conditions of normal carriage shall be reproduced by the tests prescribed in marginal 3635 and 3636 of Appendix A.6, which tests the packaging shall be shown to have passed.

"Type B packaging" means a packaging which is able to withstand not only the conditions of normal carriage, as a Type A packaging does, but also a transport accident. The conditions of such an accident shall be reproduced by the tests prescribed in marginals 3635 to 3637 of Appendix A.6, which tests the packaging, shall be shown to have passed in the conditions likewise prescribed.

Radiation level

"Radiation level" means the corresponding radiation dose-equivalent rate expressed in millirem per hour. Radiation levels may be determined by instruments, combined with the use of conversion tables where necessary or by calculation. Measured or calculated neutron flux densities may be converted into radiation levels by using the data given in the following table.

Neutron flux densities to be regarded as
equivalent to a radiation level of 1 mrem/h

Energy of neutron	Flux density equivalent to 1 mrem/h (n/cm ² . s)
Thermal	268
5 keV	228
20 keV	112
100 keV	32
500 keV	12
1 MeV	7.2
5 MeV	7.2
10 MeV	6.8

Note: Equivalent flux densities for energies between those listed above should be obtained by linear interpolation.

Radioactive contents

"Radioactive contents" means the radioactive substance together with any contaminated solids, liquids or gases in the package.

Special form radioactive substance

"Special form radioactive substance" means either a non-dispersible solid radioactive substance or a sealed capsule containing a radioactive substance. The sealed capsule shall be so constructed that it can be opened only by destroying it. The special form radioactive substance shall meet the following requirements:

- (a) It shall have at least one dimension of not less than 5 mm; and
- (b) It shall comply with the relevant test requirements specified in marginals 3640 to 3642 of Appendix A.6.

In general, the "special form" concept enables substances exhibiting a higher activity level to be included in a Type A package.

Specific activity

The "specific activity" of a radionuclide means that radionuclide's activity per unit mass. The specific activity of a substance in which the radionuclides are essentially uniformly distributed is that substance's activity per unit mass.

Transport index

The "transport index" of a package means:

- (a) The number expressing the maximum radiation level in millirem per hour at 1 m from the external surface of the package; or

(b) In the case of packages of Fissile Class II or Fissile Class III, the higher of the following numbers:

the number expressing the maximum radiation level as under (a) above; and the number obtained by dividing 50 by the allowable number of such packages.

The "transport index" of a container means either:

the sum of the transport indices of all packages within the container, except that for containers carrying Fissile Class III packages, the transport index shall be 50 unless the sum of the transport indices of the packages necessitates a higher figure.

or for containers not carrying Fissile Class II or III packages and under full load, the number expressing the maximum radiation level in $\mu\text{rem/h}$ at 1 m from the external surface of the container multiplied by the value in the following table appropriate to the maximum cross-sectional area of the container.

Multiplication factors

Size of load	Multiplication factor
<u>Measurement</u> (cross-sectional area measurements of the load perpendicular to the direction of interest).	
1 m ² and less	1
> 1 m ² to 5 m ²	3
> 5 m ² to 20 m ²	6
> 20 m ² to 100 m ²	19

(c) The figure expressing the transport index shall be rounded upwards to the first decimal place.

Uncompressed gas

"Uncompressed gas" means a gas at a pressure not exceeding the ambient atmospheric pressure at the time when the containment system is closed.

Unilateral approval

"Unilateral approval" means approval by the competent authority of the country of origin only. If the country of origin is not a party to ADR, the approval shall require validation by the competent authority of the first ADR country reached by the consignment.

Unirradiated uranium

"Unirradiated uranium" means uranium containing not more than 10^{-6} g plutonium per g uranium-235 and a fission product activity of not more than 0.25 mCi per g uranium-235.

Unirradiated thorium

"Unirradiated thorium" means thorium containing not more than 10^{-7} g of uranium-233 per g of thorium-232.

Uranium; natural, depleted, enriched

"Natural uranium" means chemically-separated uranium with the naturally-occurring distribution of uranium isotopes (approximately 99.28 per cent uranium-238 and 0.72 per cent uranium-235). "Depleted uranium" means uranium containing less than 0.72 per cent uranium-235, the remainder being uranium-238. "Enriched uranium" means uranium containing more than 0.72 per cent uranium-235, the remainder being uranium-238. In all cases a very small amount of uranium-234 is present.

(3) Prohibitions on mixed loading

Substances of class IVb contained in packages bearing a label conforming with models Nos. 6A, 6B or 6C shall not be loaded in the same vehicle together with substances and articles of Classes Ia (marginal 2021), Ib (marginal 2061) or Ic (marginal 2101) contained in packages bearing one or two labels conforming with model No. 1.

- 2451 The substances and articles of this class contain one or more of the radionuclides referred to in chapter VI of Appendix A.6 (marginals 3690 and 3691).
- 2452 The list hereunder specifies the different types of consignment:
1. Empty packages which have contained radioactive substances;
 2. Articles manufactured from natural or depleted uranium or natural thorium;
 3. Small quantities of radioactive substances;
 4. Instruments and manufactured articles;
 5. Low specific activity substances LSA (I)
 6. Low specific activity substances LSA (II)
 7. Low-level solid radioactive substances;
 8. Radioactive substances in Type A packages;
 9. Radioactive substances in Type B(U) packages;
 10. Radioactive substances in Type B(M) packages;
 11. Fissile substances;
 12. Radioactive substances carried under special arrangement.

Schedule 12453 1. SubstancesDanger labels on packagesEmpty packages: which have contained radioactive substances.

None

2. Packaging/PackageNote Any label indicating a danger shall be covered or removed.

- (a) Packaging shall be in accordance with the requirements given in marginal 3600 of Appendix A.6, and shall be securely closed and in good condition.
- (b) Permitted internal contamination levels: not more than 100 times those levels set out in paragraph 5.
- (c) Where an empty packaging includes natural or depleted uranium or natural thorium in its structure its surface shall be covered with a substantial, inactive sheath made of metal or some other resistant material.

3. Package maximum radiation level

0.5 mrem/h at the surface of the package.

4. Mixed packing

No provisions.

5. Contamination on packages

Non-fixed external contamination limits:

Beta/gamma/low-toxicity alpha emitters	10^{-4}	U Ci/cm ²
Natural/depleted uranium/natural thorium	10^{-3}	U Ci/cm ²
Other alpha emitters	10^{-5}	U Ci/cm ²

For full details, see marginal 3651 of Appendix A.6.

6. Marking on packages

- (a) Packages shall be plainly and durably marked with the weight if over 50 kg.
- (b) Any marking indicating a radioactive danger shall not be visible.

7. Transport documents

The transport document shall include the description "Radioactive substances (Empty packages), IVb, schedule 1, ADR", with the name underlined in red.

8. Storage and despatch

No provisions.

9. Carriage of packages in vehicles and containers

No provisions.

10. Carriage in bulk in vehicles and containers

Not applicable.

11. Carriage in tank vehicles and tank containers

Not applicable.

12. Placards and labels on vehicles, tank vehicles, tank containers and containers

None.

13. Prohibitions on mixed loading

No provisions.

14. Decontamination of vehicles, tank vehicles, tank containers and containers

No provisions.

15. Other provisions

None.

Schedule 2Danger labels on packages

None.

1. SubstancesArticles manufactured

from natural or depleted uranium
or natural thorium.

The outer surface of the uranium or
thorium shall be covered by a substantial,
insoluble sheath made of metal or some
other resistant material.

NOTE Such articles may for example be
in such packages intended for the
transport of radioactive substances.

2. Packaging/Package

Packaging shall be in accordance with the
requirements given in marginal 3600 of Appendix A.6.

3. Package maximum radiation level

0.5 mrem/h at the surface of the package.

4. Mixed packing

No provisions.

5. Contamination on packages

Non-fixed external contamination limits:

Beta/gamma/low-toxicity alpha emitters	10^{-4}	$\mu\text{Ci}/\text{cm}^2$
Natural/depleted uranium/ natural thorium	10^{-3}	$\mu\text{Ci}/\text{cm}^2$
Other alpha emitters	10^{-5}	$\mu\text{Ci}/\text{cm}^2$

For full details see marginal 3651 of Appendix A.6.

6. Marking on packages

None.

7. Transport documents

The transport document shall include the description "Radioactive
substances (Manufactured articles), IVb, schedule 2, ADR", with
the name underlined in red.

8. Storage and despatch
No provisions.
9. Carriage of packages in vehicles and containers
No provisions.
10. Carriage in bulk in vehicles and containers
Not applicable.
11. Carriage in tank vehicles and tank containers
Not applicable.
12. Placards and labels on vehicles, tank vehicles,
tank containers and containers
None.
13. Prohibitions on mixed loading
No provisions.
14. Decontamination of vehicles, tank vehicles,
tank containers and containers
No provisions.
15. Other provisions
None.

Schedule 3Danger labels on packages1. Substances

Small quantities of radioactive substances in amounts which do not exceed those given in the table below and which do not contain more than 15 g of uranium - 235.

None
(but see paragraph 15).

Nature of substances	Package limits
Solids and gases	
Special Form	$10^{-3}A1$
Other Forms	$10^{-3}A2$
Tritium	20 Ci*/
Liquids	
Tritium oxide in aqueous solutions	
Less than 0.1 Ci/l	1000 Ci
between 0.1 Ci/l and 1.0 Ci/l	100 Ci
greater than 1.0 Ci/l	1 Ci
Other liquids	$10^{-4}A2$

For mixtures of radionuclides, see marginal 3691 of Appendix A.6.

*/ The values for tritium also apply to tritium in activated luminous paint and tritium adsorbed on solid carriers.

2. Packaging/Package

- (a) Packaging shall be in accordance with the requirements given in marginal 3600 of Appendix A.6.
- (b) During transport there shall be no leakage of radioactive substance.

3. Package maximum radiation level

0.5 mrem/h at the surface of the package.

4. Mixed packing

No provisions.

5. Contamination on packages

Non-fixed external contamination limits:

Beta/gamma/low-toxicity alpha emitters	10^{-4}	$\mu\text{Ci/cm}^2$
Natural/depleted uranium/natural thorium	10^{-3}	$\mu\text{Ci/cm}^2$
Other alpha emitters	10^{-5}	$\mu\text{Ci/cm}^2$

For full details, see marginal 3651 or
Appendix A.6.

6. Marking on packages

The outermost surface of the containment system
shall be marked "RADIOACTIVE" as a warning on
opening the package.

7. Transport documents

The transport document shall include the description "Radioactive
substances (Small quantities), IVb, schedule 3, ADR"; with the name
underlined in red.

8. Storage and despatch

No provisions.

9. Carriage of packages in vehicles and containers

No provisions.

10. Carriage in bulk in vehicles and containers

Not permitted.

11. Carriage in tank vehicles and tank containers

Not permitted.

12. Flacards and labels on vehicles, tank vehicles,
tank containers and containers

None.

13. Prohibitions on mixed loading

No provisions.

14. Decontamination of vehicles, tank vehicles,
tank containers and containers

See marginal 3695 (3) of Appendix A.6.

15. Other provisions

- (a) Accident provi. see marginal 3695 (1)
of Appendix A.6.
- (b) Decontamination in storage - see
marginal 3695 (2) of Appendix A.6.
- (c) Radioactive substances which possess
other hazardous properties shall also
comply with the provisions of the
appropriate class.

Schedule 41. SubstancesDanger labels on packagesInstruments and Manufactured articles

None

such as clocks, electronic tubes or apparatus, having radioactive substances as a component part, whose activity does not exceed the amounts given in the table below and which do not contain more than 15 g. of uranium - 235

Nature of substances	Item limits	Package limits
Solids		
Special form	$10^{-2}A_1$	A_1
Other forms	$10^{-2}A_2$	A_2
Liquids	$10^{-3}A_2$	$10^{-1}A_2$
Gases		
Tritium	20 Ci *	200 Ci *
Special form	$10^{-3}A_1$	$10^{-2}A_1$
Other forms	$10^{-3}A_2$	$10^{-2}A_2$

For mixtures of radionuclides, see marginal 3691 of Appendix A.6.

* The values for tritium also apply to tritium in activated luminous paint and tritium adsorbed on solid carriers.

2. Packaging/Package

- (a) Packaging shall be in accordance with the requirements given in marginal 3600 of Appendix A.6.
- (b) The instruments and articles shall be securely packed.

3. Package maximum radiation level

0.5 mrem/h at the surface of the package and 10 mrem/h at 10 cm from any point on the external surface of any unpacked instrument or article.

4. Mixed packing

No provisions.

5. Contamination on packages

Non-fixed external contamination limits:

Beta/gamma/low-toxicity alpha emitters	10^{-4} $\mu\text{Ci/cm}^2$
Natural/depleted uranium/natural thorium	10^{-3} $\mu\text{Ci/cm}^2$
Other alpha emitters	10^{-5} $\mu\text{Ci/cm}^2$

For full details, see marginal 3651 of Appendix A.6.

6. Marking on packages

Each instrument or article (except radioluminescent timepieces or devices) shall bear the marking "RADIOACTIVE".

7. Transport Documents

The transport document shall include the description "Radioactive substances (Instruments) or (Manufactured articles), IVb, schedule 4, ADR", with the name underlined in red.

8. Storage and despatch

No provisions.

9. Carriage of packages in vehicles and containers

No provisions.

10. Carriage in bulk in vehicles and containers

Not applicable.

11. Carriage in tank vehicles and tank containers

Not applicable.

12. Placards and Labels on vehicles, tank vehicles, tank containers and containers

None.

13. Prohibitions on mixed loading

No provisions.

14. Decontamination of vehicles, tank vehicles, tank containers and containers

See marginal 3695(3) of Appendix A.6.

15. Other provisions

(a) Accident provisions - see marginal 3695(1) of Appendix A.6.

(b) Decontamination in storage - see marginal 3695(2) of Appendix A.6.

Schedule 5

1. Substances

Low specific activity substances ISA(I), belonging to one of the following groups as defined fully in marginal 2450(2):

- (i) uranium or thorium ores or concentrates (sub-para (a) of definition)
- (ii) unirradiated natural or depleted uranium or unirradiated natural thorium (sub-para (b) of definition)
- (iii) tritium oxide in aqueous solutions - concentration 10Ci/l or less. (sub-para (c) of definition)
- (iv) substances with uniform activity under minimum volume conditions of not more than 10-4 A2/g (sub-para (d) of definition).
- (v) Non-radioactive articles contaminated to not more than 10 times the package limits set in para 5 below and so that the specific activity under minimum volume conditions never exceeds 10-4 A2/g (sub-para (e) of definition)

If fissile substances are present the requirements of schedule 11 shall be met in addition to the requirements of this schedule.

2. Packaging/Package

Packages transported other than as full load-packaging shall be in accordance with the requirements of marginal 3600, marginal 3650 to 3655 and marginal 3656(1) to (4) of Appendix A.6.

Substances of paragraph 1(ii) above in massive solid form shall be packed so as to prevent abrasion, and in other solid forms shall be contained in a substantial sheath.

3. Package maximum radiation level

200 mrem/h at the surface of the package and 10 mrem/h at 1 metre from that surface (see marginals 3653 to 3655 of Appendix A.6).

except in the case of a full load when the limit is 1,000 mrem/h at the surface of the package and may exceed 10 mrem/h at 1 metre from that surface (see marginal 3659(7) of Appendix A.6).

Danger labels on packages
(see Appendix A.9).

Unless transported as a full load, labels to models 6A, 6B or 6C shall be affixed externally to two opposite sides, see marginals 3653 to 3655 of Appendix A.6 for package category. The contents shall be described on the labels as "RADIOACTIVE LSA".
Subsidiary labelling:

- (i) for thorium nitrate and uranium nitrate - model No. 3 labels are required.
- (ii) for uranium hexafluoride - model No. 4 labels are required.

4. Mixed packing

See marginal 3650 of Appendix A.6.

5. Contamination on packages

- (a) Non-fixed external contamination limits for packages carried other than as full load.

Beta/gamma/low-toxicity alpha emitters	10^{-4} μ Ci/cm ²
Natural/depleted uranium/natural thorium	10^{-3} μ Ci/cm ²
Other alpha emitters	10^{-5} μ Ci/cm ²

For full details, see marginal 3651 of Appendix A.6.

- (b) For packages carried in a full load - No provisions.

6. Marking on packages

Packages transported as full load - stencilled or otherwise marked "RADIOACTIVE ISA".

Packages transported other than full load - plainly and durably marked with the weight if over 50 kg.

7. Transport documents

The transport document shall include the description "Radioactive substances (Low specific activity ISA (I)), IVb, schedule 5, ADR", with the name underlined in red, and the details specified in marginals 3680 and 3681 of Appendix A.6.

8. Storage and despatch

- (a) Storage and segregation from other dangerous goods - see marginal 3658 (1) of Appendix A.6.
- (b) Storage and segregation from packages labelled "FOTO" - see marginal 240 001 of Appendix B.4 for segregation table.
- (c) Total transport index limitation for storage, no limit except in the case of Fissile Class II or III packages, see marginal 3658 (2) to (5) of Appendix A.6.

9. Carriage of packages in vehicles and containers

- (a) Segregation from packages labelled "FOTO" - see marginal 240 001 of Appendix B.4 for segregation Table.
- (b) Total transport index limitation - 50. This limit does not apply to a full load, provided that if Fissile Class II or III packages are present the allowable number is not exceeded, (see marginal 3659(5) of Appendix A.6).

- (c) Maximum radiation levels for vehicles and large containers in the case of a full load

200 mrem/h at surface
 10 mrem/h at 2 metres from surface.
 (see marginal 3659 (9) of Appendix A.6)

Also, for vehicles - 2 mrem/h in any normally occupied position - see marginal 3659 (7) of Appendix A.6.

- (d) Packages not in conformity with the requirements of marginal 3600 shall be transported as full load, and the limits in the following table shall not be exceeded:

Nature of substances	Vehicle or large container activity limit
Solids	No limit
Tritium oxide in aqueous solutions	50,000 Ci
Other liquids and gases	100 x A ₂

10. Carriage in bulk in vehicles and containers

Permitted under full load provided that, after loading, external surfaces of vehicles are carefully cleaned by the consignor and provided that no leakage can occur under normal transport. Quantity limits as in the table in paragraph 9 above.

11. Carriage in tank vehicles and tank containers

Permitted under same conditions as paragraph 10 above, and under the conditions of marginals 3660 and 3661, except for substances which have a critical temperature less than 50°C or, at this temperature, a vapour pressure above 3 kg/cm², or which are liable to spontaneous combustion.

12. Placards and labels on vehicles, tank vehicles, tank containers and containers (see Appendices A.9 and B.4)

Containers - labels to models 6A, 6B or 6C on all four sides. Vehicles and large containers - placards to model in Appendix B.4 marginal 24 010 on each lateral side and on rear wall of vehicle (see marginals 3659(6) and 42 500).

Subsidiary labelling

- (i) for thorium nitrate and uranium nitrate - model No. 3 labels are required.
 (ii) for uranium hexafluoride - model No.4 labels are required.

13. Prohibitions on mixed loading

See marginal 2450(3).

14. Decontamination of vehicles, tank vehicles, tank containers and containers

(a) For full load consignments, after unloading, vehicles to be decontaminated by the consignee to the levels in Table XIX of Appendix A.6 unless to be used for carrying the same substances. See also marginal 3695(4) of Appendix A.6.

(b) For non-full load consignments, see marginal 3695(3) of Appendix A.6.

15. Other provisions

(a) Accident provisions - see marginal 3695(1) of Appendix A.6.

(b) Decontamination in storage - see marginal 3695(2) of Appendix A.6.

Schedule 61. Substances

Low specific activity substances LSA(II)
belonging to either of the following
groups as defined fully in marginal
2450(2):

- (i) substances with uniform activity
of not more than 10^{-4} A2/g. (sub-para
(a) of definition).
- (ii) non-radioactive articles contaminated
non-dispersibly to a level not exceeding
 $1 \mu\text{Ci}/\text{cm}^2$ for beta and gamma emitters and
low toxicity alpha emitters, or
 $0.1 \mu\text{Ci}/\text{cm}^2$ for other alpha emitters
(sub-para (b) of definition).

If fissile substances are present the requirements
of schedule 11 shall be met in addition to the
requirements of this schedule.

2. Packaging/Package

Packaging shall be in accordance with the
requirements of marginal 3600, marginal 3650
and marginal 3651 of Appendix A.6.

3. Package maximum radiation level

Closed vehicles under conditions of marginal
3659 (7) (a) of Appendix A.6 - 1000 mrem/h
at the surface of the package and may exceed
10 mrem/h at one metre from that surface.
All other vehicles not under the conditions
of marginal 3659 (7)(a) of Appendix A.6 -
200 mrem/h at the surface of the package and
10 mrem/h at one metre from that surface.

4. Mixed packing

See marginal 3650 of Appendix A.6.

5. Contamination on packages

Non-fixed external contamination limits:

Beta/gamma/low toxicity alpha emitters	$10^{-4} \mu\text{Ci}/\text{cm}^2$
Natural/depleted uranium/natural thorium	$10^{-5} \mu\text{Ci}/\text{cm}^2$
Other alpha emitters	$10^{-5} \mu\text{Ci}/\text{cm}^2$

For full details, see marginal 3651 of Appendix A.6

Danger labels on packages

None required unless fissile
substances are present.
(see Schedule 11).

6. Marking on packages

Packages shall be stencilled or otherwise marked "RADIOACTIVE LSA".

7. Transport documents

The transport document shall include the description "Radioactive substances (Low specific activity LSA (II)), IVb, schedule 6, ADR," with the name underlined in red, and the details specified in marginals 3680 and 3681 of Appendix A.6.

8. Storage and despatch

Only under full load

9. Carriage of packages in vehicles and containers

(a) Carriage only by full load

(b) If the consignment includes Fissile Class II or III packages the allowable number shall not be exceeded. (see §schedule 11).

(c) Maximum radiation levels for vehicles and large containers -

200 mrem/h at surface
10 mrem/h at 2 metres from surface (see marginal 3659(7) of Appendix A.6)

Also, for vehicles - 2 mrem/h in any normally occupied position - (see marginal 3659(8) of Appendix A.6)

(d) The limits in the following table shall not be exceeded:

Nature of substances	Vehicle or large container activity limit
Solids	No limit
Tritium oxide in aqueous solutions	50 000 Ci
Other liquids and gases	100 x A ₂

10. Carriage in bulk in vehicles and containers

Not permitted.

11. Carriage in tank vehicles and tank containers

Not permitted.

12. Placards and labels on vehicles, tank vehicles, tank containers and containers (see Appendices A.9 and B.4)

Containers — labels to 6A, 6B or 6C on all four sides.

Vehicles and large containers — placards to model in Appendix B.4, marginal 240 010 on each lateral side and on rear wall of vehicle (see marginals 3659(6) and 42 500).

13. Prohibitions on mixed loading

See marginal 2450(3).

14. Decontamination of vehicles, tank vehicles, tank containers and containers

See marginal 3695(3) and (4) of Appendix A.6.

15. Other provisions

Accident provisions — see marginal 3695 (1) of Appendix A.6

Schedule 71. Substances

Low-level solid radioactive substances LLS belonging to either of the following groups as defined fully in marginal 2450(2):

- (i) substances with uniform activity of not more than 2×10^{-3} A2/g. (sub-para (a) of definition).
- (ii) non-radioactive articles contaminated to a level not exceeding 20 μ Ci/cm² for beta and gamma emitters and low toxicity alpha emitters or 2 μ Ci/cm² for other alpha emitters. (sub-para (b) of definition).

If fissile substances are present the requirements of schedule 11 shall be met in addition to the requirements of this schedule

2. Packaging/Package

- (a) Packaging shall be in accordance with the requirements of marginals 3600 and 3650 of Appendix A.6. and shall be capable of withstanding the tests set out in marginal 3635(4) and (5) of Appendix A.6.
- (b) Under the conditions of the tests set out in (a) there shall be
 - (i) no loss or dispersal of the radioactive contents
 - (ii) no increase of the maximum radiation level recorded or calculated at the external surface for the condition before the test.

3. Package maximum radiation level

Closed vehicles under conditions of marginal 3659(7) (a) of Appendix A.6 - 1000 mrem/h at the surface^a of the package and may exceed 10 mrem/h at one metre from that surface. All other vehicles not under the conditions of marginal 3659(7) (a) of Appendix A.6 - 200 mrem/h at the surface of the package and 10 mrem/h at one metre from that surface.

4. Mixed packing

See marginal 3650 of Appendix A.6.

Danger labels on packages

None required unless fissile substances are present. (see Schedule 11).

5. Contamination on packages

No provisions.

6. Marking on packages

Packages shall be stencilled or otherwise marked "RADIOACTIVE LLS".

7. Transport documents

The transport document shall include the description "Radioactive substances (Low-level solid (LLS)), IVb, schedule 7, ADR," with the name underlined in red, and the details specified in marginals 3680 and 3681 of Appendix A.6.

8. Storage and despatch

Only under full load

9. Carriage of packages in vehicles and containers

(a) Carriage only by full load

(b) If the consignment contains Fissile Class II or III packages the allowable number shall not be exceeded (see Schedule 11).

(c) Maximum radiation levels for vehicles and large containers -

200 mrem/h at surface

10 mrem/h at 2 metres from surface -

see marginal 3659(7) of Appendix A.6.

Also, for vehicles - 2 mrem/h in any normally occupied position -
see marginal 3659(8) of Appendix A.6.

10. Carriage in bulk in vehicles and containers

Not permitted.

11. Carriage in tank vehicles and tank containers

Not applicable.

12. Placards and labels on vehicles, tank vehicles, tank containers and containers (See Appendices A.9 and B.4)

Containers - labels to model 6A, 6B or 6C on all four sides.
Vehicles and large containers - placards to model in Appendix B.4. marginal 240 010 on each lateral side and on rear wall of vehicle (see marginals 3659(6) and 42 500).

13. Prohibitions on mixed loading

See marginal 2450(3).

14. Decontamination of vehicles, tank vehicles, tank containers and containers

After unloading, vehicles to be decontaminated by the consignee to the level set in Table XIX of Appendix A.6 unless to be used for carrying the same substances.
See also marginal 3695(3) and (4) of Appendix A.6.

15. Other provisions

Accident provisions - see marginal 3695(1) of Appendix A.6.

Schedule 81. Substances

Radioactive substances in Type A packages
up to an activity per package of A_2 ;
or A_1 if in special form.

If fissile substances are present the requirements of schedule 11 shall be met in addition to the requirements of this schedule.

Danger labels on packages
(see Appendix A.9)

Labels to models 6A, 6B or 6C shall be affixed externally to two opposite sides, see marginals 3653 to 3655 of Appendix A.6 for package category.

2. Packaging/Package

Type A, in accordance with the design requirements given in marginals 3600 and 3601 of Appendix A.6.

3. Package maximum radiation level

200 mrem/h at the surface of the package and 10 mrem/h at 1 metre from that surface (see marginals 3653 to 3655 of Appendix A.6).

except in the case of a full load, when the limit is 1000 mrem/h at the surface of the package and may exceed 10 mrem/h at 1 metre from that surface (see marginal 3659(7) of Appendix A.6).

4. Mixed packing

See marginal 3650 of Appendix A.6.

5. Contamination on packages

Non-fixed external contamination limits:

Beta/gamma/low-toxicity alpha emitters $10^{-4} \mu\text{Ci/cm}^2$

Natural/depleted uranium/natural thorium $10^{-3} \mu\text{Ci/cm}^2$

Other alpha emitters $10^{-5} \mu\text{Ci/cm}^2$

For full details, see marginal 3651 or Appendix A.6.

6. Marking on packages

Packages shall be plainly and durably marked externally with

- (i) "Type A"
- (ii) the weight of the package, if over 50 kg.

7. Transport Documents

- (a) For a summary of the approval and notification requirements - see marginal 2454.
- (b) The transport document should include the description "Radioactive substances in Type A packages, IVb, schedule 8, ADR", with the name underlined in red, and the details specified in marginals 3680 and 3681 of Appendix A.6.
- (c) Where advantage is taken of the increased activity per package permitted if the substance is in Special Form, the unilateral special form design approval certificate shall be in the consignor's possession before the first shipment (see marginal 3671 of Appendix A.6).

8. Storage and despatch

- (a) Storage and segregation from other dangerous goods
- see marginal 3658(1) of Appendix A.6.
- (b) Storage and segregation from packages labelled "FOTO"
- see marginal 240 001 of Appendix B.4 for segregation table.
- (c) Total transport index limitation for storage - 50 per group with 6 metres between groups
- see marginal 3658(2) to (5) of Appendix A.6.

9. Carriage of packages in vehicles and containers

- (a) Segregation from packages labelled "FOTO"
- see marginal 240 001 of Appendix B.4 for segregation tables.

- (b) Total transport index limitation - 50.
This limitation does not apply to a full load, provided that if Fissile Class II or III packages are present the allowable number is not exceeded. See marginal 3659(5) of Appendix A.6.
- (c) Maximum radiation level for vehicles and large containers in the case of a full load

200 mrem/h at surface
10 mrem/h at 2 metres from surface

(See marginal 3659(7) of Appendix A.6)
Also, for vehicles - 2 mrem/h in any normally occupied position - see marginal 3659(8) of Appendix A.6.

10. Carriage in bulk in vehicles and containers

Not applicable.

11. Carriage in tank vehicles and tank containers

Not applicable.

12. Placards and labels on vehicles, tank vehicles, tank containers and containers (see Appendices A.9 and B.4)

Containers - labels to model 6A, 6B or 6C on all four sides.

Vehicles and large containers - placards to model in Appendix B.4, marginal 240/010 each lateral side and on rear wall of vehicle (see marginals 3659(6) and 42 500).

13. Prohibition on mixed loading

See marginal 2450(3)

14. Decontamination of vehicles, tank vehicles, tank containers and containers

See marginal 3695(3) of Appendix A.6.

15. Other provisions

(a) Accident provisions - see marginal 3695(1) of Appendix A.6.

(b) Decontamination in storage - see marginal 3695(2) of Appendix A.6.

Schedule 9

1. Substances

Radioactive substances in Type B(U)

Packages

No limit on the quantity per package except as prescribed in the approval certificates. If fissile substances are present, the requirements of schedule 11 shall be met in addition to the requirements of this schedule.

2. Packaging/Package

Type B(U), in accordance with the design requirements given in marginals 3600 to 3603 of Appendix A.6 requiring competent authority unilateral approval, see marginal 3672 of Appendix A.6.

3. Package maximum radiation level

200 mrem/h at the surface of the package and 10 mrem/h at 1 metre from that surface. (see marginals 3653 to 3655 of Appendix A.6).

except in the case of a full load, when the limit is 1000 mrem/h at the surface of the package and may exceed 10 mrem/h at 1 metre from that surface. (See marginal 3659(7) of Appendix A.6)

4. Mixed packing

See marginal 3650 of Appendix A.6.

5. Contamination on packages

Non-fixed external contamination limits:

Beta/gamma/low toxicity alpha emitters	10^{-4} $\mu\text{Ci}/\text{cm}^2$
Natural/depleted uranium/natural thorium	10^{-3} $\mu\text{Ci}/\text{cm}^2$
Other alpha emitters	10^{-5} $\mu\text{Ci}/\text{cm}^2$

For full details, see marginal 3651 of Appendix A.6

Danger labels on packages
(see Appendix A.9)

Labels to models 6A, 6B or 6C shall be affixed externally to two opposite sides, see marginals 3653 to 3655 of Appendix A.6 for package category.

6. Marking on packages

Packages shall be plainly and durably marked externally with:

- (i) "TYPE B(U)".
- (ii) competent authority identification mark.
- (iii) the weight if over 50 kg.
- (iv) the trefoil symbol embossed or stamped on the outermost fire and water-resistant receptacle.

7. Transport Documents

- (a) For a summary of the approval and notification requirements, see marginal 2454.
- (b) The transport document shall include the description "Radioactive substances in Type B(U) packages, IVb, schedule 9, ADR", with the name underlined in red, and the details specified in marginals 3680 and 3681 of Appendix A.6.
- (c) Unilateral package design approval certificate is required, see marginal 3672 of Appendix A.6.
- (d) Before the shipment of any package the consignor shall be in possession of all relevant approval certificates.
- (e) Before the first shipment of a particular design of package, if the activity is greater than $3 \times 10^3 A_2$ or $3 \times 10^3 A_1$ as appropriate, or $3 \times 10^4 Ci$ whichever is the lower, the consignor shall ensure that copies of the competent authority approval certificates have been supplied to the competent authorities of countries affected by the movement, see marginal 3682(1) of Appendix A.6.
- (f) Prior to each shipment where the activity is greater than $3 \times 10^3 A_2$ or $3 \times 10^3 A_1$ as appropriate, or $3 \times 10^4 Ci$ whichever is the lower, the consignor shall notify the competent authorities of all countries affected by the movement, preferably fifteen days in advance as detailed in marginal 3682 of Appendix A.6.

- (g) Where advantage is taken of the increased activity per package permitted because the substance is in special form, see paras. (e) and (f) above, a unilateral special form design approval certificate is required (see marginal 3671 of Appendix A.6).

8. Storage and despatch

- (a) Any instructions in the competent authority approval certificate shall be observed.
- (b) Storage and segregation from other dangerous goods — see marginal 3658(1) of Appendix A.6.
- (c) Storage and segregation from packages labelled "FOTO" — see marginal 240 OOI Appendix B.4 for segregation Table.
- (d) Total transport index limitation for storage — 50 per group with 6 metres between groups — see marginal 3658(2) to (5) of Appendix A.6.
- (e) The consignor shall have complied with the pre-use and pre-shipment requirements of marginals 3643 and 3644 of Appendix A.6.
- (f) The temperature of the accessible surfaces of the package shall not exceed 50°C in the shade unless transport is under full load conditions, in which case the limit is 82°C (see marginals 3602(3)(b) and 3603(8) of Appendix A.6).
- (g) If the average surface heat flux from a package exceeds 15 w/m^2 then the package shall be transported as a full load.

9. Carriage of packages in vehicles and containers

- (a) Segregation from packages labelled "FOTO" — see marginal 240 OOI of Appendix B.4 for segregation Table.
- (b) Total transport index limitation — 50.
This limitation does not apply to a full load, provided that if Fissile Class II or III packages are present the allowable number is not exceeded. See marginal 3659(5) of Appendix A.6.
- (c) Maximum radiation levels for vehicles and large containers in the case of a full load
- 200 mrem/h at surface
10 mrem/h at 2 metres from surface

See marginal 3659(7) of Appendix A.6
Also for vehicles - 2 mrem/h in any normally occupied
position - see marginal 3659(8) of Appendix A.6.

10. Carriage in bulk in vehicles and containers

Not applicable.

11. Carriage in tank vehicles and tank containers

Not applicable.

12. Placards and labels on vehicles, tank vehicles,
tank containers and containers

(see Appendices A.9 and B.4).

Containers - labels to model 6A, 6B or 6C on
all four sides.

Vehicles and large containers - placards to model
in Appendix B.4 marginal 240 OIO on each lateral
side and on rear wall of vehicle (see marginals
3659(6) and 42 500).

13. Prohibition on mixed loading

See marginal 2450(3).

14. Decontamination of vehicles, tank vehicles, tank
containers and containers

See marginal 3695(3) of Appendix A.6.

15. Other provisions

(a) Accident provisions - see marginal 3695(1) of
Appendix A.6.

(b) Decontamination in storage - see marginal 3695(2)
of Appendix A.6.

Schedule 101. SubstancesRadioactive substances in Type B (M) packages

that is a Type B package design which fails to meet one or more of the specific additional requirements for Type B(U) packages (see marginal 3603 of Appendix A.6). No limit on the quantity per package except as prescribed in the approval certificate. If fissile substances are present the requirements of schedule 11 shall be met in addition to the requirements of this schedule.

2. Packaging/Package

Type B(M), in accordance with the design requirements given in marginal 3604 of Appendix A.6 requiring competent authority multilateral approval, see marginal 3673 of Appendix A.6.

3. Package maximum radiation level

200 mrem/h at the surface of the package and 10 mrem/h at 1 metre from that surface (see marginals 3653 to 3655 of Appendix A.6), except in the case of a full load when the limit is 1000 mrem/h at the surface of the package and may exceed 10 mrem/h at 1 metre from that surface (see marginal 3659(7) of Appendix A.6).

4. Mixed packing

See marginal 3650 of Appendix A.6.

5. Contamination on packages

Non-fixed external contamination limits:

Beta/gamma/low-toxicity
alpha emitters

10^{-4} μ Ci/cm²

Natural/depleted uranium/
natural thorium

10^{-3} μ Ci/cm²

Other alpha emitters

10^{-5} μ Ci/cm²

For full details, see marginal 3651 of Appendix A.6.

Danger labels on packages
(see Appendix A.9)

Labels to models 6A, 6B or 6C shall be affixed externally to two opposite sides, see marginals 3653 to 3655 of Appendix A.6 for package category.

6. Marking on packages

Packages shall be plainly and durably marked externally with:

- (i) "Type B(M)"
- (ii) competent authority identification mark
- (iii) the weight of the package if over 50 kg
- (iv) the trefoil symbol embossed or stamped on the outermost fire and water-resistant receptacle.

7. Transport documents

- (a) For a summary of the approval and notification requirements - see marginal 2454.
- (b) The transport document shall include the description "Radioactive substances in Type B(M) packages, IVb, schedule 10, ADR", with the name underlined in red, and the details specified in marginals 3680 and 3681 of Appendix A.6.
- (c) Multilateral package design approval certificates are required, see marginal 3673 of Appendix A.6.
- (d) If the package is designed to allow for continuous venting or if the total contents exceed $3 \times 10^3 A_2$ or $3 \times 10^3 A_1$, as appropriate or $3 \times 10^4 Ci$, whichever is the lower, multilateral shipment certificates are required unless a competent authority authorizes transport by a specific provision in its package design certificate, see marginal 3675 of Appendix A.6.
- (e) Where advantage is taken of the increased activity per package permitted if the substance is in special form, see para. (d) above, a unilateral special form design approval certificate is required (see marginal 3671 of Appendix A.6).
- (f) Prior to each shipment the consignor shall notify the competent authorities of all countries affected by the movement preferably fifteen days in advance as detailed in marginal 3682(2) to (4) of Appendix A.6.
- (g) Before the shipment of any package, the consignor shall be in possession of all relevant approval certificates.

8. Storage and despatch

- (a) Any instructions in the competent authority approval certificates shall be observed.
- (b) Storage and segregation from other dangerous goods - see marginal 3658(1) of Appendix A.6.
- (c) Storage and segregation from packages labelled "FOTO" - see marginal 240 OOI of Appendix B4 for segregation Table.
- (d) Total transport index limitation for storage - 50 per group with 6 metres between groups - see marginal 3658(2) to (5) of Appendix A.6.
- (e) The consignor shall have complied with the pre-use and pre-shipment requirements of marginals 3643 and 3644 of Appendix A.6.
- (f) If the surface temperature of the package exceeds 50°C in the shade, the package shall be transported as a full load - see marginal 3602(3)(b) of Appendix A.6.
- (g) If the average surface heat flux from a package exceeds 15 W/m^2 , then the package shall be transported as a full load.
- (h) Packages specially designed to allow continuous venting - see marginal 3604(2) of Appendix A.6 - shall only be transported under full load.

9. Carriage of packages in vehicles and containers

- (a) Segregation from packages labelled "FOTO" - see marginal 240 OOI of Appendix B4 for segregation Table.
- (b) Total transport index limitation - 50. This limitation does not apply to a full load, provided that if Fissile Class II or III packages are present the allowable number is not exceeded - see marginal 3659(5) of Appendix A.6.
- (c) Maximum radiation levels for vehicles and large containers in the case of a full load
 - 200 mrem/h at surface
 - 10 mrem/h at 2m from surfacesee marginal 3659(7) of Appendix A.6.
Also, for vehicles 2 mrem/h in any normally occupied position - see marginal 3659(8) of Appendix A.6.

10. Carriage in bulk in vehicles and containers

Not applicable.

11. Carriage in tank vehicles and tank containers

Not applicable.

12. Placards and labels on vehicles, tank vehicles, tank containers and containers
(see Appendix A9 and B4)

Containers - labels to model 6A, 6B or 6C on all four sides.

Vehicles and large containers - placards to model in Appendix B4 marginal 240 010 on each lateral side and on rear wall of vehicle (see marginals 3659(6) and 42 500).

13. Prohibition on mixed loading

See marginal 2450(3).

14. Decontamination of vehicles, tank vehicles, tank containers and containers

See marginal 3695(3) of Appendix A.6.

15. Other provisions

- (a) Accident provisions - see marginal 3695(1) of Appendix A.6.
- (b) Decontamination in storage - see marginal 3695(2) of Appendix A.6.

Schedule 111. Substances

Fissile substances that is

uranium - 233, uranium-235,

plutonium - 238, plutonium-239,

plutonium - 241, or any substance containing any of the foregoing, except unirradiated natural and depleted uranium.

Fissile substances shall also be consigned in full compliance with the requirements of one of the other schedules, as appropriate to the radioactivity.

Danger labels on packages
(see Appendix A9)

Fissile Class I - labels to models 6A, 6B or 6C.

Fissile Class II - labels to models 6B or 6C

Fissile Class III - labels to model 6C only. Labels to be affixed externally to two opposite sides, see marginals 3653 to 3655 of Appendix A6 for package category.

2. Packaging/Package

(a) The following substances specified fully in marginal 3610 of Appendix A6 are exempt from the special packaging requirements of this schedule:

- (i) Fissile substances in quantity not exceeding 15 g.
- (ii) Natural or depleted uranium irradiated in a thermal reactor.
- (iii) Dilute hydrogenous solutions in limited concentrations and quantities.
- (iv) Enriched uranium with not more than 1 per cent of uranium-235, which should not form a lattice arrangement if metal or oxide.
- (v) Substances distributed at not more than 5 g per 10 litre volume.
- (vi) Plutonium where less than 1 kg per package and where not more than 20 per cent by mass consists of plutonium-239 or 241.
- (vii) Enriched uranyl nitrate solution containing uranium with not more than 2 per cent uranium-235.

(b) Otherwise, packages shall be in accordance with the design requirements of Fissile Class I, II or III given in marginals 3611 to 3624 of Appendix A6 and have competent authority approval, where necessary, as detailed in marginal 3674 of Appendix A6.

3. Package maximum radiation level
See appropriate schedule.
4. Mixed packing
See marginal 3650 of Appendix A6
5. Contamination on packages
See appropriate schedule.
6. Marking on packages
See appropriate schedule.
7. Transport documents
 - (a) For a summary of the approval and notification requirements - see marginal 2454.
 - (b) The transport document shall include the details specified in the schedule appropriate to the nature of the contents with the word "Fissile" prefixed to the description and underlined in red.
 - (c) Unilateral or multilateral package design approval certificates may be required, see marginal 3674 of Appendix A6.
 - (d) Fissile Class II package designs complying with marginal 3620 of Appendix A6 shall have multilateral shipment approval certificates. Such a package design requires no prior notification unless specified in the competent authority's shipment approval.
 - (e) Fissile Class III package designs shall have multilateral shipment approval certificates unless a competent authority authorizes transport by a specific provision in its package design certificate, see marginal 3675 of Appendix A6.
 - (f) Prior to each shipment of a Fissile Class III package which requires multilateral package design approval, see marginal 3674 of Appendix A6 the consignor shall notify the competent authorities of all countries affected by the movement preferably fifteen days in advance as detailed in marginal 3682(2) to (4) of Appendix A6.
 - (g) Before the shipment of any package the consignor shall be in possession of any relevant approval certificates.

8. Storage and despatch

- (a) Any instructions in the competent authority approval certificates must be observed.
- (b) Total transport index limitation for storage - 50 per group with 6 metres between groups - see marginal 3658 (2) to (5) of Appendix A6.
- (c) The consignor shall have complied with the pre-use requirements of marginal 3643 of Appendix A6.

9. Carriage of packages in vehicles and containers

- (a) Any instructions in the competent authority approval certificates shall be observed.
- (b) Total transport index limitation - 50. This limitation does not apply to a full load, provided that if Fissile Class II or III packages are present the allowable number is not exceeded. See marginal 3659(5) of Appendix A6.

10. Carriage in bulk in vehicles and containers

- (a) No restrictions for fissile material up to 15g total or for solutions within certain concentration and quantity limits, see paragraph 2(a) (i), (ii) and (vii) and marginal 3610 of Appendix A6.
- (b) Not applicable for Fissile Class I or II packages.
- (c) Permitted under Fissile Class III only if so specified in the competent authority certificate.

11. Carriage in tank vehicles and tank containers

See paragraph 10(a), (b) and (c) above.

12. Placards and labels on vehicles, tank vehicles, tank containers and containers
(see Appendices A9 and B.4)

Containers - labels to models 6A, 6B or 6C on all four sides.

Vehicles and large containers - placards to model in Appendix B4 marginal 240 010 on each lateral side and on rear wall of vehicle (see marginals 3659(6) and 42 500).

13. Prohibitions on mixed loading

See marginal 2450 (3)

14. Decontamination of vehicles, tank vehicles, tank containers and containers

See appropriate schedule.

15. Other provisions

Accident provisions - see marginal 3695(1) of Appendix A6.

Schedule 12Danger labels on packages
(see Appendix A9)

Labels in conformity with model no. 6C shall be affixed externally to two opposite sides unless otherwise prescribed in the competent authority certificate. See marginal 3655(1) of Appendix A6.

1. SubstancesRadioactive substances carried under special arrangement

If it is not possible to comply with the package design or shipment requirements, consignments shall be transported under a special arrangement which will ensure that the over-all safety level is no less than it would have been had all the applicable requirements been met. See marginal 3676 of Appendix A6.

NOTE For a summary of the approval and notification requirements, see marginal 2454.

2454 Summary of approvals and prior notification requirements(a) Approval of special form substances, and package designs

	Subject of approval	Competent authority whose approval is required
1	Special form substance excepting those items specified in Schedules 3 and 4.	Country of origin
2	Type A, ISA and LIS.	None unless contents are fissile and not exempted from the fissile requirements under marginal 3610 of Appendix A6: Country of origin
3	Type B (U)	Country of origin
4	Type B (M)	Country of origin and all countries en route
5	Fissile packages	
	Package designs complying with marginal 3620, 3623 or 3624 of Appendix A6	None
	Package designs complying with marginal 3616 or 3622 of Appendix A6	Country of origin
	All other package designs	Country of origin and all countries en route
<p>Note: "Country of origin" refers to the country where the design originated. Packages in the fissile classes also fall into one or other of package design categories 2, 3 or 4 above and the relevant provisions also apply to them.</p>		

(b) Approval of shipments and prior notification

	Package	Competent authority whose approval is required for each shipment	Prior notification of each shipment
1.	Type A, ISA and LIS	None	None
2.	Type B(U)	None	Country of origin and all countries en route when contents exceed $3 \times 10^3 A_1$ or $3 \times 10^3 A_2$, as appropriate or $3 \times 10^4 Ci$ whichever is lower.
3.	Type B(M)-Continuously venting	Country of origin and all countries en route.	Country of origin and all countries en route.
4.	Type B(M)-Not continuously venting	Country of origin and all countries en route when contents exceed $3 \times 10^3 A_1$ or $3 \times 10^3 A_2$, as appropriate or $3 \times 10^4 Ci$ whichever is lower	Country of origin and all countries en route.
5	Fissile packages		
	Fissile Class I	None	None
	Fissile Class II	Packages complying with marginal 3620 of Appendix A6 only: Country of origin and all countries en route.	None unless specified in the competent authority shipment approval
	Fissile Class III	Country of origin and all countries en route.	Country of origin and all countries en route.
6.	Packages subject to transport under special arrangements	Country of origin and all countries en route.	Country of origin and all countries en route.
<p>Note: Before shipping a Type B(U) package the contents of which exceed $3 \times 10^3 A_1$ or $3 \times 10^3 A_2$, as appropriate, or $3 \times 10^4 Ci$ whichever is lower, for the first time, the consignor shall ensure that copies of each applicable competent authority certificate applying to the design have been submitted to the competent authority of those countries in whose territory it is to be transported. Country of origin refers to the country where the shipment originated.</p>			
<p>Packages in the fissile classes also fall into one or other of the other headings of this Table and the relevant provisions also apply to them.</p>			

APPENDIX A.6

Should be replaced by the following:

REGULATIONS RELATING TO RADIOACTIVE SUBSTANCES OF CLASS IVb

CHAPTER I — PACKAGING AND PACKAGE DESIGN REQUIREMENTS

A. GENERAL DESIGN REQUIREMENTS FOR PACKAGING AND PACKAGES

- 3600 (1) The packaging shall be so designed that the package can be easily handled and can be properly secured during transport.
- (2) A package of gross weight 10 kg or more and up to 50 kg shall be provided with means for manual handling.
- (3) A package of gross weight in excess of 50 kg shall be so designed as to enable safe handling to be done by mechanical means.
- (4) The design shall be such that any lifting attachments on the package, when used in the intended manner, do not impose unsafe stresses on the structure of the package; assessment shall take account of appropriate safety factors to cover 'snatch' lifting.
- (5) Attachments and any other features on the outer surface of the packaging which could be used to lift the packages shall be removable or otherwise rendered inoperable for transport or shall be designed to support the weight of the package in accordance with the requirements of paragraph (4) above.
- (6) The outer layer of packaging shall be so designed as to avoid, as far as practicable, the collection and the retention of water.
- (7) The external surfaces of packaging shall, as far as practicable, be so designed and finished that they may be easily decontaminated.
- (8) Any features added to the package at the time of transport which are not part of the package shall not reduce the safety of the package.
- (9) The smallest overall external dimension of the packaging shall not be less than 10 cm.
- (10) Substances which have a critical temperature below 50°C or, at this temperature, a vapour pressure above 3kg/cm^2 shall be contained in receptacles which also comply with the regulations of marginals 2132 and 2141 to 2148.

B. ADDITIONAL REQUIREMENTS FOR TYPE A PACKAGES

- 3601 (1) The outside of every package shall incorporate a feature such as a seal, which is not readily breakable and which, while intact, will be evidence that the package has not been opened.

(2) As far as practicable, packaging shall be designed so that the external surfaces are free from protruding features.

(3) The design of the packaging shall take into account the variations in temperature to which the packaging may be subjected during transport and storage. In this respect, -40°C and 70°C shall be considered as satisfactory limits to be used in the selection of the materials; special attention, however, shall be given to brittle fracture over this temperature range.

(4) The design, fabrication and manufacturing techniques for welded, brazed, or other fusion joints shall be in accordance with national or international standards or with standards acceptable to the competent authority.

(5) The package shall be capable of withstanding the effects of any acceleration, vibration or vibration resonance which may arise during normal transport without any deterioration in the effectiveness of the closing devices on the various receptacles or in the integrity of the package as a whole. In particular, nuts, bolts and other securing devices shall be so designed as to prevent them from becoming loose or being released unintentionally, even after repeated use.

(6) Special form radioactive substances may be considered as a component of the containment system.

(7) The design shall include a containment system closed by a positive fastening device, that is a device which cannot open by itself, can only be opened intentionally and will resist the effect of a possible increase in pressure inside the vessel.

(8) If a containment system forms a separate unit of the packaging, it shall be capable of being securely closed by a positive fastening device which is independent of any other part of the packaging.

(9) The materials of the packaging and any components or structures shall be physically and chemically compatible with each other and with the package contents; account shall be taken of their behaviour under irradiation.

(10) The design of any component of the containment system shall take into account, where applicable, the radiolytic decomposition of liquids and other vulnerable materials and the generation of gas by chemical reaction and radiolysis.

(11) The containment system shall retain its radioactive contents under the reduction of ambient pressure to 0.25 kg/cm^2 .

(12) All valves, other than pressure relief valves, through which the radioactive contents could otherwise escape shall be protected against unauthorized operation and shall be provided with an enclosure to retain any leakage from the valve.

(13) A radiation shield which encloses a component of the packaging specified as a part of the containment system shall be so designed as to prevent the unintentional release of that component from the shield. Where the radiation shield and such component within it form a separate unit, the radiation shield shall be capable of being securely closed by a positive fastening device which is independent of any other packaging structure.

(14) Any tie-down attachments on the package shall be so designed that, under both normal and accident conditions, the forces in those attachments shall not impair the ability of the package to meet the requirements of this Appendix.

(15) Type A packaging shall be so designed that, if it were subjected to the tests specified in marginal 3635 it would prevent:

- (a) loss or dispersal of the radioactive contents, and
- (b) any increase of the maximum radiation level recorded or calculated at the external surface for the condition before the test.

(16) Type A packaging designed for liquids shall, in addition, be adequate to meet the conditions prescribed in marginal (15) above if the package is subjected to the tests specified in marginal 3636.

However, these tests are not required when enough absorbent material to absorb twice the volume of the liquid contents is within the containment system and:

- (a) the absorbent material is within the radiation shield; or
- (b) the absorbent material is outside the radiation shield, provided that it can be shown that if the liquid contents were taken up by the absorbent material the resultant radiation level at the surface of the package would not exceed 200 mrem/h.

(17) Type A packaging designed for compressed or uncompressed gases shall, in addition, prevent loss or dispersal of the radioactive contents if the package is subjected to the tests specified in marginal 3636. Packaging designed for tritium and argon-37, in gaseous form and in activities up to 200 Ci, shall be exempted from this requirement.

C. BASIC ADDITIONAL REQUIREMENTS FOR TYPE B(U) AND TYPE B(M) PACKAGES

3602

(1) Except as provided in marginal 3603(1)(a) and 3604(2) respectively, Type B(U) and Type B(M) packages shall be designed to meet the additional requirements specified for Type A packages in marginal 3601(1) to (15) inclusive.

(2) The packaging shall be so designed that if it were subjected to the tests in marginal 3637 it would retain sufficient radiation shielding to ensure that the radiation level at 1 m from the surface of the package would not exceed 1 rem/h had the package contained sufficient iridium-192 to produce a radiation level of 10 mrem/h at 1 m from the surface before the tests. Where the use of the packaging is to be restricted to particular radionuclides, those radionuclides may be used as the reference source in place of iridium-192. In addition, if the packaging is to be used for neutron emitters, an appropriate neutron reference source should also be used. It is not required that a measurement necessarily be made with a test radiation source but only that calculations be made with respect to the particular reference radiation source considered.

(3) Type B(U) and Type B(M) packages shall be so designed, constructed and prepared for shipment that, under the ambient conditions specified in paragraph (4), they shall satisfy the conditions in (a) and (b) below:

(a) Heat generated within the package by the radioactive contents will not, under normal conditions of transport (as demonstrated by the tests in marginal 3635) adversely affect the package in such a way that it will fail to meet the applicable requirements for containment and shielding if left unattended for a period of one week. Particular attention shall be paid to the effects of heat which may:

(i) alter the arrangement, the geometrical form or the physical state of the radioactive contents or, if the material is enclosed in a can or receptacle (for example, clad fuel elements), cause the can, receptacle or material to melt;

(ii) lessen the efficiency of the packaging through differential thermal expansion or cracking or melting of the radiation shielding material;

(iii) in combination with moisture, accelerate corrosion.

(b) The temperature of the accessible surfaces of a Type B(U) or Type B(M) package shall not exceed 50°C in the shade unless the package is transported as a full load.

(4) In applying paragraph 3(a), the following conditions shall be assumed:

(a) Ambient temperature 38°C

(b) Insolation data according to Table I below.

In applying paragraph 3(b), the following condition shall be assumed:

Ambient temperature 38°C.

In the case of Type B(M) packages to be transported exclusively between specified countries, alternative conditions may be assumed with the agreement of the competent authorities of these countries.

TABLE I INSOLATION DATA

Form and location of surface	Insolation in Gcal/cm^2 for 12 hours per day
Flat surfaces transported horizontally:	
- base	none
- other surfaces	800
Flat surfaces not transported horizontally:	
- each surface	200 ^{a/}
Curved surfaces	400 ^{a/}

a/ Alternatively, a sine function may be used, adopting an absorption coefficient and neglecting the effects of possible reflection from neighbouring objects.

(5) Packaging which includes thermal protection for the purpose of satisfying the requirements of the thermal test specified in marginal 3637(3) shall be so designed that such protection will remain effective if the packaging is subjected to the tests specified in marginal 3635 and marginal 3637(2). Any such protection on the exterior of the package shall not be rendered ineffective by conditions commonly encountered in normal handling or in accidents and not simulated in the tests referred to above, e.g. by ripping, cutting, skidding, abrasion or rough handling.

D. SPECIFIC ADDITIONAL REQUIREMENTS FOR TYPE B(U) PACKAGES

3603

(1) The package shall be so designed that, if it were subjected to the tests referred to below, it would:

- (a) with regard to the tests specified in marginal 3635 restrict the loss of radioactive contents to not more than $A_2 \times 10^{-6}$ per hour.
- (b) with regard to the tests in marginal 3637, restrict the accumulated loss of radioactive contents to not more than $A_2 \times 10^{-3}$ in a period of one week.

Where mixtures of different radionuclides are present, the provisions of marginal 3691 shall apply.

For (a) above, the evaluation shall take into account the external contamination limitations of marginal 3651. For both (a) and (b) above, the A_2 values for noble gases shall be those for the uncompressed state.

(2) Compliance with the permitted activity release limits shall depend neither upon filters nor upon a mechanical cooling system.

(3) A package shall not incorporate a feature which is intended to allow continuous venting during transport.

(4) The package shall not include a pressure relief system from the containment system which would allow the release of radioactive substances to the environment under the conditions of the tests specified in marginals 3635 and 3637.

(5) Where the maximum normal operating pressure (see marginal 2450(2)) of the containment system added to any differential pressure below mean sea-level atmospheric pressure to which any component of the packaging specified as part of the containment system may be subjected exceeds 0.35 kg/cm^2 , that component shall be capable of withstanding a pressure of not less than one and a half times the sum of those pressures; the stress at this latter pressure shall not be more than 75 per cent of the minimum yield strength and not more than 40 per cent of the ultimate strength of that component at the maximum expected operating temperature.

(6) With the package at the maximum normal operating pressure (see marginal 2450(2)) subjected to the thermal test specified in marginal 3637(3), the pressure in any component of the packaging specified as a part of the containment system shall be demonstrated not to exceed the pressure which corresponds to the minimum yield strength of that component at the maximum temperature which it would be expected to reach in the test.

(7) The package shall not have a maximum normal operating pressure (see marginal 2450(2)) in excess of 7 kg/cm^2 (gauge).

(8) The maximum temperature of any surface readily accessible during transport of the package shall not exceed 82°C in the shade under normal conditions of transport (see also marginal 3602(3)(b) above).

(9) The containment system of a package containing liquid shall not be impaired if the package is subjected to a temperature of -40°C under normal conditions of transport.

E. ADDITIONAL REQUIREMENTS FOR TYPE B(M) PACKAGES

3604

(1) In addition to the requirements of marginal 3602, Type B(M) packages shall, as far as practicable, meet the additional specific requirements for Type B(U) packages given in marginal 3603.

(2) A Type B(M) package shall be so designed that, if it were subjected to the tests referred to in Table II it would restrict the loss of radioactive contents to not more than the activity limits specified in Table II. The evaluation with respect to the tests specified in marginal 3635 shall take into account the external contamination limitations of marginal 3651.

TABLE II ACTIVITY LIMITS FOR LOSS OF RADIOACTIVE CONTENTS FROM TYPE B(M) PACKAGES

Conditions	Type B(M) packages not designed for continuous venting	Type B(M) packages specially designed to allow continuous venting
After the tests in marginal 3635	$A_2 \times 10^{-6}$ per hour	$A_2 \times 5 \times 10^{-5}$ per hour
After the tests in marginal 3637	Krypton-85: 10 000 Ci in 1 week Other radionuclides: A_2 in 1 week	Krypton-85: 10 000 Ci in 1 week Other radionuclides: A_2 in 1 week

The A_2 values used for noble gases shall be for the uncompressed state. Where mixtures of radionuclides are present the provisions of marginal 3691 shall apply.

(5) If the pressure in the containment system of a Type B(M) package could result in a stress exceeding, under the conditions of the tests in marginals 3635 and 3637, the minimum yield strength of any structural material of the containment system at the temperature which it would be expected to reach in the tests, the packaging shall be equipped with a pressure relief system to ensure that that minimum yield strength is not exceeded.

3605-
3609

CHAPTER II - FISSILE SUBSTANCES

A. EXEMPTIONS OF FISSILE SUBSTANCES FROM FISSILE CLASS PACKAGE PRESCRIPTIONS

3610 Packages containing radioactive substances which are also fissile substances except for the cases specified in (a) to (g) below, shall be designed to comply with the requirements of this chapter.

(a) Packages containing individually not more than 15 g of uranium-233, uranium-235, plutonium-238, plutonium-239, plutonium-241, or 15 g of any combination of these radionuclides, provided that the smallest external dimension of the package is not less than 10 cm. When material is transported in bulk, the quantity limitations shall apply to the vehicle.

(b) Packages containing only natural or depleted uranium which has been irradiated in thermal reactors only.

(c) Packages containing homogeneous hydrogenous solutions or mixtures satisfying the conditions listed in Table III. When material is transported in bulk, the quantity limitations shall apply to the vehicle.

TABLE III. LIMITATIONS ON HOMOGENEOUS HYDROGENOUS SOLUTIONS OR MIXTURES

Parameters	Any other fissile substances (including mixtures)	^{235}U only
Minimum $\text{H}/\text{X}^{\text{a}}$	5200	5200
Maximum concentration of fissile nuclide in g/l	5	5
Maximum mass of fissile nuclide in g/package	500	800 ^{b/}

a/ Where H/X is the ratio of the number of hydrogen atoms to the number of atoms of fissile nuclide.

b/ With a tolerance for Pu and ^{233}U of not more than 1 per cent of the mass of ^{235}U .

(d) Packages containing uranium enriched in uranium-235 to a maximum of 1 per cent by weight, and with a total plutonium and uranium-233 content of up to 1 per cent of the mass uranium-235, provided, that the fissile substances are distributed homogeneously throughout the material. In addition, if uranium-233 is present in metallic or oxide forms, it shall not form a lattice arrangement within the package.

(e) Packages containing any fissile substances provided that they do not contain more than 5 g of fissile substances in any 10-litre volume. The substances shall be packed in packages which will maintain the limitations on fissile substances distribution during normal transport.

(f) Packages containing individually not more than 1 kg of total plutonium, of which not more than 20 per cent by mass may consist of plutonium-239, plutonium-241, or any combination of those radio nuclides.

(g) Packages containing liquid solutions of uranyl nitrate enriched in uranium-235 to a maximum of 2 per cent by weight, with a tolerance for plutonium and uranium-233 of up to 0.1 per cent of the mass of uranium-235.

The packages shall also comply with the other relevant parts of this Appendix.

B. GENERAL PROVISIONS FOR NUCLEAR SAFETY

- 3611 (1) All fissile substances shall be packed and shipped in such a manner that criticality ^{*/} cannot be reached under any foreseeable circumstances of transport. In particular, the following contingencies shall be considered:
- (a) water leaking into or out of packages
 - (b) the loss of efficiency of built-in neutron absorbers or moderators;
 - (c) possible rearrangement of contents into more reactive arrays, either within the package or as a result of loss from the package;
 - (d) reduction of spaces between packages or contents;
 - (e) packages becoming immersed in water or buried in snow;
 - (f) possible increase of reactivity due to temperature changes;
- (2) In addition, for irradiated nuclear fuel or unspecified fissile substances the following assumptions shall be made:
- (a) Irradiated nuclear fuel for which the degree of irradiation is not known and whose reactivity decreases with burn-up shall be regarded as unirradiated for criticality control. If its reactivity increases with burn-up, it shall be regarded as irradiated to the point of maximum reactivity. The reactivity of nuclear fuel for which the degree of irradiation is known may be assessed accordingly.
 - (b) For unspecified fissile substances such as residues or scrap whose enrichment, mass, concentration, moderation ratio or density is not known or cannot be identified, the assumption shall be that each parameter that is not known has the value which gives the maximum reactivity under credible conditions.
- (3) Packages of fissile substances, except as provided in marginal 3610, shall be classified as follows:
- (a) Fissile Class I: packages which are nuclearly safe in any number and in any arrangement under all foreseeable circumstances of transport;
 - (b) Fissile Class II: packages which, in limited number, are nuclearly safe in any arrangement under all foreseeable circumstances of transport;
 - (c) Fissile Class III: packages which are nuclearly safe under all foreseeable circumstances of transport by reason of special precautions, or special administrative or operational controls imposed upon the transport of the consignment.

^{*/} In applying criticality data, obtained by either calculation or experiment, to the criticality clearance of transport packages, allowance shall be made separately for any inaccuracy in the data or uncertainty concerning their validity.

C. PROVISIONS SPECIFIC TO FISSILE CLASS I PACKAGES

- 3612 (1) Each Fissile Class I package shall be so designed that, if it were subjected to the tests specified in marginal 3635:
- (a) water would not leak into or out of any part of the package unless water inleakage to, or outleakage from, that part, to the optimum foreseeable extent, has been assumed for the purposes of marginal 3614(1); and
 - (b) the configuration of the contents and the geometry of the containment system would not be altered so as to increase the reactivity significantly.
- (2) Fissile Class I packages shall satisfy the nuclear safety criteria specified in marginals 3613 and 3614.

1. For the individual package considered in isolation

- 3613 (1) The following conditions shall be assumed:
- (a) the package is "damaged" (for this purpose "damaged" shall mean the evaluated or demonstrated condition of the package if it had been subjected either to the tests specified in marginals 3635 and 3637(1) to (3), followed by that in marginal 3638 or to the tests specified in marginals 3635 and 3637(4), whichever combination is the more limiting); and
 - (b) water can leak into or out of all void spaces of the package including those within the containment system, except that, where the package design incorporates special features to prevent the leakage of water into or out of certain void spaces even as a result of human error, absence of leakage may be assumed in respect of those void spaces. Such special features may include either:
 - (i) multiple high standard water barriers, each of which would remain leaktight if the package were subjected to the combinations of tests specified in paragraph (1)(a); or
 - (ii) high degree of quality control in the production and maintenance of packaging, coupled with special tests to demonstrate closure of each package before shipment.
- (2) The package shall be sub-critical by an adequate margin*/under the conditions specified in paragraph (1), the physical and chemical characteristics being taken into account, including any change in those characteristics which could occur under the conditions of paragraph (1), and with the conditions of moderation and reflection as specified below:

*/ For example, if mass of fissile substance is an appropriate parameter for control, an adequate margin would be represented by limiting the mass to 80 per cent of that mass which would be critical in a similar system.

(a) with the substances within the containment system;

(i) the most reactive configuration and moderation foreseeable under the conditions of paragraph (1);

(ii) close full water reflection of the containment system or such greater reflection of the containment system as may additionally be provided by the surrounding material of the packaging, and, in addition,

(b) if any part of the substances escapes from the containment system under the conditions of paragraph (1);

the most reactive configuration and moderation considered credible;

close full water reflection of the substances.

2. For consignments of one or more packages

3614 (1) Any number of undamaged packages of one design in any arrangement shall be sub-critical; for this purpose "undamaged" shall mean the condition in which the packages are designed to be presented for transport.

(2) 250 such packages when "damaged" shall be sub-critical if stacked together in any arrangement and closely reflected on all sides of the stack by the equivalent of water (for this purpose "damaged" shall mean the evaluated or demonstrated condition of the package if it had been subjected either to the tests specified in marginals 3635 and 3637 (1) to (3), followed by that in marginal 3638, or to the tests specified in marginals 3635 and 3637 (4), whichever combination is the more limiting). Hydrogenous moderation ^{*}/ between packages, and water leakage into or out of the packages consistent with the test results shall be assumed to the extent which results in the greatest reactivity.

3. Examples of package designs requiring multilateral approval

Example I

3615 The calculation shall be based on the following requirements:

(a) Each individual package shall comply with the criteria under marginals 3612 and 3613.

(b) The package, whether damaged or undamaged, shall be such as to shield the fissile contents from thermal neutrons.

^{*}/ The hydrogenous moderation may be considered to consist of either a uniform layer of full density water surrounding each package or water at an appropriate density homogeneously interspersed between packages.

(c) When a parallel beam of neutrons having an energy spectrum as specified in Table IV is incident at any angle on an undamaged package, the surface multiplication factor for epithermal neutrons, i.e. the ratio of the number of epithermal neutrons leaving the package to the number of epithermal neutrons entering the package, shall be less than one, and the energy spectrum of the neutrons that are emitted by the package in an infinite array shall be no harder than that of the incident neutron.

(d) The package design shall comply with the criteria in marginal 3614 (2).

4. Examples of package designs requiring unilateral approval

Example I

3616

(1) The packaging shall be constructed so that the fissile contents are surrounded by a layer of material capable of absorbing all thermal neutrons incident on it ^{*}/ and this neutron absorbent layer is then surrounded by a thickness of at least 10.2 cm of wood having a minimum hydrogen content of 6.5 per cent by weight, so that the minimum external dimension over the wood is 30.5 cm.

TABLE IV - NEUTRON ENERGY SPECTRUM ^a/

Neutron energy E	Fractions of neutrons with energy less than E
11.0 MeV	1.000
2.4 MeV	0.802
1.1 MeV	0.590
0.55 MeV	0.460
0.26 MeV	0.373
0.13 MeV	0.319
43 keV	0.263
10 keV	0.210
1.6 keV	0.156
0.26 keV	0.111
42 eV	0.072
5.5 eV	0.036
0.4 eV	0

^a/ The spectrum is the epithermal portion of the equilibrium spectrum emergent from packages incorporating 5 cm thickness of wood in a critical array of such packages.

^{*}/ This layer may consist of cadmium at least 0.38 mm thick equivalent to 0.325 g cadmium per cm².

(2) The packaging shall be so constructed that when "damaged" (for this purpose "damaged" shall have the meaning assigned in marginal 3613 (1)) the fissile contents will remain surrounded by the neutron absorbent layer, the neutron absorbent layer will remain surrounded by the wood, and wood will not be lost to an extent which would reduce the thickness of the remaining wood to less than 9.2 cm or reduce the minimum external dimension over the remaining wood to less than 28.5 cm.

(3) The contents shall not exceed that permissible mass of fissile substances shown in Tables V to XIII which is consistent with: (a) the nature of the substances; (b) the maximum moderation; and (c) the maximum diameter (or volume) which could occur if the package were "damaged" (for this purpose "damaged" shall have the meaning assigned in marginal 3613 (1)).

Note: A detailed calculation for a given package design in accordance with the method set out in marginal 3615 can give less restrictive values than those in Tables V to XIII.

TABLE V
AQUEOUS SOLUTIONS OF URANIUM FLUORIDE OR URANIUM NITRATE
Permissible mass of uranium per package as a function of the packaging wood density

1. Limited by maximum internal diameter of inner receptacle												
Inner receptacle diameter not exceeding (cm)	Wood density not exceeding 1.25 g/cm ³ and not less than (g/cm ³)		0.85		0.9		0.95		1.0		1.05	
	0.6	0.65	0.7	0.75	0.8	0.85	0.9	0.95	1.0	1.05	1.1	1.15
10.16	← No limit →											
No limit	0.084	0.120	0.157	0.193	0.231	0.267	0.301	0.335	0.370	0.400	0.429	0.456
kg uranium per package												
2. Limited by maximum internal volume of inner receptacle												
Inner receptacle volume not exceeding (l)	Wood density not exceeding 1.25 g/cm ³ and not less than (g/cm ³)		0.8		0.85		0.9		1.0		1.05	
	0.6	0.65	0.7	0.75	0.8	0.85	0.9	0.95	1.0	1.05	1.1	1.15
2	0.152	0.380	0.66	1.01	1.47	2.00	2.66	3.50	4.64	6.04	7.62	9.39
3	0.084	0.223	0.416	0.65	0.93	1.25	1.58	1.96	2.34	2.74	3.16	3.57
4	0.084	0.120	0.157	0.193	0.231	0.274	0.356	0.498	0.73	1.05	1.47	2.02
5	0.084	0.120	0.157	0.193	0.231	0.267	0.301	0.495	0.57	0.66	0.74	0.84
7	0.084	0.120	0.157	0.193	0.231	0.267	0.301	0.347	0.406	0.467	0.53	0.60
No limit	0.084	0.120	0.157	0.193	0.231	0.267	0.301	0.335	0.370	0.400	0.429	0.456
kg uranium per package												

a/ Uranium which includes no U²³⁵ and no more than 97.5% U²³⁵ by weight

TABLE VI
 NON-HOMOGENEOUS URANIUM (a) COMPOUNDS OR MIXTURES IN WHICH THE
 URANIUM-235 CONCENTRATION DOES NOT EXCEED 4.8 g/cm³ (b)
 (Including unadorned uranium metal of uranium-235 enrichment not exceeding 25 per cent by weight)
 Permissible mass of uranium per package as a function of the packaging wood density

1. Limited by maximum internal diameter of inner receptacle				
Inner receptacle diameter not exceeding (cm)	Wood density not exceeding 1.25 g/cm ³ and not less than 0.6 g/cm ³			
	kg uranium per package			
10.16	No limit			
No limit	0.69			
2. Limited by maximum internal volume of inner receptacle				
Inner receptacle volume not exceeding (l)	Wood density not exceeding 1.25 g/cm ³ and not less than (g/cm ³)			
	0.65	0.7	0.8	0.85
	0.7	0.75		
	kg uranium per package			
3	7.0	10.0	12.2	14.5
4	4.8	7.8	7.8	7.8
5	3.63	3.63	3.63	3.63
7	1.41	1.41	1.41	1.41
No limit	0.69	0.69	0.69	0.69

(a) Uranium which includes no ²³⁵U and no more than 93% per cent ²³⁵U by weight.

(b) Mixtures containing beryllium or deuterium are excluded and the mass of carbon shall not exceed five times the allowed mass of uranium.

TABLE VII
 NON-HYDROGENOUS URANIUM/ COMPOUNDS OR MIXTURES IN WHICH THE URANIUM-235 CONCENTRATION DOES NOT EXCEED 9.6 g/cm³ b/
 (Including unmoderated uranium metal of uranium-235 enrichment not exceeding 50% by weight)
 Permissible mass of uranium per package as a function of the packaging wood density

1. Limited by maximum internal diameter of inner receptacle		Wood density not exceeding 1.25 g/cm ³ and not less than (g/cm ³)		0.95		1.0		1.05		1.1		1.15		1.2		1.25		
Inner receptacle diameter not exceeding (cm)	kg uranium per package	0.6	0.65	0.7	0.75	0.8	0.85	0.9	0.95	1.0	1.05	1.1	1.15	1.2	1.25	1.25	1.25	
7.5	← No limit																	
8	← No limit																	
8.5	← No limit																	
9	← No limit																	
9.5	← No limit																	
10	← No limit																	
No limit	← No limit																	
2. Limited by maximum internal volume of inner receptacle		Wood density not exceeding 1.25 g/cm ³ and not less than (g/cm ³)		0.8		0.85		0.9		0.95		1.0		1.0		1.0		
Inner receptacle volume not exceeding (l)		0.65	0.7	0.75	0.8	0.85	0.9	0.95	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
3	7	8	9.2	10	11	12	14	15	16	17	17	17	17	17	17	17	17	17
4	4.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8
5	3.63	3.63	3.63	3.63	3.63	3.63	3.63	3.63	3.63	3.63	3.63	3.63	3.63	3.63	3.63	3.63	3.63	3.63
7	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41
No limit	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69

a/ Uranium which includes no ²³³U and no more than 93% ²³⁵U by weight
 b/ Mixtures containing beryllium or deuterium are excluded and the mass of carbon shall not exceed five times the allowed mass of uranium.

TABLE VIII
UNMODERATED URANIUM ^{a/} METAL
Permissible mass of uranium per package as a function of the packaging wood density

1. Limited by maximum internal diameter of inner receptacle		Wood density not exceeding 1.25 g/cm ³ and not less than (g/cm ³)													
Inner receptacle diameter not exceeding (cm)	kg uranium per package	0.6	0.65	0.7	0.75	0.8	0.85	0.9	0.95	1.0	1.05	1.1	1.15	1.2	1.25
		6	6	7	8	9.2	10	No limit							
7	6	7	8	9.2	10	No limit									
7.5	6	7	8	9.2	10	11	12	14	15	16	17	17	17	19	19
10	6	7	8	9.2	10	11	12	14	15	16	17	17	17	19	19
No limit	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
No limit ^{b/}	6	7	8	9.2	10	11	12	14	15	16	17	17	17	19	19
2. Limited by maximum internal volume of inner receptacle		Wood density not exceeding 1.25 g/cm ³ and not less than (g/cm ³)													
Inner receptacle volume not exceeding (l)	kg uranium per package	0.6	0.65	0.7	0.75	0.8	0.85	0.9	0.95	1.0	1.05	1.1	1.15	1.2	1.25
		2	6	7	8	9.2	10	11	12	14	15	16	17	17	17
3	6	7	8	9.2	10	11	12	14	14.5	14.5	14.5	14.5	14.5	14.5	14.5
4	6	7	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8
5	3.63	3.63	3.63	3.63	3.63	3.63	3.63	3.63	3.63	3.63	3.63	3.63	3.63	3.63	3.63
7	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41
No limit	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
No limit ^{b/}	6	7	8	9.2	10	11	12	14	15	16	17	17	17	17	19

^{a/} Uranium which includes ²³⁵U and no more than 97% ²³⁵U by weight

^{b/} These enhanced masses apply where the fissile substances are in the form of massive metal pieces weighing not less than 2 kg each and free from re-entrant surfaces.

TABLE IX
URANIUM/ COMPOUNDS OR MIXTURES IN WHICH THE URANIUM CONCENTRATION DOES NOT EXCEED $\frac{26.44}{W/U + 1.41} g/cm^3$
Permissible mass of uranium per package as a function of the packaging wood density

1. Limited by maximum internal diameter of inner receptacle														
Inner receptacle diameter not exceeding (cm)	Wood density not exceeding 1.25 g/cm ³ and not less than (g/cm ³)		1.0		1.05		1.1		1.15		1.2		1.25	
	0.6	0.65	0.7	0.75	0.8	0.85	0.9	0.95	1.0	1.05	1.1	1.15	1.2	1.25
kg uranium per package														
6	← No limit →													
6.5	2.80	6.0	← No limit →		← No limit →		← No limit →		← No limit →		← No limit →		← No limit →	
7	2.80	6.0	6.0	6.0	6.0	6.0	6.0	14	15	15.2	15.2	15.2	15.2	15.2
7.5	2.80	6.0	6.0	6.0	6.0	6.0	6.0	14	15	15.2	15.2	15.2	15.2	15.2
10	0.330	0.87	1.10	1.80	2.50	3.50	4.6	7.1	7.7	9.6	11.6	13.8	16.1	18.3
No limit	0.084	0.120	0.157	0.193	0.251	0.267	0.301	0.335	0.370	0.400	0.429	0.456	0.478	0.498
2. Limited by maximum internal volume of inner receptacle														
Inner receptacle volume not exceeding (l)	Wood density not exceeding 1.25 g/cm ³ and not less than (g/cm ³)		1.0		1.05		1.1		1.15		1.2		1.25	
	0.6	0.65	0.7	0.75	0.8	0.85	0.9	0.95	1.0	1.05	1.1	1.15	1.2	1.25
kg uranium per package														
2	0.152	0.390	0.66	1.01	1.47	2.00	2.66	3.50	4.64	6.04	7.62	9.39	11.3	13.3
3	0.084	0.223	0.416	0.65	0.93	1.25	1.58	1.96	2.34	2.74	3.16	3.57	3.99	4.42
4	0.084	0.120	0.157	0.193	0.231	0.274	0.356	0.498	0.73	1.05	1.47	2.02	2.70	3.55
5	0.084	0.120	0.157	0.193	0.231	0.267	0.301	0.495	0.57	0.66	0.74	0.84	0.92	1.02
7	0.084	0.120	0.157	0.193	0.231	0.267	0.301	0.347	0.406	0.467	0.53	0.60	0.66	0.73
No limit	0.084	0.120	0.157	0.193	0.231	0.267	0.301	0.335	0.370	0.400	0.429	0.456	0.478	0.498

g/ Uranium which includes no U²³⁵ and no more than 93% per cent U²³⁵ by weight.

TABLE X
 NON-HYDROGENOUS PLUTONIUM COMPOUNDS OR MIXTURES IN WHICH THE
 PLUTONIUM-239 CONCENTRATION DOES NOT EXCEED 10 g/cm^3
 Permissible mass of plutonium per package as a function of the packaging wood density

1. Limited by maximum internal diameter of inner receptacle											
Inner receptacle diameter not exceeding (cm)	Wood density not exceeding 1.25 g/cm^3 and not less than (g/cm^3)		0.75		0.95		1.05		1.15		
	0.6	0.65	0.7	0.8							
kg plutonium per package											
6	← No limit									←	
6.5	3.60	4.2	← No limit							←	←
7	3.60	4.2	4.7	5.3	← No limit					←	
7.5	3.60	4.2	4.7	5.3	5.9	7.1	← No limit			←	
10	3.60	4.2	4.7	5.3	5.9	7.1	8.1	8.3	8.6	8.9	
No limit	0.405	0.405	0.405	0.405	0.405	0.405	0.405	0.405	0.405	0.405	
2. Limited by maximum internal volume of inner receptacle											
Inner receptacle volume not exceeding (l)	Wood density not exceeding 1.25 g/cm^3 and not less than (g/cm^3)		0.7		0.75						
	0.6	0.65									
kg plutonium per package											
3	3.60	4.2	4.7	5.3							
4	3.60	3.84	4.7	3.84							
5	2.44	2.44	2.44	2.44							
7	1.20	1.20	1.20	1.20							
No limit	0.405	0.405	0.405	0.405							

g/ Mixtures containing beryllium and deuterium are excluded and the mass of carbon shall not exceed 1/10 of the allowed mass of plutonium.

TABLE XI
UNMODERATED PLUTONIUM METAL
Permissible mass of plutonium per package as a function of the packaging wood density

1. Limited by maximum internal diameter of inner receptacle			
Inner receptacle diameter not exceeding (cm)	Wood density not exceeding 1.25 g/cm ³ and not less than (g/cm ³)		0.8
	0.6	0.7	
kg plutonium per package			
4	3.20	No limit	→
10	3.20	3.90	4.4
No limit	0.405	0.405	0.405
No limit ^{a/}	3.20	3.90	4.4
2. Limited by maximum internal volume of inner receptacle			
Inner receptacle volume not exceeding (l)	Wood density not exceeding 1.25 g/cm ³ and not less than (g/cm ³)		0.8
	0.6	0.7	
kg plutonium per package			
3	3.20	3.90	4.4
4	3.20	3.84	3.84
5	2.44	2.44	2.44
7	1.20	1.20	1.20
No limit	0.405	0.405	0.405
No limit ^{a/}	3.20	3.90	4.4

^{a/} These enhanced masses apply where the fissile substances are in the form of massive metal pieces weighing not less than 2 kg each and free from re-entrant surfaces

TABLE XII
PLUTONIUM COMPOUNDS OR MIXTURES IN WHICH THE PLUTONIUM CONCENTRATION DOES NOT EXCEED $\frac{26.56}{\sqrt{F+1.35}} \text{ g/cm}^3$

Permissible mass of plutonium per package as a function of the packaging wood density

1. Limited by maximum internal diameter of inner receptacle														
Inner receptacle diameter not exceeding (cm)	Wood density not exceeding 1.25 g/cm^3 and not less than (g/cm^3)		kg plutonium per package											
	0.6	0.65	0.7	0.75	0.8	0.85	0.9	0.95	1.0	1.05	1.1	1.15	1.2	1.25
4	← No limit →													
5	3.2	3.60	3.90	4.2	4.4	← No limit →						4.5	4.5	4.5
6	2.80	3.60	3.90	4.2	4.4	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
6.5	2.50	3.40	3.80	4.2	4.4	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
7	2.20	3.10	3.70	4.2	4.4	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
7.5	1.90	2.70	3.40	4.1	4.4	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
8	1.60	2.30	3.0	3.80	4.4	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
8.5	1.30	1.80	2.40	3.20	3.80	4.3	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
9	0.97	1.30	1.80	2.40	3.00	3.40	3.60	3.80	4.0	4.2	4.4	4.4	4.4	4.4
9.5	0.65	0.88	1.20	1.50	1.90	2.20	2.40	2.60	2.80	3.10	3.60	4.4	4.4	4.4
10	0.390	0.42	0.50	0.58	0.70	0.83	0.99	1.20	1.50	1.90	2.70	3.90	4.5	4.5
No limit	0.022	0.053	0.084	0.114	0.143	0.173	0.199	0.226	0.250	0.274	0.294	0.311	0.327	0.339
2. Limited by maximum internal volume of inner receptacle														
Inner receptacle volume not exceeding (l)	Wood density not exceeding 1.25 g/cm^3 and not less than (g/cm^3)		kg plutonium per package											
	0.6	0.65	0.7	0.75	0.8	0.85	0.9	0.95	1.0	1.05	1.1	1.15	1.2	1.25
2	0.152	0.309	0.52	0.80	1.16	1.59	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
3	0.047	0.133	0.247	0.380	0.700	0.76	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
4	0.022	0.076	0.095	0.133	0.700	0.700	0.700	0.700	0.700	0.99	1.19	1.55	1.98	2.27
5	0.022	0.053	0.084	0.118	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
7	0.02	0.053	0.084	0.114	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
No limit	0.022	0.053	0.084	0.114	0.143	0.171	0.199	0.226	0.250	0.274	0.294	0.311	0.327	0.339

TABLE XIII
 AQUEOUS SOLUTIONS OF URANIUM-233 NITRATE OR URANIUM-233 FLUORIDE
 Permissible mass of uranium per package as a function of the packaging wood density

1. Limited by maximum internal diameter of inner receptacle														
Inner receptacle diameter not exceeding (cm)	Wood density not exceeding 1.25 g/cm ³ and not less than (g/cm ³)													
	0.6	0.65	0.7	0.75	0.8	0.85	0.9	0.95	1.0	1.05	1.1	1.15	1.2	1.25
9	← No limit →													
9.5	← No limit →													
10	← No limit →													
No limit	0.095	0.067	0.100	0.134	0.169	0.200	0.231	0.261	0.289	0.316	0.340	0.361	0.371	0.391
2. Limited by maximum internal volume of inner receptacle														
Inner receptacle volume not exceeding (l)	Wood density not exceeding 1.25 g/cm ³ and not less than (g/cm ³)													
	0.6	0.65	0.7	0.75	0.8	0.85	0.9	0.95	1.0	1.05	1.1	1.15	1.2	1.25
2	0.152	0.309	0.475	0.71	0.99	1.33	1.71	2.11	2.54	2.99	3.44	3.94	4.41	4.8
3	0.085	0.133	0.180	0.228	0.285	0.332	0.389	0.446	0.50	0.56	0.60	0.67	0.73	0.78
4	0.085	0.109	0.133	0.175	0.213	0.256	0.304	0.356	0.408	0.460	0.51	0.57	0.63	0.69
5	0.095	0.076	0.114	0.152	0.190	0.223	0.256	0.292	0.323	0.356	0.389	0.422	0.451	0.484
7	0.095	0.073	0.109	0.142	0.175	0.204	0.235	0.263	0.289	0.318	0.342	0.368	0.394	0.420
No limit	0.095	0.067	0.100	0.134	0.169	0.200	0.231	0.261	0.289	0.316	0.340	0.361	0.377	0.391

D. PROVISIONS SPECIFIC TO FISSILE CLASS II PACKAGES

3617

(1) Each Fissile Class II package shall be designed so that if it were subjected to the tests specified in marginal 3635:

(a) Neither the volume nor any spacing on the basis of which nuclear safety for the purpose of marginal 3619(a) has been assessed would suffer more than 5 per cent reduction, and the construction of the package would not permit the entry of a 10 cm cube.

(b) Water would not leak into or out of any part of the package unless water inleakage to, or outleakage from, that part, to the optimum foreseeable extent had been assumed in assessing the allowable number for the purposes of marginal 3619(a).

(c) The configuration of the contents and the geometry of the containment system would not be altered so as to increase the reactivity significantly.

(2) Fissile Class II packages shall satisfy the nuclear safety criteria described in marginals 3618 and 3619.

1. The individual package considered in isolation

3618

(1) The following conditions shall be assumed:

(a) the package is damaged (for this purpose "damaged" shall mean the evaluated or demonstrated condition of the package if it has been subjected either to the tests specified in marginals 3635 and 3637 (1) to (3), followed by that in marginal 3638 or to the tests specified in marginals 3635 and 3637 (4), whichever combination is the more limiting); and

(b) water can leak into or out of all void spaces of the package, including those within the containment system, except that, where the package design incorporates special features to prevent the leakage of water into or out of certain void spaces even as a result of human error, absence of leakage may be assumed in respect of those void spaces. Such special features may include either:

(i) multiple high-standard water barriers, each of which would remain leaktight if the package were subjected to the combinations of tests specified in paragraph (1)(a); or

(ii) a high degree of quality control in the production and maintenance of packaging, coupled with special tests to demonstrate closure of each package before shipment.

(2) The package shall be sub-critical by an adequate margin (see footnote 2) under the conditions specified in paragraph (1), the physical and chemical characteristics being taken into account, including any change in those characteristics which could occur under the conditions of paragraph (1), and with the conditions of moderation and reflection as specified below:

(a) with the substances within the containment system:

(i) the most reactive configuration and moderation foreseeable under the conditions of paragraph (1);

(ii) close full water reflection of the containment system or such greater reflection of the containment system as may additionally be provided by the surrounding material of the packaging and, in addition,

(b) if any part of the substances escapes from the containment system under the conditions of paragraph (1);

(i) the most reactive configuration and moderation considered credible;

(ii) close full water reflection of the substances.

2. Consignments of one or more packages

3619

An "allowable number" shall be derived for each Fissile Class II package design, such that:

(a) five times the allowable number of undamaged packages shall be sub-critical if stacked together in any arrangement without anything between the packages, close reflection on all sides of the stack by the equivalent of water being assumed; for this purpose "undamaged" shall mean the condition in which the packages are designed to be presented for transport; and

(b) twice the allowable number of such packages when damaged shall be sub-critical if stacked together in any arrangement and closely reflected on all sides of the stack by the equivalent of water (for this purpose "damaged" shall mean the evaluated or demonstrated condition of each package if it had been subjected either to the tests specified in marginals 3635 and 3637 (1) to (3) followed by that in marginal 3638, or to the tests specified in marginals 3635 and 3637 (4), whichever combination is the more limiting); hydrogenous moderations ¹ between packages and water leakage into or out of the packages consistent with test results shall be assumed to the extent which results in the greatest reactivity.

¹ See footnote on page 332.

3. Examples of package designs requiring no competent authority approval

3620

Example I (requiring multilateral approval of shipment) Packages for Fissile Class II require no competent authority approval of package design provided that the following conditions are met:

(a) Packaging: the criticality safety of these consignments does not depend upon the integrity of the packaging. Any packaging which complies with the other relevant requirements of Class IVb with respect to the non-fissile radioactive characteristics may, therefore, be used.

(b) Contents - uranium metal, compounds and/or mixtures: the contents of any consignment consisting of the "allowable number" of packages shall not exceed the permissible mass of uranium-235 given in Table XIV per consignment as a function of enrichment for substances satisfying the following conditions:

- (i) Uranium-233 shall not be present.
- (ii) Beryllium and hydrogenous material enriched in deuterium shall not be present.
- (iii) The total mass of graphite present shall not exceed 150 times the total mass of uranium-235.
- (iv) Mixtures of fissile substances with substances having a higher hydrogen density than water, e.g., some hydrocarbon oils, shall not be present. This does not preclude the use of polyethylene for packing or wrapping.

TABLE XIV. PERMISSIBLE MASS OF
URANIUM-235 PER CONSIGNMENT

Uranium enrichment in weight per cent of uranium-235 not exceeding	Permissible mass per consignment grams of uranium-235
93	160
75	168
80	176
40	184
30	192
20	203
15	224
11	240
10	256
9.5	262
9	270
8.5	276
8	284
7.5	294
7	300
6.5	312
6	324
5.5	340
5	360
4.5	380
4	400
3.5	440
3	500
2.5	600
2	820
1.5	1360
1.35	1600
1	3400
0.92	6000

(c) Contents - uranium metal, compounds and/or mixtures not forming a lattice: the contents of any consignment consisting of the allowable number of packages shall not exceed the permissible mass of uranium-235 given in Table XV per consignment as a function of enrichment for substances satisfying the following conditions:

- (i) Uranium-233 shall not be present.
- (ii) Beryllium and hydrogenous material enriched in deuterium shall not be present.

- (iii) The total mass of graphite present shall not exceed 150 times the total mass of uranium-235.
- (iv) Mixtures of fissile substances with substances having a higher hydrogen density than water, e.g., some hydrocarbon oils, shall not be present. This does not preclude the use of polyethylene for packing or wrapping.
- (v) The fissile substances shall be distributed homogeneously throughout the contents. In addition, the substances shall not form a lattice arrangement within the package.

TABLE XV. PERMISSIBLE MASS OF
URANIUM-235 PER CONSIGNMENT

Uranium enrichment in weight per cent of uranium-235 not exceeding	Permissible mass per consignment grams of uranium-235
4	420
3.5	460
3	560
2.5	740
2	1200
1.5	2800
1.35	4000

(d) Contents — uranium and/or plutonium metal, compounds and/or mixtures: the substances shall satisfy the following conditions:

- (i) Beryllium and hydrogenous material enriched in deuterium shall not be present.
- (ii) The total mass of graphite present shall not exceed 150 times the total mass of uranium and plutonium.
- (iii) Mixtures of fissile substances with substances having a higher hydrogen density than water, e.g., some hydrocarbon oils, etc., shall not be present. This does not preclude the use of polyethylene for packing or wrapping.

The total mass of fissile substances per consignment shall be such that:

$$\frac{^{235}\text{U} \text{ (grams)}}{160} + \frac{\text{Pu} \text{ (grams)}}{90} + \frac{^{233}\text{U} \text{ (grams)}}{100} \text{ is not greater than 1}$$

(e) Allowable number: the allowable number for a particular package to this specification will depend on the actual contents and is equal to the fissile mass limit per consignment divided by the actual fissile mass present in the package. In the case of the mixed nuclides in (d) above, the allowable number is:

$$\frac{160}{^{235}\text{U} + 1.6 \times ^{233}\text{U} + 1.778 \times \text{Pu}}$$

where ^{235}U , ^{233}U and Pu are the numbers of grams of ^{235}U , ^{233}U and Pu present in the package. Where the package forms part of a mixed consignment the requirements of footnote 1 to marginal 2450(2) be met.

(f) Shipment shall be subject to multilateral approval.

E. PROVISIONS SPECIFIC TO FISSILE CLASS III PACKAGES

3621 Fissile Class III packages shall meet the general requirements of marginal 3611 and shall be approved in accordance with marginals 3674 and 3675.

1. Examples of package designs requiring unilateral approval

Example I (requiring multilateral approval of shipment)

3622 Packages to the following specification require only unilateral approval of the package design provided that the following conditions are fulfilled:

(a) The number of packages in any one consignment shall be so limited that:

- (i) twice this number of undamaged packages shall be sub-critical if stacked together in any arrangement without anything between the packages, assuming close reflection on all sides of the stack by the equivalent of water; for this purpose 'undamaged' shall mean the condition in which the packages are designed to be presented for transport; and

- (ii) this number of packages when 'damaged' shall be sub-critical if stacked together in any arrangement and closely reflected on all sides of the stack by the equivalent of water (for this purpose 'damaged' shall mean the evaluated or demonstrated condition of each package if it had been subjected either to the tests specified in marginals 3635 and 3637 (1) to (3) followed by that in marginals 3638 or the tests specified in marginals 3635 and 3637 (4), whichever combination is the more limiting). Hydrogenous moderation $\frac{3}{}$ between the packages and water leakage into or out of the packages consistent with test results shall be assumed to the extent which results in the greatest reactivity.

(b) Shipment of these packages shall be made only under arrangements approved by the competent authorities in conformity with marginal 3675, so as to prevent loading, transport or storage of these packages with other labelled packages of radioactive material.

2. Examples of fissile package design requiring no competent authority approval

Example I (requiring multilateral approval of shipment).

3623

Packages to the following specification for Fissile Class III require no competent authority approval of package design provided the following conditions are met:

(a) The package is currently approved as a Fissile Class II package and the number in any one consignment does not exceed twice the allowable number associated with the Fissile Class II approval.

(b) Shipment of these packages shall be made only under arrangements approved by the competent authorities in conformity with marginal 3675, so as to prevent loading, transport or storage of these packages with other Fissile Class II or Class III packages. Examples of such arrangements are:

- (i) no other labelled packages of radioactive substances may be carried with the consignment in the same vehicle, and
- (ii) either transport shall be direct to the consignee without any intermediate transit storage; or

controls shall be imposed, by the provision of an escort, to prevent the packages of the consignment from being stacked with or alongside any other packages of radioactive substances after an accident, or at any other time.

The escort shall travel in a separate vehicle.

3624

Example II (requiring multilateral approval of shipment)

Packages for Fissile Class III require no competent authority approval of package design provided that the following conditions are met:

(a) Packaging: the criticality safety of these consignments does not depend upon the integrity of the packaging. Any packaging which complies with the other relevant requirements of this Appendix may therefore be used, provided it does not incorporate lead exceeding 5 cm in thickness, tungsten or uranium shielding.

(b) Contents - uranium metal, compounds and/or mixtures: the contents of any consignment shall not exceed the permissible mass of uranium-235 given in Table XVI per consignment as a function of enrichment for substances satisfying the following conditions:

- (i) Uranium-233 shall not be present.
- (ii) Beryllium and hydrogenous material enriched in deuterium shall not be present.
- (iii) The total mass of graphite present shall not exceed 150 times the total mass of uranium-235.
- (iv) Mixtures of fissile substances with substances having a higher hydrogen density than water, e.g., some hydrocarbon oils, shall not be present. This does not preclude the use of polyethylene for packing or wrapping.

TABLE XVI. PERMISSIBLE MASS OF
URANIUM-235 PER CONSIGNMENT

Uranium enrichment in weight per cent of uranium-235 not exceeding	Permissible mass per consignment grams of uranium-235
93	400
75	420
60	440
40	460
30	480
20	520
15	560
11	600
10	640
9.5	655
9	675
8.5	690
8	710
7.5	730
7	750
6.5	780
6	810
5.5	850
5	900
4.5	950
4	1000
3.5	1100
3	1250
2.5	1500
2	2050
1.5	3400
1.35	4000
1	8500
0.92	15000

(c) Contents - uranium metal, compounds and/or mixtures not forming a lattice: Table XVII gives the permissible mass of uranium-235 per consignment as a function of enrichment, for substances satisfying the following conditions:

- (i) Uranium-233 shall not be present.
- (ii) Beryllium and hydrogenous material enriched in deuterium shall not be present.

- (iii) The total mass of graphite present shall not exceed 150 times the total mass of uranium-235.
- (iv) Mixtures of fissile substances with substances having a higher hydrogen density than water, e.g., some hydrocarbon oils, shall not be present. This does not preclude the use of polyethylene for packing or wrapping.
- (v) The fissile substances shall be distributed homogeneously throughout the contents. In addition, the substances shall not form a lattice arrangement within the package.

TABLE XVII. PERMISSIBLE MASS OF
URANIUM-235 PER CONSIGNMENT

Uranium enrichment in weight per cent of uranium-235 not exceeding	Permissible mass per consignment kilograms of uranium-235
4	1.05
3.5	1.15
3	1.4
2.5	1.8
2	3
1.5	7
1.35	10

(d) Contents - uranium and/or plutonium metal, compounds and/or mixtures: the substances shall satisfy the following conditions:

- (i) Beryllium and hydrogenous material enriched in deuterium shall not be present.
- (ii) The total mass of graphite present shall not exceed 150 times the total mass of uranium and plutonium.
- (iii) Mixtures of fissile substances with substances having a higher hydrogen density than water, e.g., some hydrocarbon oils, shall not be present. This does not preclude the use of polyethylene for packing or wrapping.

The total mass of fissile substances per consignment shall be such that:

$$\frac{^{235}\text{U (grams)}}{400} + \frac{\text{Pu(grams)}}{225} + \frac{^{233}\text{U (grams)}}{250} \text{ is not greater than 1.}$$

(e) Conditions of transport: the following administrative controls shall be applied throughout the transport of the consignment:

- (i) the quantity of substances in a consignment shall not exceed that defined in (b), (c) or (d) above;
- (ii) transport shall be direct to the consignee, without any intermediate transit storage.
- (f) Shipment shall be subject to multilateral approval.

3625-
3629

CHAPTER III - TEST AND INSPECTION PROCEDURES

A. DEMONSTRATION OF COMPLIANCE WITH THE TESTS

- 3630 (1) Demonstration of compliance with the test requirements of this chapter may be accomplished by any of the methods listed below or by a combination thereof.
- (a) Performance of tests with prototypes or samples of the packaging as normally presented for transport, in which case the contents of the packaging for the test shall simulate as closely as practicable the expected normal radioactive contents.
- (b) Reference to previous satisfactory demonstrations of sufficiently similar nature.
- (c) Performance of tests with models of appropriate scale incorporating those features which are significant with respect to the item under investigation, when engineering experience has shown results of such tests to be suitable for design purposes. When a scale model is used, the need for adjusting certain test parameters, such as the penetrator diameter or the compressive load, shall be taken into account.
- (d) Calculation, or reasoned argument, when the calculative procedures and parameters are generally agreed to be reliable or conservative.
- (2) With respect to the initial conditions for the tests of this chapter except those in marginals 3637(4) to 3639, the demonstration of compliance shall be based on the assumption that the package is in equilibrium at an ambient temperature of 38°C. With respect to the thermal test the effects of solar radiation can be neglected prior to and during that test but shall be taken into account in the subsequent evaluation of the test results.

B. TESTS FOR PACKAGING

1. Number of specimens to be tested

- 3631 The number of specimens actually subjected to the tests should be related to the number of packagings of that type which are to be produced, the frequency of use and the cost. The results of the tests may necessitate an increase in the number of specimens to meet the requirements of the test procedures in respect of maximum damage.

2. Preparation of a specimen for testing

- 3632 (1) All specimens shall be examined before testing to identify and record faults or damage including the following:
- (a) divergence from the specifications or the drawings;
- (b) defects in construction;
- (c) corrosion or other deterioration; and
- (d) distortion of features.

- (2) The containment system of the packaging shall be clearly specified.
- (3) The external features of the specimen shall be clearly identified so that reference may be made simply and clearly to any part of such specimen.

3. Testing the integrity of containment and shielding

3633 After any of the applicable tests specified in marginals 3635 to 3637, it shall be further demonstrated that the integrity of the containment, or of the containment and shielding, has been retained to the extent required in marginals 3601(15) to (17), 3602(2), 3603(1) and 3604(2) for the packaging under test.

4. Target for the drop tests specified in marginals 3635(4), 3636(2), 3637(2), and 3641(1)

3634. The target shall be a flat, horizontal surface of such a character that any increase in its resistance to displacement or deformation upon impact by the specimen would not significantly increase the damage to the specimen.

5. Tests for demonstrating ability to withstand normal conditions of transport

3635 (1) The tests are: the water spray test, the free drop test, the compression test and the penetration test. Prototypes of the package shall be subjected to the free drop test, the compression test and the penetration test, preceded in each case by the water spray test. One prototype may be used for all the tests, provided that the requirements of paragraph (2) are complied with.

(2) The time interval between the conclusion of the water spray test and the succeeding test shall be such that the water has soaked in to the maximum extent, without appreciable drying of the exterior of the specimen. In the absence of any evidence to the contrary, this interval shall be taken to be about two hours if the water spray is applied from four directions simultaneously. No time interval should elapse, however, if the water spray is applied from each of the four directions consecutively.

(3) Water spray test: Any water spray test shall be considered as satisfactory provided that:

- (a) the amount of water per unit of ground area is approximately equivalent to a rainfall rate of 5 cm per hour;
- (b) the water impinges upon the specimen at an angle of approximately 45° from the horizontal;
- (c) the water is approximately uniformly distributed, as in a rainfall, over the entire surface of the specimen in the direction of the spray;
- (d) the duration of the spray is at least one hour;
- (e) the orientation of the packaging is such that the effects are expected to be the most severe for the features under investigation, and the specimen is supported so that it does not sit in a pool of water.

(4) Free drop test: The specimen shall fall onto the target so as to suffer maximum damage in respect of the safety features to be tested.

(a) The height of fall measured from the lowest point of the package to the upper surface of the target shall be as specified in Table XVIII.

TABLE XVIII. FREE-FALL DISTANCE FOR PACKAGES

Package weight (kg)	Free fall distance (m)
less than 5,000	1.2
5,000 to < 10,000	0.9
10,000 to < 15,000	0.6
15,000 and greater	0.3

(b) For Fissile Class II packages, the free drop specified above shall be preceded by a free drop from a height of 0.3 m on each corner or, in the case of a cylindrical package, onto each of the quarters of each rim.

(c) For fibreboard or wood rectangular packages not exceeding 50 kg in weight, a separate specimen shall be subjected to a free drop onto each corner from a height of 0.3 m.

(d) For fibreboard cylindrical packages not exceeding 100 kg in weight, a separate specimen shall be subjected to a free drop onto each of the quarters of each rim from a height of 0.3 m.

(5) Compression test: the specimen shall be subjected, for a period of 24 hours to a compressive load equal to the greater of the following:

(a) the equivalent of 5 times the weight of the actual package;

(b) the equivalent of 1300 kg/m^2 multiplied by the vertically projected area of the package.

The load shall be applied uniformly to two opposite sides of the specimen, one of which shall be the base on which the package would normally stand.

(6) Penetration test: the specimen shall be placed on a rigid, flat, horizontal surface which will not move significantly while the test is being carried out.

(a) A bar of 3.2 cm diameter with a hemispherical end and weighing 6 kg shall be dropped and directed to fall, with its longitudinal axis vertical, onto the centre of the weakest part of the specimen, so that, if it penetrates sufficiently far, it will hit the containment vessel. The bar shall not be significantly deformed by the test performance.

(b) The height of fall of the bar measured from its lower end to the upper surface of the specimen shall be 1 m.

6. Additional tests for Type A packaging designed for liquids and gases

3636 (1) Separate specimens shall be subjected to each of the following tests unless it can be demonstrated that one test is more severe for the specimen in question than the other, in which case one specimen shall be subjected to the more severe test.

(2) Free drop test: the specimen shall fall onto the target so as to suffer the maximum damage in respect of containment. The height of the fall measured from the lowest part of the specimen to the upper surface of the target shall be 9 m.

(3) Penetration test: the specimen shall be subjected to the test specified in marginal 3635(6) except that the height of fall shall be increased to 1.7 m from the 1 m specified in marginal 3635(6)(b).

7. Tests for demonstrating ability to withstand accident conditions in transport

3637 (1) The specimen shall be subjected to the cumulative effects of the mechanical tests specified in paragraph (2) and the thermal test specified in paragraph (3) in that order. A separate specimen shall be subjected to the effect of the water immersion test in paragraph (4).

(2) Mechanical test: the test shall consist of two drops onto a target. The order in which the specimen is subjected to the two drops shall be such that, on completion of the mechanical test, the specimen will have suffered such damage as will lead to the maximum damage in the thermal test which follows.

(a) For drop I, the specimen shall fall onto the target so as to suffer the maximum damage, and the height of fall measured from the lowest point of the specimen to the upper surface of the target shall be 9 m.

(b) For drop II, the specimen shall fall onto the target so as to suffer the maximum damage, and the height of fall measured from the intended point of impact of the specimen to the upper surface of the target shall be 1 m. The target in this case shall be the upper end of a solid mild steel bar of circular section, 15 cm ± 0.5 cm in diameter. The target surface shall be flat and horizontal with its edges rounded off to a radius of not more than 6 mm. The bar shall be rigidly mounted perpendicularly on the foundation target described in marginal 3634 and shall be 20 cm long unless a longer bar would cause greater damage; in that case, a bar of sufficient length to cause maximum damage shall be used.

(3) Thermal test: any thermal test shall be considered as satisfactory provided that the heat flux incident on the specimen is not less than that which would result from exposure for 30 minutes of the whole specimen to a

radiation environment of 800°C with an emissivity coefficient of at least 0.9. For purposes of calculation, the surface absorptivity shall be either that value which the package may be expected to possess if exposed to a fire or 0.8, whichever is greater. In addition, when significant, convective heat input shall be included on the basis of still ambient air at 800°C during the thirty-minute period. After cessation of the external heat input to the specimen:

- (a) the specimen shall not be cooled artificially until another three hours have elapsed or until it has been demonstrated that all internal temperatures have begun to fall, whichever is the earlier; and
- (b) any combustion of materials of the specimen shall be allowed to proceed for three hours after the cessation of external heating to the specimen unless it terminates earlier naturally.
- (4) Water immersion test: the specimen shall be immersed under a head of water of at least 15 m for a period of not less than eight hours. For test purposes, an external pressure of water of 1.5 kg/cm² (gauge) will be considered to meet these conditions.

8. Water in-leakage test for packages containing fissile substances

- 3638 (1) Packages other than Fissile Class I or Fissile Class II packages and any packages for which water in-leakage or out-leakage to the extent which results in greatest reactivity has been assumed for purposes of assessment under marginals 3614(2) and 3619(b) shall be exempted from the test.
- (2) Before the specimen is subjected to the water in-leakage test specified below, it shall be subjected to the tests in marginals 3637(2) and (3).
- (3) The specimen shall be immersed under a head of water of at least 0.9 m for a period of not less than eight hours and in the attitude for which maximum leakage is expected. For this test an ambient temperature of 38°C is not required.

9. Tests for integrity of containment and shielding

- 3639 Any test or inspection method may be employed to determine whether the requirements of this Chapter have been met after the specimen has been subjected to the tests in marginals 3635 to 3637, provided that the method can be demonstrated to meet the relevant requirements of marginals 3601 to 3604.

C. TESTS FOR SPECIAL FORM RADIOACTIVE SUBSTANCES

1. General

- 3640 (1) The tests are: the impact test, the percussion test, the bending test and the heat test.
- (2) Specimens (solid radioactive substances or capsules) to be tested shall be prepared as normally presented for transport. The radioactive substances shall be duplicated as closely as practicable.

- (3) A different specimen may be used for each of the tests.
- (4) The specimen shall not break or shatter when subjected to the impact, percussion or bending tests.
- (5) The specimen shall not melt or disperse when subjected to the heat test.
- (6) After each test, a leaching assessment shall be performed on the specimen by a method no less sensitive than the methods given in marginal 3642.

2. Test methods

- 3641 (1) Impact test: the specimen shall fall onto the target from a height of 9 m. The target shall be as defined in marginal 3634.
- (2) Percussion test: the specimen shall be placed on a sheet of lead which is supported by a smooth solid surface and struck by the flat face of a steel billet so as to produce an impact equivalent to that resulting from a free fall of 1.4 kg through 1 m. The flat face of the billet shall be 25 mm in diameter with the edges rounded off to a radius of 3 mm \pm 0.3 mm. The lead, of hardness number 3.5 to 4.5 on the Vickers scale and not more than 25 mm thick, shall cover an area greater than that covered by the specimen. A fresh surface of lead shall be used for each impact. The billet shall strike the specimen so as to cause maximum damage.
- (3) Bending test: the test is applicable only to long, slender sources with both a minimum length of 10 cm and a length to minimum width ratio of not less than 10. The specimen shall be rigidly clamped in a horizontal position so that one half of its length protrudes from the face of the clamp. The orientation of the specimen shall be such that the specimen will suffer maximum damage when its free end is struck by the flat face of a steel billet. The billet shall strike the specimen so as to produce an impact equivalent to that resulting from a free vertical fall of 1.4 kg through 1 m. The flat face of the billet shall be 25 mm in diameter with the edges rounded off to a radius of 3 mm to \pm 0.3 mm.
- (4) Heat test: the specimen shall be heated in air to a temperature of 800°C and held at that temperature for a period of 10 min and shall then be allowed to cool.

3. Leaching assessment methods

- 3642 (1) For indispersible solid substances:
- (a) The specimen shall be immersed for seven days in water at ambient temperature. The water shall have a pH of 6 to 8 and a maximum conductivity of 10 μ S/cm at 20°C.
 - (b) The water with specimen shall then be heated to a temperature of 50° \pm 5°C and maintained at this temperature for four hours.

- (c) The activity of the water shall then be determined.
- (d) The specimen shall then be stored for at least seven days in still air of humidity not less than 90 per cent at 30°C.
- (e) The specimen shall then be immersed in water of the same specification as in (a) above and the water with specimen heated to 50°C ± 5°C and maintained at this temperature for four hours.
- (f) The activity of the water shall then be determined.

The activities determined in (c) and (f) above shall not exceed 0.05 µCi.

(2) For encapsulated substances:

- (a) The specimen shall be immersed in water at ambient temperature. The water shall have a pH of 6-8 with a maximum conductivity of 10 µS/cm. The water and specimen shall be heated to a temperature of 50°C ± 5°C and maintained at this temperature for four hours.
- (b) The activity of the water shall then be determined.
- (c) The specimen shall then be stored for at least seven days in still air at a temperature not less than 30°C.
- (d) Repeat (a).
- (e) The activity of the water shall then be determined.

The activities determined in (b) and (e) above shall not exceed 0.05 µCi.

D. INSPECTION REQUIREMENTS TO BE FULFILLED BEFORE FIRST USE AND BEFORE EACH SHIPMENT OF CERTAIN TYPES OF PACKAGES

1. Before first use

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Before first use of any package, the following requirements shall be complied with by the consignor:

- (a) For each Type B(U) and Type B(M) package, it shall be ensured that the effectiveness of its shielding and containment, and, where necessary, the heat transfer characteristics, are within the limits applicable to or specified for the approved design.
- (b) If the design pressure of the containment system exceeds 0.35 kg/cm² (gauge), it shall be ensured that the containment system of each package conforms with the approved design requirements relating to the capability of that system to maintain its integrity under pressure.

(c) Where, in order to comply with the nuclear safety criteria, neutron poisons are specifically included as components of the packaging primarily for this purpose, tests shall be performed to confirm the presence and distribution of that poisoning.

2. Before each shipment

3644 Before each shipment of any package, the following requirements shall be complied with by the consignor:

(a) Type B(U) and Type B(M) packages shall be held until equilibrium conditions have been closely enough approached to demonstrate compliance with the shipment requirements for temperature and pressure unless an exemption from these requirements has received unilateral approval.

(b) It shall be ensured that all the requirements specified in the approval certificates have been satisfied.

(c) It shall be ensured by examination 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 marginals 3603(1) and 3604(2) were made.

(d) It shall be ensured that the provisions of marginal 3600(5), with regard to lifting attachments have been complied with.

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CHAPTER IV. - CONTROLS FOR TRANSPORT AND STORAGE IN TRANSIT

A. MIXED PACKING

3650 A package containing radioactive substances shall not contain any other items except such articles and documents as are necessary for the use of the radioactive substances. Such items may be included, provided that there is no interaction between them and the packaging or contents that would reduce the safety of the package.

B. NON-FIXED RADIOACTIVE CONTAMINATION

3651 The non-fixed radioactive contamination on any external surface of the package shall be kept as low as practicable and shall at no time during normal transport exceed the levels laid down in Table XIX. The level of non-fixed radioactive contamination may be determined by wiping an area of 300 cm² of the surface concerned by hand with a filter paper, or a wad of cotton wool or any other material of this nature.

Packages used for the transport of radioactive substances such as irradiated fuel, shall be assessed to determine whether activity is likely to be leached to the surface e.g. by rain. The frequency of such assessment shall be related to the likelihood of radioactive contamination having been absorbed into the surface coating, particularly paint. When activity is likely to be leached to the surface of the package, the continued use of such a package shall be conditional upon a radiation safety assessment by a qualified person.

TABLE XIX. MAXIMUM PERMISSIBLE LEVELS OF
NON-FIXED RADIOACTIVE CONTAMINATION

Contaminant	Maximum permissible level (see Note a/) ($\mu\text{Ci}/\text{cm}^2$)
Natural and depleted uranium and natural thorium only	10^{-3}
Beta and gamma emitters and the low-toxicity alpha emitters specified in Note b/ below	10^{-4}
All other alpha emitters	10^{-5}

Notes: a/ The above levels are permissible when averaged over any area of 300 cm² of any part of the surface.

b/ Low toxicity alpha emitters:

Uranium-235 or uranium-238; thorium-232; thorium-228 and thorium-230 when diluted to a specific activity of the same order as that of natural uranium and natural thorium; radionuclides with a half-life of less than 10 days.

C. CATEGORIES

3652 Packages and containers (both large and small) shall be in one of the following three categories:

1. Category I-WHITE

3653 (1) Packages: When the radiation level originating from the package at any time during normal transport does not exceed 0.5 mrem/h at any location on the external surface of the package, and the package does not belong to Fissile Class II or III.

(2) Containers: When the container contains packages of radioactive substances none of which is in a category higher than Category I-WHITE.

2. Category II-YELLOW

3654 (1) Packages: When the radiation level limit in marginal 3653(1) is exceeded, or the package belongs to Fissile Class II, provided that:

(a) the radiation level originating from the package at any time during normal transport does not exceed 50 mrem/h at any location on the external surface of the package; and

(b) the transport index at any time during normal transport does not exceed 1.0.

(2) Containers: When the transport index of the container at any time during normal transport does not exceed 1.0, and when it contains no packages of Fissile Class III.

3. Category III-YELLOW

3655 (1) Packages: When either of the two limits in marginal 3654(1) → is exceeded, or when the package belongs to Fissile Class II or Class III, or when the package is being transported under special arrangement, provided that:

(a) the radiation level originating from the package at any time during normal transport does not exceed 200 mrem/h at any location on the external surface of the package, except that, for full load shipments under the conditions specified in marginal 3659(7), the maximum allowable level shall be 1000 mrem/h; and

(b) the transport index at any time during normal transport does not exceed 10 unless the package is being transported as full load.

(2) Containers: when the transport index of the container, at any time during normal transport, exceeds 1.0, or when the container carries packages belonging to Fissile Class III, or when it is being transported under special arrangement.

D. LABELLING AND MARKING (see Appendix A.9)

- 3656 (1) Each package and container (both large and small) shall bear at least two labels which conform to the models 6A, 6B or 6C in Appendix A.9 according to the category (see marginals 3652 to 3655) of that package or container. Large containers shall bear, in addition, a placard conforming with the model in marginal 240 010 of Appendix B.4.
- (2) The labels shall be affixed to two opposite sides of the outside of the package, or on the outside of all four sides of the container.
- (3) The labels shall be completed as follows in a clear and indelible manner:
- (a) next to the word "contents" shall be indicated the radionuclide or the substance whose presence constitutes the principal danger in the event of damage to the package (for example: strontium -90; irradiated uranium, radioactive LSA);
- (b) next to the word "activity" shall be written the activity in curies;
- Note This activity may also be expressed in micro, milli or kilocuries on condition that the prefixed micro, milli and kilo are written in full;
- (c) on the label to model Nos. 6B and 6C shall be written, in addition, the transport index in the largest possible figures in the frame intended for that purpose.
- (4) Each package of gross weight exceeding 50 kg shall have its gross weight plainly and durably marked on the outside of the package.
- (5) Each package which conforms to a Type A packaging design shall be plainly and durably marked on the outside of the package with "Type A".
- (6) Each package which conforms to a design approved under marginals 3672 to 3674 shall be plainly and durably marked on the outside of the package with the identification mark allocated to that design by the competent authority and, in the case of a Type B(U) or Type B(M) package design, with "Type B(U)" or "Type B(M)".
- (7) Each package which conforms to a Type B(U) or Type B(M) package design shall have the outside of the outermost receptacle which is resistant to the effects of fire and water plainly marked by embossing, stamping or other means resistant to the effects of fire and water with the trefoil symbol shown in the labels to models 6A to 6C.

E. SEGREGATION OF RADIOACTIVE SUBSTANCES

- 3657 Packages of Category II- YELLOW or III- YELLOW shall be separated in carriage and in storage from packages which bear a label with the word "FOTO" by the safety distances given in the table in marginal 240 010 of Appendix B.4.

F. STORAGE IN TRANSIT

3658 (1) Packages of radioactive substances shall not be stored near dangerous goods with which mixed loading is prohibited (see marginal 2450(3)).

(2) The number of Category II-YELLOW and Category III-YELLOW packages and containers stored in any one storage area, such as a transit area, terminal building, store-room or assembly yard, shall be so limited that the total sum of the transport indices in any individual group of such packages or containers does not exceed 50. Groups of such packages and containers shall be stored so as to maintain a spacing of at least 6 metres from other groups of such packages or containers.

(3) Where control of package accumulations is effected by reference to the red bands marked on the labels there shall not be more than 50 Category II-YELLOW or 5 Category III-YELLOW packages in any one group of packages. Where packages of both categories are present, one Category III-YELLOW package shall be taken as equivalent to ten Category II-YELLOW packages.

(4) Except in the case of Fissile Class II or Class III packages, the limitations in marginal 3658(2) do not apply to packages marked 'RADIOACTIVE LSA' and containing low specific activity substance or those marked 'RADIOACTIVE LLS' and containing low level solid radioactive substance when they are maintained in a compact stack or in containers.

(5) Mixing of different kinds of packages, including Fissile Class I packages with Fissile Class II packages, is permitted.

G. TRANSPORT

(a) Packages

3659 (1) Packages shall be so loaded in vehicles that they cannot shift dangerously, upset or fall.

(2) Provided that its average surface heat flux does not exceed $15\text{W}/\text{m}^2$, and that the surrounding cargo is not in sacks or bags, a package may be carried among packaged general cargo without any special stowage provisions except as may be specially required by the competent authority in an appropriate certificate. If the heat flux exceeds $15\text{W}/\text{m}^2$ the package shall be carried as full load.

(3) Categories I-WHITE, II- or III-YELLOW packages shall not be carried in compartments occupied by passengers, except those exclusively reserved for couriers specially authorized to accompany such packages.

(4) Mixing of different kinds of packages, including Fissile Class I packages with Fissile Class II packages, is permitted.

(5) Accumulation of packages and containers shall be controlled as follows:

(a) For both packages and containers, the number of packages and containers shall be so limited that the total sum of the transport indices in any vehicle does not exceed 50. Where this control of packages is effected by reference to the red bands marked on the packages see marginal 3658(3).

(b) In the case of full loads the limits under paragraph 6(a) shall not apply, provided that the radiation level under normal conditions of transport does not exceed 200 mrem/h. at any point on, and 10 mrem/h at 2m from the outside surface of a freight container or vehicle. For Fissile Class II or III consignments, or mixtures thereof, the full load shall not include more than the allowable number of packages (see footnote to marginal 2450).

(6) Vehicles and large containers carrying packages or containers labelled with any of the labels to Models 6A, 6B or 6C, or carrying full load consignments of any radioactive substances shall display the placard in marginal 240 010 of Appendix B.4 on the outside of each of the two lateral sides and the rear wall in the case of a vehicle.

(7) In the case of full loads the radiation level shall not exceed:

(a) 1000 mrem/h at any point on the external surface of any package, provided that:

(i) the vehicle is equipped with an enclosure which, during normal transport, prevents the access of unauthorized persons to the interior of the enclosure;

(ii) provisions are made to secure the packages so that their position within the vehicle remains fixed during normal transport;

(iii) there are no loading or unloading operations between the beginning and end of the transport.

Under other conditions, the radiation level at any point on the external surface of the package shall not exceed 200 mrem/h.

(b) 200 mrem/h at any point on the outer surface of the vehicle or large container, including the upper and lower surfaces, and, 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) 10 mrem/h at any point 2m from the vertical planes represented by the outer lateral surfaces of the vehicle or large container, and, if the load is transported in an open vehicle at any point 2m from the vertical planes projected from the outer edges of the vehicle.

(8) (a) The radiation level in any normally occupied position of a vehicle shall not exceed 2 mrem/h during transport. Under such circumstances the carrier shall ensure that the driver or any accompanying personnel, shall not receive more radiation than 0.5 rem. in any 12 month period. Maintaining the minimum distances listed in the table in marginal 240 000 of Appendix B.4, even in the absence of a protective shield, shall be considered as keeping within the 2 mrem/h limit.

(b) As an alternative to (a) above, the carrier may operate to a scheme of work approved by the competent authority whereby records must be kept by him of the times spent by persons travelling in his vehicles and the radiation levels those persons are subjected to, in order that no person receives a greater dose than 375 mrem in any calendar quarter.

(b) Tank Vehicles

3660 Low specific activity substances, ISA (I), may be carried in tank vehicles subject to the following conditions:

(a) materials from which the receptacles and closures are made shall not be liable to attack by the contents nor form with them harmful or dangerous compounds;

(b) receptacles shall not possess any opening (taps, valves, etc.) in their lower part and shall be hermetically sealed;

(c) receptacles shall be of metal and earthed electrically;

(d) receptacles for substances having vapour pressure exceeding 1.1 kg/cm^2 at 50°C shall comply with the regulations of marginal 210 350 and shall be submitted to an inner hydraulic pressure test carried out by an expert approved by a competent authority in the field of compressed gases. The interior pressure to be applied should be: 3 kg/cm^2 when they are intended for the carriage of liquids which have a vapour pressure which does not exceed 1.75 kg/cm^2 at 50°C ; 4 kg/cm^2 when they are intended for the carriage of liquids which have a vapour pressure more than 1.75 kg/cm^2 at 50°C . The hydraulic pressure test shall be renewed at least every four years at the same time as an internal examination;

(e) the receptacles shall not be filled to more than 93 per cent of their capacity.

(c) Tank-Containers

3661 Low specific activity substances, ISA(I), may be carried in tank-
3662- containers subject to the requirements of Appendix B.1.
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CHAPTER V. — ADMINISTRATIVE REQUIREMENTS

3670 Approval by competent authorities is not required for package designs for substances consigned under Schedules 1 to 4 and, provided the contents are not fissile substances requiring approval under marginal 3674, for package designs for substances consigned under schedules 5 to 8.

A. APPROVAL OF SPECIAL FORM RADIOACTIVE SUBSTANCES

3671 (1) Any design for special form radioactive substances, with the exception of the substances specified in Schedules 3 and 4, shall require unilateral approval. An application for approval shall include:

(a) a detailed description of the substance or, if a capsule, the contents; particular reference shall be made to both physical and chemical states;

(b) a detailed statement of the design of any capsule to be used, including complete engineering drawings and schedules of materials and methods of construction to be used;

(c) a statement of the tests which have been done and their results, or evidence based on calculative methods to show that the substances are capable of meeting the tests, or other evidence that the special form radioactive substances meet the requirements of this Appendix.

(2) The competent authority shall establish a certificate stating that the approved design meets the definition of special form radioactive substances as defined in marginal 2450(2) and shall attribute to that design an identification mark. The certificate shall specify the details of the radioactive substances.

B. APPROVAL OF PACKAGE DESIGNS

1. Approval of Type B(U) package designs (including those for Fissile Class I, Class II and Class III packages which are also subject to marginal 3674)

3672 (1) Any design of Type B(U) package originating in a country party to ADR shall be approved by the competent authority of this country; if the country where the package has been designed is not party to ADR, carriage is possible on condition that:

(a) a certificate has been supplied by this country, proving that the package satisfies the technical regulations of ADR, and that this certificate is counter-signed by the competent authority of the first ADR country reached by the consignment;

(b) if no certificate has been supplied, the package design is approved by the competent authority of the first ADR country reached by the consignment;

- (2) An application for approval shall include:
- (a) a detailed description of the proposed contents with particular reference to their physical and chemical states and the nature of the radiation emitted;
 - (b) a detailed statement of the design, including complete engineering drawings and schedules of materials and methods of construction to be used;
 - (c) a statement of the tests which have been done and their results, or evidence based on calculative methods or other evidence that the package design is adequate to meet the requirements of marginals 3602 and 3603;
 - (d) the proposed operating and maintenance instructions for the use of the package, in particular, in the case of packages likely to be immersed in contaminated ponds, the provisions incorporated to ensure that the surface of the package is not contaminated above the permitted levels;
 - (e) if the package is designed to have a maximum normal operating pressure in excess of 1.0 kg/cm² (gauge), the application for approval shall, in particular, state, in respect of the materials of construction of the containment system, the specifications, the samples to be taken and the tests to be made;
 - (f) where the proposed contents are irradiated fuel, the applicant shall state and justify any assumption in the safety analysis relating to the characteristics of the fuel;
 - (g) any special stowage provisions necessary to ensure the safe dissipation of heat from the package; consideration shall be given to the type of vehicle or container (see marginal 3681 (1)(a));
 - (h) a reproducible illustration not larger than 21 cm x 30 cm, showing the make-up of the package.
- (3) The competent authority shall establish a certificate stating that the approved design meets the requirements for Type B(U) packages (see marginals 3677 and 3678).
2. Approval of Type B(M) package design (including those for Fissile Class I, Class II and Class III packages which are also subject to marginal 3674)
- 3673 (1) Each type B(M) package design shall require multilateral approval
- (2) An application for approval of a Type B(M) package design shall include, in addition to the information required in marginal 3672(2) for Type B(U) packages:
- (a) a list of those specific additional requirements for Type B(U) packages specified in marginal 3603 with which the package does not conform;

(b) any proposed supplementary operational controls ^{*} to compensate for the deficiencies listed in (a) above; and

(c) a statement relative to any special loading, carriage, unloading, or handling procedures;

(d) the maximum and minimum ambient conditions (temperature, solar radiation) expected to be encountered during transport and which have been taken into account in the design.

(3) The competent authority shall establish a certificate stating that the approved package design meets the requirements for Type B(M) packages (see marginals 3677 to 3679).

3. Approval of Fissile Class I, Class II and Class III package design

3674 (1) Package designs complying with the examples in marginal 3620, 3623, or 3624 shall require no further competent authority approvals.

(2) Package designs complying with the examples in marginals 3616 and 3622 shall require unilateral approval.

(3) All other package designs shall require multilateral approval.

(4) An application for approval shall include all information necessary to satisfy the competent authority that the design meets the requirements of marginals 3610 to 3624.

(5) The competent authority shall establish a certificate (see marginals 3677 to 3679) stating that the approved package design meets the requirements of marginals 3610 to 3624.

C. APPROVAL OF SHIPMENTS

3675 (1) Multilateral shipment approvals shall be required for the following packages:

(a) Type B(M) packages specially designed to allow continuous venting.

(b) Type B(M) packages containing radioactive materials with an activity greater than 3×10^3 A₁ or 3×10^3 A₂, as appropriate, or 3×10^4 Ci, whichever is the lower;

^{*}/ That is, operational controls during transport not routinely provided for in this Appendix but which are considered necessary to ensure the safety of the package during transport, such as human intervention for temperature or pressure measurements or for periodical venting. These controls shall also take into account the possibility of unexpected delay.

(c) Fissile Class II packages complying with marginal 3620.

(d) Fissile Class III packages.

However, a competent authority can authorize transport into or through its country, without shipment approval, by a specific provision in its design approval.

(2) An application for shipment approval shall include:

(a) the period of time, related to the shipment, for which the approval is sought;

(b) the actual contents, the type of vehicle and the probable or proposed route; and

(c) how the special precautions and special administrative and operational controls referred to in the package design certificates issued under marginals 3673 and 3674, are to be put into effect.

(3) Upon approval of the shipment, the competent authority shall issue a certificate (see marginals 3677 to 3679).

(4) The package and shipment certificates may be combined into a single certificate.

D. APPROVAL OF TRANSPORT BY SPECIAL ARRANGEMENT

3676 (1) A consignment of radioactive substances which does not satisfy all the applicable requirements of this Appendix shall be transported only by special arrangement, which always requires multilateral approval. The special arrangements shall be adequate to ensure that the overall level of safety in transport is at least equivalent to that which would be provided if all the applicable requirements of this Appendix had been met.

(2) An application for approval shall include the information required under marginals 3672 to 3675 and also:

(a) a statement of the respects in which, and of the reasons why, the consignment cannot be made in full accordance with the applicable requirements of this Appendix; and

(b) a statement of any special precautions or special administrative or operational controls which shall be taken during transport to compensate for the failure to meet the applicable requirements of this Appendix.

(3) Upon approval of the special arrangement, the competent authority shall issue a certificate (see marginals 3677 to 3679).

E. COMPETENT AUTHORITY CERTIFICATES OF APPROVAL

1. Competent authority identification marks

- 3677 (1) Each approval certificate issued by a competent authority shall be identified by an identification mark. The mark shall be of the following generalized type:

Symbol of nationality of country * / Number / Type Code

(a) The number shall be assigned by the competent authority, and shall be unique and specific with regard to the particular design or shipment. The shipment approval identification mark shall be clearly identified with the package design approval identification mark.

(b) The following type codes shall be used in the order listed to indicate the types of approval certificates issued:

A	Type A package design (when also a fissile class package)
B(U)	Type B(U) package design
B(M)	Type B(M) package design
F	Fissile class package design
S	Special form material approval
T	Shipment
X	Special arrangement.

- (2) These type codes shall be applied as follows:

(a) Each certificate and each package shall bear the appropriate identification mark composed of the symbols prescribed in paragraph (1) except that for packages, only the applicable package design type codes shall appear following the second stroke, i.e. the "S", "T" and "X" shall not appear in the identification marking on the package. Where the package design approval and shipment approval are combined, the applicable Type Codes do not need to be repeated. For example:

A/132/B(M)F: A Type B(M) Fissile Class package approved by Austria for package design number 132 (to be marked on both the package itself and on the package design approval certificate).

A/132/B(M)FT: The shipment approval certificate identification mark issued for that package design (to be marked on the certificate only).

A/137/X: The shipment approval certificate identification mark issued for Austrian design 137 under a special arrangements shipment (to be marked on the certificate only).

*/ The signs referred to are the national distinguishing signs for motor vehicles in international traffic.

(b) Where multilateral approval is effected by validation, only the identification marks issued by the country of origin of the design or shipment would be used. Where multilateral approval is effected by issue of certificates by successive countries, each certificate would bear the appropriate mark and the package whose design was so approved would bear all appropriate identification marks. For example,

(A/132/B(M)F)
(CH/28/B(M)F)

would be the identification marks of a package which was originally approved by Austria and was subsequently approved, by separate certificate, by Switzerland. Additional identification marks would be tabulated in a similar manner on the package

(c) The revision of certificate numbers shall be indicated by a parenthetical expression following the identification mark on the certificate. For example, A/132/B(U)F. (Rev.2) would indicate revision 2 of the Austrian-approved package design certificate; or A/132/B(U)F. (Rev.0) would indicate the original issue of the Austrian-approved package design certificate. For original issue the parenthetical expression is optional and other words such as "(original issue)" may also be used in lieu of "(Rev.0)". Certificate revision numbers may only be issued by the country issuing the original certificate number. Revision by other than the issuing country shall require a new certificate and identification number.

(d) Additional symbols (as may be necessitated by national requirements) may be added in brackets to the end of the identification mark. For example, A/132/B(U)F (SP503).

(e) It is not necessary to alter the identification mark on the package each time that a revision to the package certificate is made. Such alteration shall be made only in those cases where the revision of the package design certificate involves a change in the letter type codes for the package design, following the second stroke.

2. Information required in certificates

3678 Each approval certificate issued by a competent authority shall include the relevant information from the following:

(a) The competent authority identification mark.

(b) A brief description of the packaging, including materials of construction, gross weight, general outside dimensions, and appearance. This shall include a reproducible illustration not larger than 21 cm by 30 cm, showing the make-up of the package.

(c) A brief specification of the permitted contents, including any restrictions on contents which might not be obvious from the nature of the packaging. This should include the physical and chemical forms, the activities in curies (including those of the various isotopes, if appropriate), amounts in grams for fissile substances, and whether in special form.

(d) Additionally, for fissile class packages:

(i) Fissile Class I: a detailed description of the permissible contents and any special features, on the basis of which the leakage of water in respect of certain void spaces has been assumed in the criticality assessment (see marginal 3613(b)).

(ii) Fissile Class II: a detailed description of the permissible contents the corresponding allowable numbers (or transport index) and any special features, on the basis of which the leakage of water in respect of certain void spaces has been assumed in the criticality assessment (see marginal 3618 (b)).

(iii) Fissile Class III: a detailed description of the individual consignments including the permissible contents and the corresponding allowable numbers (or transport indices) together with any special precautions to be taken during transport.

(e) A statement regarding the ambient conditions assumed for purposes of design (see marginal 3602 (4)).

(f) For Type B(M) packages, a statement specifying those prescriptions of marginal 3603 with which the package does not conform and any amplifying information which may be useful to other competent authorities.

(g) A reference to the following information provided by the applicant:

(i) instructions on the use and maintenance of the packaging;

(ii) the actions to be taken by the consignor prior to the shipment, e.g. any special decontamination procedures.

(h) A detailed listing of any supplementary operational requirements (see footnote 5) for package preparation, loading, transport, storage, unloading, and handling, including any special stowage provisions for the safe dissipation of heat from the package, or a statement that no such controls are required.

(j) A statement authorizing shipment where shipment approval is required under marginal 3675.

(k) Any restrictions on the types of vehicle, containers, and any necessary routing instructions.

(l) Emergency arrangements specific to the approved design.

(m) The following statement: "This certificate does not relieve the consignor from compliance with any requirement of the government of any country through or into which the package will be transported".

(n) An issue date, and, if appropriate, an expiry date.

(o) Signature and identification of the certifying official.

(p) Appendices containing certificates for alternative package contents, other competent authority validations, or additional technical data or information.

3. Validation of certificates

3679 Multilateral approvals may be by validation of the original certificate issued by the competent authority of the country of origin of the design or shipment.

F. CONSIGNOR'S RESPONSIBILITIES

1. Particulars of consignment

3680 The consignor shall include in the transport document for each consignment of radioactive substances, as well as the description given in the appropriate schedule, the following details:

(a) The statement "The nature of the goods and the packaging are in conformity with the provisions of ADR".

(b) The identification mark for each competent authority certificate (special form, package design, and shipment) applicable to the consignment.

(c) The name of the radioactive substances, or nuclide.

(d) A description of the physical and chemical form of the substance, or whether it is in special form.

(e) The activity of the radioactive substances in appropriate curie units.

(f) The category of the package, i.e. I-WHITE, II-YELLOW, III-YELLOW.

(g) The transport index (Categories II- and III-YELLOW only).

(h) For a consignment of fissile substances:

(i) if exempted under marginal 3610, the words "FISSILE EXEMPT"; or

(ii) if not so exempted, the fissile class of the package(s).

3681 2. Information and notification for carriers

(1) The consignor shall provide in the transport document a statement regarding actions, if any, that must be taken by the carrier. The statement shall be in the languages deemed necessary by the carrier or the authorities concerned, and shall include at least the following points:

(a) supplementary operational requirements for loading, transport, storage, unloading, handling, and stowage for safe dissipation of heat, or a statement that no supplementary operational requirements are necessary (see marginal 3678 (h));

(b) any necessary routing instructions (see marginal 3678 (k)).

(c) emergency arrangements specific to the approved design (see marginal 3678 (l)).

(2) In all cases where approval of the shipment or prior notification to the competent authority is required, all the carriers shall be informed of the requirements in advance, in order that they may take in good time any measures required for the transport.

3. Notification to competent authorities

3682 (1) Before the first shipment of a Type B(U) package containing radioactive substances with an activity greater than $3 \times 10^3 A_1$ or $3 \times 10^3 A_2$, as appropriate, or $3 \times 10^4 Ci$, whichever is the lower, the consignor shall ensure that copies of each applicable competent authority certificate applying to that package design have been submitted to the competent authority of each country in whose territory 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 such acknowledgement of receipt of the certificate.

(2) For each shipment listed in (a) to (d) below inclusive, the consignor shall notify the competent authorities of each country in whose territory the consignment is to be transported. This notification shall be in the hands of each competent authority prior to the commencement of the shipment, and preferably at least 15 days in advance.

(a) Type B(U) packages containing radioactive substances with an activity greater than $3 \times 10^3 A_1$ or $3 \times 10^3 A_2$, as appropriate, or $3 \times 10^4 Ci$, whichever is the lower.

(b) Type B(M) packages.

(c) Fissile Class III packages under marginal 3674 (3).

(d) Transport by special arrangement.

(3) The consignment notification shall include:

(a) sufficient information to enable the identification of the package, including all applicable certificate numbers and identification marks; and

(b) information on the date of shipment, the expected date of arrival and proposed routing.

(4) The consignor is not required to send a separate notification if the required information has been included in the application for shipment approval (see marginal 3675 (2)).

4. Possession of certificates

3683 The consignor shall have in his possession a copy of each certificate required under this Appendix and a copy of the instructions with regard to the proper closing of the package and other preparation for shipment before making any shipment under the terms of the certificates.

G. QUALITY CONTROL IN FABRICATION AND MAINTENANCE OF PACKAGING

3684 The manufacturer, consignor, or user of an approved package design shall be prepared to demonstrate to any cognizant competent authority that:

(a) the constructional methods and materials used for the construction of the packaging are in accordance with the approved design requirements; the competent authority may carry out inspection of the packaging during construction;

(b) all packagings built to an approved design shall be maintained in good condition so that they continue to comply with all relevant regulatory criteria, even after repeated use.

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CHAPTER VI - ACTIVITY LIMITS

DETERMINATION OF A_1 AND A_2 1. Single radionuclides

3690 (1) For single radionuclides of known identity, the values of A_1 and A_2 are given in Table XX. The values of A_1 and A_2 are also applicable for radionuclides contained in (α , n) or (γ , n) neutron sources.

TABLE XX. A_1 and A_2 VALUES FOR RADIONUCLIDES

Symbol of radionuclide	Element and atomic number	A_1 (Ci)	A_2 (Ci)	Specific activity (Ci/g)
^{227}Ac	Actinium (89)	1000	0.003	7.2×10^6
^{228}Ac		10	4	2.2×10^6
^{105}Ag	Silver (47)	40	40	3.1×10^4
$^{110}\text{Ag}^m$		7	7	4.7×10^3
^{111}Ag		100	100	1.6×10^5
^{241}Am	Americium (95)	8	0.008	3.2
^{243}Am		8	0.008	1.9×10^{-1}
^{37}Ar (compressed or uncompressed)	Argon (18)	1000	1000	1.0×10^5
^{41}Ar (uncompressed)		20	20	4.3×10^7
^{41}Ar (compressed)		1	1	4.3×10^7
^{73}As	Arsenic (33)	1000	400	2.4×10^4
^{74}As		20	20	1.0×10^5
^{76}As		10	10	1.6×10^6
^{77}As		300	300	1.1×10^6
^{211}At	Astatine (85)	200	7	2.1×10^6
^{193}Au	Gold (79)	200	200	9.3×10^5
^{196}Au		30	30	1.2×10^5
^{198}Au		40	40	2.5×10^5
^{199}Au		200	200	2.1×10^5
^{131}Ba	Barium (56)	40	40	8.7×10^4
^{133}Ba		40	10	4.0×10^2

Symbol of radionuclide	Element and atomic number	A ₁ (Ci)	A ₂ (Ci)	Specific activity (Ci/g)
¹⁴⁰ Ba	Barium (cont'd)	20	20	7.3 x 10 ⁴
⁷ Be	Beryllium (4)	300	300	3.5 x 10 ⁵
²⁰⁶ Bi	Bismuth (83)	5	5	9.9 x 10 ⁴
²⁰⁷ Bi		10	10	2.16 x 10 ²
²¹⁰ Bi (RaE)		100	4	1.2 x 10 ⁵
²¹² Bi		6	6	1.5 x 10 ⁷
²⁴⁹ Bk	Berkelium (97)	1000	1	1.8 x 10 ³
⁸² Br	Bromine (35)	6	6	1.1 x 10 ⁶
¹⁴ C	Carbon (6)	1000	100	4.6
⁴⁵ Ca	Calcium (20)	1000	40	1.9 x 10 ⁴
⁴⁷ Ca		20	20	5.9 x 10 ⁵
¹⁰⁹ Cd	Cadmium (48)	1000	70	2.6 x 10 ³
¹¹⁵ Cd ^m		30	30	2.6 x 10 ⁴
¹¹⁵ Cd		80	80	5.1 x 10 ⁵
¹³⁹ Ce	Cerium (58)	100	100	6.5 x 10 ³
¹⁴¹ Ce		300	200	2.8 x 10 ⁴
¹⁴³ Ce		60	60	6.6 x 10 ⁵
¹⁴⁴ Ce		10	7	3.2 x 10 ³
²⁴⁹ Cf	Californium (98)	2	0.002	3.1
²⁵⁰ Cf		7	0.007	1.3 x 10 ²
²⁵² Cf		2	0.009	6.5 x 10 ²
³⁶ Cl	Chlorine (17)	300	30	3.2 x 10 ⁻²
³⁸ Cl		10	10	1.3 x 10 ⁸
²⁴² Cm	Curium (96)	200	0.2	3.3 x 10 ³
²⁴³ Cm		9	0.009	4.2 x 10
²⁴⁴ Cm		10	0.01	8.2 x 10
²⁴⁵ Cm		6	0.006	1.0 x 10 ⁻¹
²⁴⁶ Cm		6	0.006	3.6 x 10 ⁻¹
⁵⁶ Co	Cobalt (27)	5	5	3.0 x 10 ⁴
⁵⁷ Co		90	90	8.5 x 10 ³

Symbol of radionuclide	Element and atomic number	A ₁ (Ci)	A ₂ (Ci)	Specific activity (Ci/g)
⁵⁸ Co ^m	Cobalt (cont'd)	1000	1000	5.9 x 10 ⁶
⁵⁸ Co		20	20	3.1 x 10 ⁴
⁶⁰ Co		7	7	1.1 x 10 ³
⁵¹ Cr	Chromium (24)	600	600	9.2 x 10 ⁴
¹³¹ Cs	Caesium (55)	1000	1000	1.0 x 10 ⁵
¹³⁴ Cs ^m		1000	1000	7.4 x 10 ⁶
¹³⁴ Cs		10	10	1.2 x 10 ³
¹³⁵ Cs		1000	100	8.8 x 10 ⁻⁴
¹³⁶ Cs		7	7	7.4 x 10 ⁴
¹³⁷ Cs		30	20	9.8 x 10
⁶⁴ Cu	Copper (29)	80	80	3.8 x 10 ⁶
¹⁶⁵ Dy	Dysprosium (66)	100	100	8.2 x 10 ⁶
¹⁶⁶ Dy		1000	200	2.3 x 10 ⁵
¹⁶⁹ Er	Erbium (68)	1000	300	8.2 x 10 ⁴
¹⁷¹ Er		50	50	2.4 x 10 ⁶
¹⁵² Eu ^m	Europium (63)	30	30	2.2 x 10 ⁶
¹⁵² Eu		20	20	1.9 x 10 ²
¹⁵⁴ Eu		10	5	1.5 x 10 ²
¹⁵⁵ Eu		400	90	1.4 x 10 ³
¹⁸ F	Fluorine (9)	20	20	9.3 x 10 ⁷
⁵² Fe	Iron (26)	6	6	7.3 x 10 ⁶
⁵⁵ Fe		1000	1000	2.2 x 10 ³
⁵⁹ Fe		10	10	4.9 x 10 ⁴
⁷² Ga	Gallium (31)	7	7	3.1 x 10 ⁶
¹⁵³ Gd	Gadolinium (64)	200	100	3.6 x 10 ³
¹⁵⁹ Gd		300	300	1.1 x 10 ⁶
⁷¹ Ge	Germanium (32)	1000	1000	1.6 x 10 ⁵
³ H	Hydrogen (1) see T-Tritium			
¹⁸¹ Hf	Hafnium (72)	30	30	1.6 x 10 ⁴
¹⁹⁷ Hg ^m	Mercury (80)	200	200	6.6 x 10 ⁵

Symbol of radionuclide	Element and atomic number	A ₁ (Ci)	A ₂ (Ci)	Specific activity (Ci/g)
197 _{Hg}	Mercury (cont'd)	200	200	2.5 × 10 ⁵
203 _{Hg}		80	80	1.4 × 10 ⁴
166 _{Ho}	Holmium (67)	30	30	6.9 × 10 ⁵
125 _I	Iodine (53)	1000	70	1.7 × 10 ⁴
126 _I		40	10	7.8 × 10 ⁴
129 _I		1000	2	1.62 × 10 ⁻⁴
131 _I		40	10	1.2 × 10 ⁵
132 _I		7	7	1.1 × 10 ⁷
133 _I		30	30	1.1 × 10 ⁶
134 _I		8	8	2.7 × 10 ⁷
135 _I		10	10	3.5 × 10 ⁶
113 _{In^m}	Indium (49)	60	60	1.6 × 10 ⁷
114 _{In^m}		30	20	2.3 × 10 ⁴
115 _{In^m}		100	100	6.1 × 10 ⁶
190 _{Ir}	Iridium (77)	10	10	6.2 × 10 ⁴
192 _{Ir}		20	20	9.1 × 10 ³
194 _{Ir}		10	10	8.5 × 10 ⁵
42 _K	Potassium (19)	10	10	6.0 × 10 ⁶
85 _{Kr^m} (uncompressed)	Krypton (36)	100	100	8.4 × 10 ⁶
85 _{Kr^m} (compressed)		3	3	8.4 × 10 ⁶
85 _{Kr} (uncompressed)		1000	1000	4.0 × 10 ²
85 _{Kr} (compressed)		5	5	4.0 × 10 ²
87 _{Kr} (uncompressed)		20	20	2.8 × 10 ⁷
87 _{Kr} (compressed)		0.6	0.6	2.8 × 10 ⁷
140 _{La}	Lanthanum (57)	30	30	5.6 × 10 ⁵
LLS	Low-level solid radioactive material See Marginal 2450 (2)			
LSA	Low specific activity material See Marginal 2450 (2)			
177 _{Lu}	Lutetium (71)	300	300	1.1 × 10 ⁵
MFP	Mixed fission products	10	0.4	

Symbol of radionuclide	Element and atomic number	A ₁ (Ci)	A ₂ (Ci)	Specific activity (Ci/g)
²⁸ Mg	Magnesium (12)	6	6	5.2 x 10 ⁶
⁵² Mn	Manganese (25)	5	5	4.4 x 10 ⁵
⁵⁴ Mn		20	20	8.3 x 10 ³
⁵⁶ Mn		5	5	2.2 x 10 ⁷
⁹⁹ Mo	Molybdenum (42)	100	100	4.7 x 10 ⁵
²² Na	Sodium (11)	8	8	6.3 x 10 ³
²⁴ Na		5	5	8.7 x 10 ⁶
⁹³ Nb ^m	Niobium (41)	1000	200	1.1 x 10 ³
⁹⁵ Nb		20	20	3.9 x 10 ⁴
⁹⁷ Nb		20	20	2.6 x 10 ⁷
¹⁴⁷ Nd	Neodymium (60)	100	100	8.0 x 10 ⁴
¹⁴⁹ Nd		30	30	1.1 x 10 ⁷
⁵⁹ Ni	Nickel (28)	1000	900	8.1 x 10 ⁻²
⁶³ Ni		1000	100	4.6 x 10
⁶⁵ Ni		10	10	1.9 x 10 ⁷
²³⁷ Np	Neptunium (93)	5	0.005	6.9 x 10 ⁻⁴
²³⁹ Np		200	200	2.3 x 10 ⁵
¹⁸⁵ Os	Osmium (76)	20	20	7.3 x 10 ³
¹⁹¹ Os		600	400	4.6 x 10 ⁴
¹⁹¹ Os ^m		200	200	1.2 x 10 ⁶
¹⁹³ Os		100	100	5.3 x 10 ⁵
³² P	Phosphorus (15)	30	30	2.9 x 10 ⁵
²³⁰ Pa	Protoactinium (91)	20	0.8	3.2 x 10 ⁴
²³¹ Pa		2	0.002	4.5 x 10 ⁻²
²³³ Pa		100	100	2.1 x 10 ⁴
²¹⁰ Pb	Lead (82)	100	0.2	8.8 x 10
²¹² Pb		6	/	1.4 x 10 ⁶
¹⁰³ Pd	Palladium (46)	1000	700	7.5 x 10 ⁴
¹⁰⁹ Pd		100	100	2.1 x 10 ⁶

Symbol of radionuclide	Element and atomic number	A ₁ (Ci)	A ₂ (Ci)	Specific activity (Ci/g)
¹⁴⁷ Fm	Promethium (61)	1000	80	9.4 x 10 ²
¹⁴⁹ Fm		100	100	4.2 x 10 ⁵
²¹⁰ Po	Polonium (84)	200	0.2	4.5 x 10 ³
¹⁴² Pr	Praseodymium (59)	10	10	1.2 x 10 ⁶
¹⁴³ Pr		300	200	6.6 x 10 ⁴
¹⁹¹ Pt	Platinum (78)	100	100	2.3 x 10 ⁵
¹⁹³ Pt		200	200	
¹⁹⁷ Pt ^m		300	300	1.2 x 10 ⁷
¹⁹⁷ Pt		300	300	8.8 x 10 ⁵
²³⁸ Pu	Plutonium (94)	3	0.003	1.7 x 10
²³⁹ Pu		2	0.002	6.2 x 10 ⁻²
²⁴⁰ Pu		2	0.002	2.3 x 10 ⁻¹
²⁴¹ Pu		1000	0.1	1.1 x 10 ²
²⁴² Pu		3	0.003	3.9 x 10 ⁻³
²²³ Ra	Radium (88)	50	0.2	5.0 x 10 ⁴
²²⁴ Ra		6	0.5	1.6 x 10 ⁵
²²⁶ Ra		10	0.05	1.0
²²⁸ Ra		10	0.05	2.3 x 10 ²
⁸⁶ Rb	Rubidium (37)	30	30	8.1 x 10 ⁴
⁸⁷ Rb		Unlimited	Unlimited	6.6 x 10 ⁻⁸
Rb (natural)		Unlimited	Unlimited	1.8 x 10 ⁻⁸
¹⁸⁶ Re	Rhenium (75)	100	100	1.9 x 10 ⁵
¹⁸⁷ Re		Unlimited	Unlimited	3.8 x 10 ⁻⁸
¹⁸⁸ Re		10	10	1.0 x 10 ⁶
Re (natural)		Unlimited	Unlimited	2.4 x 10 ⁻⁸
¹⁰³ Rh ^m	Rhodium (45)	1000	1000	3.2 x 10 ⁷
¹⁰⁵ Rh		200	200	8.2 x 10 ⁵
²²² Rn	Radon (86)	10	2	1.5 x 10 ⁵
⁹⁷ Ru	Ruthenium (44)	80	80	5.5 x 10 ⁵
¹⁰³ Ru		30	30	3.2 x 10 ⁴

Symbol of radionuclide	Element and atomic number	A ₁ (Ci)	A ₂ (Ci)	Specific activity (Ci/g)
¹⁰⁵ Ru	Ruthenium	20	20	6.6 × 10 ⁶
¹⁰⁶ Ru	(cont'd)	10	7	3.4 × 10 ³
³⁵ S	Sulphur (16)	1000	300	4.3 × 10 ⁴
¹²² Sb	Antimony (51)	30	30	3.9 × 10 ⁵
¹²⁴ Sb		5	5	1.8 × 10 ⁴
¹²⁵ Sb		40	30	1.4 × 10 ³
⁴⁶ Sc	Scandium (21)	8	8	3.4 × 10 ⁴
⁴⁷ Sc		200	200	8.2 × 10 ⁵
⁴⁸ Sc		5	5	1.5 × 10 ⁶
⁷⁵ Se	Selenium (34)	40	40	1.4 × 10 ⁴
³¹ Si	Silicon (14)	100	100	3.9 × 10 ⁷
¹⁴⁷ Sm	Samarium (62)	Unlimited	Unlimited	2.0 × 10 ⁻⁸
¹⁵¹ Sm		1000	90	2.6 × 10
¹⁵³ Sm		300	300	4.4 × 10 ⁵
¹¹³ Sn	Tin (50)	60	60	1.0 × 10 ⁴
¹²⁵ Sn		10	10	1.1 × 10 ⁵
⁸⁵ Sr ^m	Strontium (38)	80	80	3.2 × 10 ⁷
⁸⁵ Sr		30	30	2.4 × 10 ⁴
⁸⁷ Sr ^m		50	50	1.2 × 10 ⁷
⁸⁹ Sr		100	40	2.9 × 10 ⁴
⁹⁰ Sr		10	0.4	1.5 × 10 ²
⁹¹ Sr		10	10	3.6 × 10 ⁶
⁹² Sr		10	10	1.3 × 10 ⁷
T (uncompressed)	Tritium (1)	1000	1000	9.7 × 10 ³
T (compressed)		1000	1000	
T (activated luminous paint)		1000	1000	
T (absorbed on solid carrier)		1000	1000	
T (tritiated water)		1000	1000	
T (other forms)		20	20	

Symbol of radionuclide	Element and atomic number	A ₁ (Ci)	A ₂ (Ci)	Specific activity (Ci/g)
182 _{Ta}	Tantalum (73)	20	20	6.2 x 10 ³
160 _{Tb}	Terbium (65)	20	20	1.1 x 10 ⁴
96 _{Tc^m}	Technetium (43)	1000	1000	3.8 x 10 ⁷
96 _{Tc}		6	6	3.2 x 10 ⁵
97 _{Tc^m}		1000	200	1.5 x 10 ⁴
97 _{Tc}		1000	400	1.4 x 10 ⁻³
99 _{Tc^m}		100	100	5.2 x 10 ⁶
99 _{Tc}		1000	80	1.7 x 10 ⁻²
125 _{Te^m}	Tellurium (52)	1000	100	1.8 x 10 ⁴
127 _{Te^m}		300	40	4.0 x 10 ⁴
127 _{Te}		300	300	2.6 x 10 ⁶
129 _{Te^m}		30	30	2.5 x 10 ⁴
129 _{Te}		100	100	2.0 x 10 ⁷
131 _{Te^m}		10	10	8.0 x 10 ⁵
132 _{Te}		7	7	3.1 x 10 ⁵
227 _{Th}	Thorium (90)	200	0.2	3.2 x 10 ⁴
228 _{Th}		6	0.008	8.3 x 10 ²
230 _{Th}		3	0.003	1.9 x 10 ⁻²
231 _{Th}		1000	1000	5.3 x 10 ⁵
232 _{Th}		Unlimited	Unlimited	1.1 x 10 ⁻⁷
234 _{Th}		10	10	2.3 x 10 ⁴
Th (natural)		Unlimited	Unlimited	(see Table XXI)
Th (irradiated)		a/	a/	
200 _{Tl}	Thallium (81)	20	20	5.8 x 10 ⁵
201 _{Tl}		200	200	2.2 x 10 ⁵
202 _{Tl}		40	40	5.4 x 10 ⁴
204 _{Tl}		300	30	4.3 x 10 ²

a/ The values for A₁ and A₂ shall be calculated in accordance with marginal 3691(3) taking into account the activity of the fission products and uranium-233 in addition to that of thorium.

Symbol of radionuclide	Element and atomic number	A ₁ (Ci)	A ₂ (Ci)	Specific activity (Ci/g)
170 _{Tm}	Thulium (69)	300	40	6.0 x 10 ⁻³
171 _{Tm}		1000	100	1.1 x 10 ⁻³
230 _U	Uranium (92)	100	0.1	2.7 x 10 ⁴
232 _U		30	0.03	2.1 x 10
233 _U		100	0.1	9.5 x 10 ⁻³
234 _U		100	0.1	6.2 x 10 ⁻³
235 _U		100	0.2	2.1 x 10 ⁻⁶
236 _U		200	0.2	6.3 x 10 ⁻⁵
238 _U		Unlimited	Unlimited	3.3 x 10 ⁻⁷
U (natural)		Unlimited	Unlimited	(see Table XXI)
U (enriched) (< 20% 20% or greater)	Unlimited 100	Unlimited 0.1	(see Table XXI)	
U (depleted)	Unlimited	Unlimited	(see Table XXI)	
U (irradiated)	b/	b/		
48 _V	Vanadium (23)	6	6	1.7 x 10 ⁵
181 _W	Tungsten (74)	200	100	5.0 x 10 ³
185 _W		1000	100	9.7 x 10 ⁻³
187 _W		40	40	7.0 x 10 ⁵
131 _{Xe} ^m (compressed)	Xenon (54)	10	10	1.0 x 10 ⁵
131 _{Xe} ^m (uncompressed)		100	100	1.0 x 10 ⁵
133 _{Xe} (uncompressed)		1000	1000	1.9 x 10 ⁵
133 _{Xe} (compressed)		5	5	1.9 x 10 ⁵
135 _{Xe} (uncompressed)		70	70	2.5 x 10 ⁶
135 _{Xe} (compressed)		2	2	2.5 x 10 ⁶
90 _Y	Yttrium (39)	10	10	5.3 x 10 ⁵
91 _Y ^m		30	30	4.1 x 10 ⁷
91 _Y		30	30	2.5 x 10 ⁴

b/ The values for A₁ and A₂ shall be calculated in accordance with marginal 3691(3) taking into account the activity of the fission products and plutonium isotopes in addition to that of the uranium.

Symbol of radionuclide	Element and atomic number	A ₁ (Ci)	A ₂ (Ci)	Specific activity (Ci/g)
⁹² Y	Yttrium (cont'd)	10	10	9.5 x 10 ⁶
⁹³ Y		10	10	3.2 x 10 ⁶
¹⁷⁵ Yb	Ytterbium (70)	400	400	1.8 x 10 ⁵
⁶⁵ Zn	Zinc (30)	30	30	8.0 x 10 ³
⁶⁹ Zn ^m		40	40	3.3 x 10 ⁶
⁶⁹ Zn		300	300	5.3 x 10 ⁷
⁹³ Zr	Zirconium (40)	1000	200	3.5 x 10 ⁻³
⁹⁵ Zr		20	20	2.1 x 10 ⁴
⁹⁷ Zr		20	20	2.0 x 10 ⁶

TABLE XXI. ACTIVITY-MASS RELATIONSHIPS FOR URANIUM AND NATURAL THORIUM^{a/}
 (This table is referred to in Table XX).

Radioactive material	Ci/g	g/Ci
Uranium		
(wt% ²³⁵ U present)		
0.45	5.0×10^{-7}	2.0×10^6
0.72 (natural)	7.06×10^{-7}	1.42×10^6
1.0	7.6×10^{-7}	1.3×10^6
1.5	1.0×10^{-6}	1.0×10^6
5.0	2.7×10^{-6}	3.7×10^5
10.0	4.8×10^{-6}	2.1×10^5
20.0	1.0×10^{-5}	1.0×10^5
35.0	2.0×10^{-5}	5.0×10^4
50.0	2.5×10^{-5}	4.0×10^4
90.0	5.8×10^{-5}	1.7×10^4
95.0	7.0×10^{-5}	1.4×10^4
95.0	9.1×10^{-5}	1.1×10^4
Natural thorium	2.2×10^{-7}	4.6×10^6

^{a/} The figures for uranium include the activity of uranium-234 which is concentrated during the enrichment process. The activity for thorium includes the equilibrium concentration of thorium-228.

(2) For any single radionuclide whose identity is known, but which is not listed in Table XX, the values of A_1 and A_2 shall be determined according to the procedure given below:

(a) If the radionuclide emits only one type of radiation, A_1 shall be determined according to the rules in (i), (ii), (iii) and (iv) below. For radionuclides emitting different kinds of radiation, A_1 shall be the most restrictive value of those determined for each individual radiation. However, in both cases A_1 shall be restricted to a maximum of 1000 Ci. If a parent nuclide decays into a shorter lived daughter, of a half-life not greater than 10 days, A_1 shall be calculated for both the parent and the daughter, and the more limiting of the two values should be assigned to the parent nuclide.

- (i) For gamma emitters, A_1 is determined by the expression:

$$A_1 = \frac{9}{\Gamma} \text{ curies}$$

where Γ is the gamma-ray constant, corresponding to the dose in R/h at 1 m per Ci; the number 9 results from the choice of 1 rem/h at a distance of 3 m as the reference dose equivalent rate.

- (ii) For X-ray emitters, A_1 is determined by the atomic number of the nuclide:

$$\text{for } Z \leq 55 ; A_1 = 1000 \text{ Ci}$$

$$\text{for } Z > 55 ; A_1 = 200 \text{ Ci}$$

- (iii) For beta emitters, A_1 is determined by the maximum beta energy (E_{\max}) according to Table XXII.

- (iv) For alpha emitters A_1 is determined by the expression:

$$A_1 = 1000 A_3$$

where A_3 is the value listed in Table XXIII.

- (b) A_2 shall be the more restrictive of the following two values:

- (1) the corresponding A_1 and (2) the value A_3 obtained from Table XXIII.

TABLE XXII RELATIONSHIP BETWEEN A_1 AND E_{\max} FOR BETA EMITTERS

E_{\max} (MeV)	A_1 (Ci)
≤ 0.5	1000
0.5 - ≤ 1.0	300
1.0 - ≤ 1.5	100
1.5 - ≤ 2.0	30
> 2.0	10

TABLE XXIII RELATIONSHIP BETWEEN A_3 AND THE ATOMIC NUMBER OF THE RADIONUCLIDE

Atomic number	A_3		
	Half-life less than 1000 days	Half-life 1000 days to 10^6 years	Half-life greater than 10^6 years
1 to 81	3 Ci	50 mCi	3 Ci
82 and above	2 mCi	2 mCi	3 Ci

(3) For any single radionuclide whose identity is unknown, the value of A_1 shall be taken to be 2 Ci and the value of A_2 shall be taken to be 0.002 Ci. However, if the atomic number of the radionuclide is known to be less than 82, the value of A_1 shall be taken to be 10 Ci and the value of A_2 shall be taken to be 0.4 Ci.

2. Mixtures of radionuclides, including radioactive decay chains

3691

(1) For mixed fission products the following activity limits may be assumed, if a detailed analysis of the mixture is not carried out:

$$A_1 = 10 \text{ Ci}$$

$$A_2 = 0.4 \text{ Ci}$$

(2) A single radioactive decay chain in which the radionuclides are present in their naturally occurring proportions and in which no daughter nuclide has a half-life either longer than 10 days or longer than that of the parent nuclide shall be considered as a single radionuclide. The activity to be taken into account and the A_1 or A_2 value to be applied shall be those corresponding to the parent nuclide of that chain. However, in the case of radioactive decay chains in which any daughter nuclide has a half-life either longer than 10 days or greater than that of the parent nuclide, the parent and such daughter nuclides shall be considered as mixtures of different nuclides.

(3) In the case of a mixture of different radionuclides, where the identity and activity of each radionuclide are known, the permissible activity of each radionuclide $R_1, R_2 \dots R_n$ shall be such that $F_1 + F_2 + \dots + F_n$ is not greater than unity, where

$$F_1 = \frac{\text{Total activity of } R_1}{A_1(R_1)}$$

$$F_2 = \frac{\text{Total activity of } R_2}{A_1 (R_2)}$$

$$F_n = \frac{\text{Total activity of } R_n}{A_1 (R_n)}$$

$A_1 (R_1), A_1 (R_2), \dots, A_1 (R_n)$ is the value of A_1 or A_2 as appropriate for the nuclide $R_1, R_2 \dots R_n$.

(4) When the identity of each radionuclide is known but the individual activities of some of the radionuclides are not known, the formula given in paragraph (3) shall be applied to establish the values of A_1 or A_2 as appropriate. All the radionuclides whose individual activities are not known (their total activity will, however, be known) shall be classed in a single group and the most restrictive value of A_1 and A_2 applicable to any one of them shall be used as the value of A_1 or A_2 in the denominator of the fraction.

(5) Where the identity of each radionuclide is known but the individual activity of none of the radionuclides is known, the most restrictive value of A_1 or A_2 applicable to any one of the radionuclides present shall be adopted as the applicable value.

(6) When the identity of none or only some of the nuclides is known, the value of A_1 shall be taken to be 2 Ci and the value of A_2 shall be taken to be 0.002 Ci. However, if alpha emitters are known to be absent, the value of A_2 shall be taken to be 0.4 Ci.

3692-
3694

CHAPTER VII. DECONTAMINATION, LEAKING PACKAGES AND ACCIDENTS

3695

(1) If a package containing radioactive substances is broken or is visibly leaking or is involved in an accident during carriage, the vehicle or affected area shall be isolated so as to prevent all contact of persons with radioactive substances and, when possible, shall be duly marked off or surrounded by barriers. No-one shall be authorized to stay within the isolated area until qualified persons arrive to supervise the handling and salvage work. The sender and authorities concerned shall be notified immediately. Notwithstanding these provisions, the presence of radioactive substances shall not be considered as a bar to operations for the rescue of people or fire-fighting.

(2) If radioactive substances have leaked, have been spilled or have been scattered in any way whatever in a place, area or on to goods or equipment used in storage, qualified persons shall be called in as soon as possible to direct decontamination operations. The place, area or equipment thus contaminated shall only be put back into service when its use has been declared free from danger by qualified persons.

(3) Except as provided for in paragraph (4) any vehicles, equipment or part thereof, which have been contaminated in the course of carriage of radioactive substances shall be decontaminated as soon as possible by a qualified person and shall not be reused unless the non-fixed radioactive contamination is below the levels specified in Table XIX and the vehicles, equipment or part thereof have been declared safe in respect of residual radiation levels by a qualified person.

(4) Vehicles or compartments used for the bulk transport or tank transport of low specific activity substances, or for the transport of packages of low specific activity substances carried as a full load or for the transport of low level solid radioactive substances as a full load shall not be used for other goods until decontaminated as specified in paragraph (3).

3696-3699

APPENDIX A.9

Marginal 3902 - Entries for labels 6A, 6B and 6C

Substitute for 'marginal 2459 (1)':

"schedules 5 to 12 as appropriate and in marginal 3656 (1), (2) and (3)."

ANNEX B

Chapter IGENERAL PROVISIONS APPLICABLE TO THE CARRIAGE OF
DANGEROUS SUBSTANCES OF ALL CLASSES

Marginal 10 100 (1).

Delete second sentence beginning:
"It also exempts ... "

Chapter IISPECIAL PROVISIONS APPLICABLE TO THE CARRIAGE OF
DANGEROUS SUBSTANCES OF CLASSES I TO VIIClass IVaRadioactive Substances

Should be replaced by the following:

Class IVbRadioactive SubstancesSection 1GeneralCarriage

42 000

For details see the relevant schedule in marginal 2453.

42 001-
42 170

Crews of vehicles: supervision

42 171

The provisions of marginal 10 171 (2) shall apply to all substances, in whatever quantity. However, the provisions of marginal 10 171 (2) need not be applied where:

- (a) the loaded compartment is locked and the packages carried are otherwise protected against any illicit unloading, and

- (b) the dose rate does not exceed 0.5 mR/h at any accessible point on the surface of the vehicle.

42 172-
42 199

Section 2

Special requirements to be fulfilled
by vehicles and their equipment

Provisions

42 200

For details see the relevant schedule in marginal 2453.

42 201-
42 299

Section 3

General Service Provisions

Provisions

42 300

For details see the relevant schedule in marginal 2453.

42 301-
42 373

Prohibition of smoking

42 374

The provisions of marginal 10 374 shall not apply.

42 375-
42 399

Section 4

Special provisions concerning loading,
unloading and handling

Provisions

42 400

For details see the relevant schedule in marginal 2453.

42 401-
42 499

Section 5

Special provisions concerning the
operation of vehicles

Vehicle signs

42 500

- (1) Marginal 10 500 shall not apply.

(2) Every road vehicle carrying radioactive substances shall bear on the outside of each side wall and of the rear wall a label conforming to the model shown in Appendix B.4, marginal 240 O10. If loading is done by the sender, it shall be his duty to affix these labels to the vehicles.

42 501-
42 506

Parking of a vehicle constituting a special danger

(See, in addition to marginal 10 507, marginal 42 302).

42 508-
42 599

Section 6

Transitional provisions, derogations, and provisions peculiar to certain countries

(No special provisions).

42 600-
50 999

APPENDIX B.4

Should be replaced by the following:

Tables concerning the carriage of dangerous substances of Class IVb; Label to be placed on vehicles carrying these substances.

240 000 The minimum distances indicated in the table below between radioactive substances and areas on vehicles reserved for the driving and accompanying personnel are compatible with the provisions of marginal 3659(8)

Total sum of transport index	Minimum distances in metres, no shielding material intervening, from living accommodations or regularly occupied working space
	Applicable data in the case of exposure time not exceeding 250 hours per annum
Less than 2	1.0
2 to 4	1.5
4 to 8	2.5
8 to 12	3.0
12 to 20	4.0
20 to 30	5.0
30 to 40	5.5
40 to 50	6.5

240 001 The minimum safety distances referred to in marginal 3657 for the loading and storage of packages which bear a label "FOTO" together with packages of Category II - YELLOW or Category III - YELLOW are given in the following table.

Separation distances for the loading and the storage of packages which bear a label with the word FOTO together with packages of Categories II - YELLOW or III - YELLOW

Total sum of the packages of the category		Total sum of the transport index	Journey or storage duration, in hours								
YELLOW III	YELLOW II		1	2	4	10	24	48	120	240	
			Minimum distances in metres								
		0.2	0.5	0.5	0.5	0.5	1	1	2	3	
		0.5	0.5	0.5	1	1	2	3	5	7	
	1	1	0.5	0.5	1	1	2	3	5	7	
	2	2	0.5	1	1	1.5	3	4	7	9	
	4	4	1	1	1.5	3	4	6	9	13	
	8	8	1	1.5	2	4	6	8	13	18	
1	10	10	1	2	3	4	7	9	14	20	
2	20	20	1.5	3	4	6	9	13	20	30	
3	30	30	2	3	5	7	11	16	25	35	
4	40	40	3	4	5	8	13	18	30	40	
5	50	50	3	4	6	9	14	20	32	45	

240 002-
240 009

The label to be affixed to the walls of vehicles pursuant to the provisions of marginal 3659(6) shall conform to the model reproduced below: 240 010



(Minimum length of side: 15 cm)
Symbol and inscription black
on white ground

240 011-
240 999

Authentic text of the amendments: French.

Registered ex officio on 21 April 1976.
