SCHEDULE 1 Regulations 5, 25, 29, 41 and 43

TABLES

TABLE I

Basic Radionuclide Values

(1) *Radionuclide (atomic number)*	*(2)* A_1 *(TBq)*	*(3)* A_2 *(TBq)*	*(4)* *Activity concentration for exempt material* *(Bq/g)*	*(5)* *Activity limit for an exempt consignment* *(Bq)*
Actinium (89)				
Ac-225[(a)]	8×10^{-1}	6×10^{-3}	1×10^{1}	1×10^{4}
Ac-227[(a)]	9×10^{-1}	9×10^{-5}	1×10^{-1}	1×10^{3}
Ac-228	6×10^{-1}	5×10^{-1}	1×10^{1}	1×10^{6}
Silver (47)				
Ag-10[5]	2×10^{0}	2×10^{0}	1×10^{2}	1×10^{6}
Ag-108;[(a)]	7×10^{-1}	7×10^{-1}	1×10^{1}[(b)]	1×10^{6}[(b)]
Ag-110m[(a)]	4×10^{-1}	4×10^{-1}	1×10^{1}	1×10^{6}
Ag-111	2×10^{0}	6×10^{-1}	1×10^{3}	1×10^{6}
Aluminium (13)				
Al-26	1×10^{-1}	1×10^{-1}	1×10^{1}	1×10^{5}
Americium (95)				
Am-241	1×10^{1}	1×10^{-3}	1×10^{0}	1×10^{4}
Am-242m[(a)]	1×10^{1}	1×10^{-3}	1×10^{0}[(b)]	1×10^{4}[(b)]
Am-243[(a)]	5×10^{0}	1×10^{-3}	1×10^{0}[(b)]	1×10^{3}[(b)]
Argon (18)				
Ar-37	4×10^{1}	4×10^{1}	1×10^{6}	1×10^{8}
Ar-39	4×10^{1}	2×10^{1}	1×10^{7}	1×10^{4}
Ar-41	3×10^{-1}	3×10^{-1}	1×10^{2}	1×10^{9}
Arsenic (33)				
As-72	3×10^{-1}	3×10^{-1}	1×10^{1}	1×10^{5}
As-73	4×10^{1}	4×10^{1}	1×10^{3}	1×10^{7}
As-74	1×10^{0}	9×10^{-1}	1×10^{1}	1×10^{6}

(1) *Radionuclide (atomic number)*	*(2)* *A_1* *(TBq)*	*(3)* *A_2* *(TBq)*	*(4)* *Activity concentration for exempt material* *(Bq/g)*	*(5)* *Activity limit for an exempt consignment* *(Bq)*
As-76	3×10^{-1}	3×10^{-1}	1×10^{2}	1×10^{5}
As-77	2×10^{1}	7×10^{-1}	1×10^{3}	1×10^{6}
Astatine (85)				
At-211[(a)]	2×10^{1}	5×10^{-1}	1×10^{3}	1×10^{7}
Gold (79)				
Au-193	7×10^{0}	2×10^{0}	1×10^{2}	1×10^{7}
Au-194	1×10^{0}	1×10^{0}	1×10^{1}	1×10^{6}
Au-195	1×10^{1}	6×10^{0}	1×10^{2}	1×10^{7}
Au-198	1×10^{0}	6×10^{-1}	1×10^{2}	1×10^{6}
Au-199	1×10^{1}	6×10^{-1}	1×10^{2}	1×10^{6}
Barium (56)				
Ba-131[(a)]	2×10^{0}	2×10^{0}	1×10^{2}	1×10^{6}
Ba-133	3×10^{0}	3×10^{0}	1×10^{2}	1×10^{6}
Ba-133m	2×10^{1}	6×10^{-1}	1×10^{2}	1×10^{6}
Ba-140[(a)]	5×10^{-1}	3×10^{-1}	1×10^{1}[(b)]	1×10^{5}[(b)]
Beryllium (4)				
Be-7	2×10^{1}	2×10^{1}	1×10^{3}	1×10^{7}
Be-10	4×10^{1}	6×10^{-1}	1×10^{4}	1×10^{6}
Bismuth (83)				
Bi-205	7×10^{-1}	7×10^{-1}	1×10^{1}	1×10^{6}
Bi-206	3×10^{-1}	3×10^{-1}	1×10^{1}	1×10^{5}
Bi-207	7×10^{-1}	7×10^{-1}	1×10^{1}	1×10^{6}
Bi-210	1×10^{0}	6×10^{-1}	1×10^{3}	1×10^{6}
Bi-210m[(a)]	6×10^{-1}	2×10^{-2}	1×10^{1}	1×10^{5}
Bi-212[(a)]	7×10^{-1}	6×10^{-1}	1×10^{1}[(b)]	1×10^{5}[(b)]
Berkelium (97)				
Bk-247	8×10^{0}	8×10^{-4}	1×10^{0}	1×10^{4}
Bk-249[(a)]	4×10^{1}	3×10^{-1}	1×10^{3}	1×10^{6}

(1) *Radionuclide (atomic number)*	*(2)* *A_1* *(TBq)*	*(3)* *A_2* *(TBq)*	*(4)* *Activity concentration for exempt material* *(Bq/g)*	*(5)* *Activity limit for an exempt consignment* *(Bq)*
Bromine (35)				
Br-76	4×10^{-1}	4×10^{-1}	1×10^{1}	1×10^{5}
Br-77	3×10^{0}	3×10^{0}	1×10^{2}	1×10^{6}
Br-82	4×10^{-1}	4×10^{-1}	1×10^{1}	1×10^{6}
Carbon (6)				
C-11	1×10^{0}	6×10^{-1}	1×10^{1}	1×10^{6}
C-14	4×10^{1}	3×10^{0}	1×10^{4}	1×10^{7}
Calcium (20)				
Ca-41	Unlimited	Unlimited	1×10^{5}	1×10^{7}
Ca-45	4×10^{1}	1×10^{0}	1×10^{4}	1×10^{7}
Ca-47[(a)]	3×10^{0}	3×10^{-1}	1×10^{1}	1×10^{6}
Cadmium (48)				
Cd-109;	3×10^{1}	2×10^{0}	1×10^{4}	1×10^{6}
Cd-113m	4×10^{1}	5×10^{-1}	1×10^{3}	1×10^{6}
Cd-115[(a)]	3×10^{0}	4×10^{-1}	1×10^{2}	1×10^{6}
Cd-115m	5×10^{-1}	5×10^{-1}	1×10^{3}	1×10^{6}
Cerium (58)				
Ce-139	7×10^{0}	2×10^{0}	1×10^{2}	1×10^{6}
Ce-141	2×10^{1}	6×10^{-1}	1×10^{2}	1×10^{7}
Ce-143	9×10^{-1}	6×10^{-1}	1×10^{2}	1×10^{6}
Ce-144[(a)]	2×10^{-1}	2×10^{-1}	1×10^{2}[(b)]	1×10^{5}[(b)]
Californium (98)				
Cf-248	4×10^{1}	6×10^{-3}	1×10^{1}	1×10^{4}
Cf-249	3×10^{0}	8×10^{-4}	1×10^{0}	1×10^{3}
Cf-250	2×10^{1}	2×10^{-3}	1×10^{1}	1×10^{4}
Cf-251	7×10^{0}	7×10^{-4}	1×10^{0}	1×10^{3}
Cf-252	5×10^{-2}	3×10^{-3}	1×10^{1}	1×10^{4}
Cf-253[(a)]	4×10^{1}	4×10^{-2}	1×10^{2}	1×10^{5}

(1) *Radionuclide (atomic number)*	*(2)* A_1 *(TBq)*	*(3)* A_2 *(TBq)*	*(4)* *Activity concentration for exempt material* *(Bq/g)*	*(5)* *Activity limit for an exempt consignment* *(Bq)*
Cf-254	1×10^{-3}	1×10^{-3}	1×10^{0}	1×10^{3}
Chlorine (17)				
Cl-36	1×10^{1}	6×10^{-1}	1×10^{4}	1×10^{6}
Cl-38	2×10^{-1}	2×10^{-1}	1×10^{1}	1×10^{5}
Curium (96)				
Cm-240	4×10^{1}	2×10^{-2}	1×10^{2}	1×10^{5}
Cm-241	2×10^{0}	1×10^{0}	1×10^{2}	1×10^{6}
Cm-242	4×10^{1}	1×10^{-2}	1×10^{2}	1×10^{5}
Cm-243	9×10^{0}	1×10^{-3}	1×10^{0}	1×10^{4}
Cm-244	2×10^{1}	2×10^{-3}	1×10^{1}	1×10^{4}
Cm-245	9×10^{0}	9×10^{-4}	1×10^{0}	1×10^{3}
Cm-246	9×10^{0}	9×10^{-4}	1×10^{0}	1×10^{3}
Cm-247[(a)]	3×10^{0}	1×10^{-3}	1×10^{0}	1×10^{4}
Cm-248	2×10^{-2}	3×10^{-4}	1×10^{0}	1×10^{3}
Cobalt (27)				
Co-55	5×10^{-1}	5×10^{-1}	1×10^{1}	1×10^{6}
Co-56	3×10^{-1}	3×10^{-1}	1×10^{1}	1×10^{5}
Co-57	1×10^{1}	1×10^{1}	1×10^{2}	1×10^{6}
Co-58	1×10^{0}	1×10^{0}	1×10^{1}	1×10^{6}
Co-58m	4×10^{1}	4×10^{1}	1×10^{4}	1×10^{7}
Co-60	4×10^{-1}	4×10^{-1}	1×10^{1}	1×10^{5}
Chromium (24)				
Cr-51	3×10^{1}	3×10^{1}	1×10^{3}	1×10^{7}
Caesium (55)				
Cs-129	4×10^{0}	4×10^{0}	1×10^{2}	1×10^{5}
Cs-131	3×10^{1}	3×10^{1}	1×10^{3}	1×10^{6}
Cs-132	1×10^{0}	1×10^{0}	1×10^{1}	1×10^{5}
Cs-134	7×10^{-1}	7×10^{-1}	1×10^{1}	1×10^{4}

(1) *Radionuclide (atomic number)*	*(2)* A_1 *(TBq)*	*(3)* A_2 *(TBq)*	*(4)* *Activity concentration for exempt material* *(Bq/g)*	*(5)* *Activity limit for an exempt consignment* *(Bq)*
Cs-134m	4×10^{1}	6×10^{-1}	1×10^{3}	1×10^{5}
Cs-135	4×10^{1}	1×10^{0}	1×10^{4}	1×10^{7}
Cs-136	5×10^{-1}	5×10^{-1}	1×10^{1}	1×10^{5}
Cs-137[(a)]	2×10^{0}	6×10^{-1}	1×10^{1}[(b)]	1×10^{4}[(b)]
Copper (29)				
Cu-64	6×10^{0}	1×10^{0}	1×10^{2}	1×10^{6}
Cu-67	1×10^{1}	7×10^{-1}	1×10^{2}	1×10^{6}
Dysprosium (66)				
Dy-159	2×10^{1}	2×10^{1}	1×10^{3}	1×10^{7}
Dy-165	9×10^{-1}	6×10^{-1}	1×10^{3}	1×10^{6}
Dy-166[(a)]	9×10^{-1}	3×10^{-1}	1×10^{3}	1×10^{6}
Erbium (68)				
Er-169	4×10^{1}	1×10^{0}	1×10^{4}	1×10^{7}
Er-171	8×10^{-1}	5×10^{-1}	1×10^{2}	1×10^{6}
Europium (63)				
Eu-147	2×10^{0}	2×10^{0}	1×10^{2}	1×10^{6}
Eu-148	5×10^{-1}	5×10^{-1}	1×10^{1}	1×10^{6}
Eu-149	2×10^{1}	2×10^{1}	1×10^{2}	1×10^{7}
Eu-150(short lived)	2×10^{0}	7×10^{-1}	1×10^{3}	1×10^{6}
Eu-150(long lived)	7×10^{-1}	7×10^{-1}	1×10^{1}	1×10^{6}
Eu-152	1×10^{0}	1×10^{0}	1×10^{1}	1×10^{6}
Eu-152m	8×10^{-1}	8×10^{-1}	1×10^{2}	1×10^{6}
Eu-154	9×10^{-1}	6×10^{-1}	1×10^{1}	1×10^{6}
Eu-155	2×10^{1}	3×10^{0}	1×10^{2}	1×10^{7}
Eu-156	7×10^{-1}	7×10^{-1}	1×10^{1}	1×10^{6}
Fluorine (9)				
F-18	1×10^{0}	6×10^{-1}	1×10^{1}	1×10^{6}

(1) *Radionuclide (atomic number)*	*(2)* A_1 *(TBq)*	*(3)* A_2 *(TBq)*	*(4)* *Activity concentration for exempt material* *(Bq/g)*	*(5)* *Activity limit for an exempt consignment* *(Bq)*
Iron (26)				
Fe-52[(a)]	3×10^{-1}	3×10^{-1}	1×10^{1}	1×10^{6}
Fe-55	4×10^{1}	4×10^{1}	1×10^{4}	1×10^{6}
Fe-59	9×10^{-1}	9×10^{-1}	1×10^{1}	1×10^{6}
Fe-60[(a)]	4×10^{1}	2×10^{-1}	1×10^{2}	1×10^{5}
Gallium (31)				
Ga-67	7×10^{0}	3×10^{0}	1×10^{2}	1×10^{6}
Ga-68	5×10^{-1}	5×10^{-1}	1×10^{1}	1×10^{5}
Ga-72	4×10^{-1}	4×10^{-1}	1×10^{1}	1×10^{5}
Gadolinium (64)				
Gd-146[(a)]	5×10^{-1}	5×10^{-1}	1×10^{1}	1×10^{6}
Gd-148	2×10^{1}	2×10^{-3}	1×10^{1}	1×10^{4}
Gd-153	1×10^{1}	9×10^{0}	1×10^{2}	1×10^{7}
Gd-159	3×10^{0}	6×10^{-1}	1×10^{3}	1×10^{6}
Germanium (32)				
Ge-68[(a)]	5×10^{-1}	5×10^{-1}	1×10^{1}	1×10^{5}
Ge-71	4×10^{1}	4×10^{1}	1×10^{4}	1×10^{8}
Ge-77	3×10^{-1}	3×10^{-1}	1×10^{1}	1×10^{5}
Hafnium (72)				
Hf-172[(a)]	6×10^{-1}	6×10^{-1}	1×10^{1}	1×10^{6}
Hf-175	3×10^{0}	3×10^{0}	1×10^{2}	1×10^{6}
Hf-181	2×10^{0}	5×10^{-1}	1×10^{1}	1×10^{6}
Hf-182	Unlimited	Unlimited	1×10^{2}	1×10^{6}
Mercury (80)				
Hg-194[(a)]	1×10^{0}	1×10^{0}	1×10^{1}	1×10^{6}
Hg-195m[(a)]	3×10^{0}	7×10^{-1}	1×10^{2}	1×10^{6}
Hg-197	2×10^{1}	1×10^{1}	1×10^{2}	1×10^{7}
Hg-197m	1×10^{1}	4×10^{-1}	1×10^{2}	1×10^{6}

(1) *Radionuclide (atomic number)*	*(2)* A_1 *(TBq)*	*(3)* A_2 *(TBq)*	*(4)* *Activity concentration for exempt material* *(Bq/g)*	*(5)* *Activity limit for an exempt consignment* *(Bq)*
Hg-203	5×10^{0}	1×10^{0}	1×10^{2}	1×10^{5}
Holmium (67)				
Ho-166	4×10^{-1}	4×10^{-1}	1×10^{3}	1×10^{5}
Ho-166m	6×10^{-1}	5×10^{-1}	1×10^{1}	1×10^{6}
Iodine (53)				
I-123	6×10^{0}	3×10^{0}	1×10^{2}	1×10^{7}
I-124	1×10^{0}	1×10^{0}	1×10^{1}	1×10^{6}
I-125	2×10^{1}	3×10^{0}	1×10^{3}	1×10^{6}
I-126	2×10^{0}	1×10^{0}	1×10^{2}	1×10^{6}
I-129	Unlimited	Unlimited	1×10^{2}	1×10^{5}
I-131	3×10^{0}	7×10^{-1}	1×10^{2}	1×10^{6}
I-132	4×10^{-1}	4×10^{-1}	1×10^{1}	1×10^{5}
I-133	7×10^{-1}	6×10^{-1}	1×10^{1}	1×10^{6}
I-134	3×10^{-1}	3×10^{-1}	1×10^{1}	1×10^{5}
I-135[(a)]	6×10^{-1}	6×10^{-1}	1×10^{1}	1×10^{6}
Indium (49)				
In-111	3×10^{0}	3×10^{0}	1×10^{2}	1×10^{6}
In-113m	4×10^{0}	2×10^{0}	1×10^{2}	1×10^{6}
In-114m[(a)]	1×10^{1}	5×10^{-1}	1×10^{2}	1×10^{6}
In-115m	7×10^{0}	1×10^{0}	1×10^{2}	1×10^{6}
Iridium (77)				
Ir-189[(a)]	1×10^{1}	1×10^{1}	1×10^{2}	1×10^{7}
Ir-190	7×10^{-1}	7×10^{-1}	1×10^{1}	1×10^{6}
Ir-192	1×10^{0}[(c)]	6×10^{-1}	1×10^{1}	1×10^{4}
Ir-194	3×10^{-1}	3×10^{-1}	1×10^{2}	1×10^{5}
Potassium (19)				
K-40	9×10^{-1}	9×10^{-1}	1×10^{2}	1×10^{6}
K-42	2×10^{-1}	2×10^{-1}	1×10^{2}	1×10^{6}

(1) *Radionuclide (atomic number)*	*(2)* A_1 *(TBq)*	*(3)* A_2 *(TBq)*	*(4)* *Activity concentration for exempt material* *(Bq/g)*	*(5)* *Activity limit for an exempt consignment* *(Bq)*
K-43	7×10^{-1}	6×10^{-1}	1×10^{1}	1×10^{6}
Krypton (36)				
Kr-81	4×10^{1}	4×10^{1}	1×10^{4}	1×10^{7}
Kr-85	1×10^{1}	1×10^{1}	1×10^{5}	1×10^{4}
Kr-85m	8×10^{0}	3×10^{0}	1×10^{3}	1×10^{10}
Kr-87	2×10^{-1}	2×10^{-1}	1×10^{2}	1×10^{9}
Lanthanum (57)				
La-137	3×10^{1}	6×10^{0}	1×10^{3}	1×10^{7}
La-140	4×10^{-1}	4×10^{-1}	1×10^{1}	1×10^{5}
Lutetium (71)				
Lu-172	6×10^{-1}	6×10^{-1}	1×10^{1}	1×10^{6}
Lu-173	8×10^{0}	8×10^{0}	1×10^{2}	1×10^{7}
Lu-174	9×10^{0}	9×10^{0}	1×10^{2}	1×10^{7}
Lu-174m	2×10^{1}	1×10^{1}	1×10^{2}	1×10^{7}
Lu-177	3×10^{1}	7×10^{-1}	1×10^{3}	1×10^{7}
Magnesium (12)				
Mg-28[(a)]	3×10^{-1}	3×10^{-1}	1×10^{1}	1×10^{5}
Manganese (25)				
Mn-52	3×10^{-1}	3×10^{-1}	1×10^{1}	1×10^{5}
Mn-53	Unlimited	Unlimited	1×10^{4}	1×10^{9}
Mn-54	1×10^{0}	1×10^{0}	1×10^{1}	1×10^{6}
Mn-56	3×10^{-1}	3×10^{-1}	1×10^{1}	1×10^{5}
Molybdenum (42)				
Mo-93	4×10^{1}	2×10^{1}	1×10^{3}	1×10^{8}
Mo-99[(a)]	1×10^{0}	6×10^{-1}	1×10^{2}	1×10^{6}
Nitrogen (7)				
N-13	9×10^{-1}	6×10^{-1}	1×10^{2}	1×10^{9}
Sodium (11)				

(1) *Radionuclide (atomic number)*	*(2)* A_1 *(TBq)*	*(3)* A_2 *(TBq)*	*(4)* *Activity concentration for exempt material* *(Bq/g)*	*(5)* *Activity limit for an exempt consignment* *(Bq)*
Na-22	5×10^{-1}	5×10^{-1}	1×10^{1}	1×10^{6}
Na-24	2×10^{-1}	2×10^{-1}	1×10^{1}	1×10^{5}
Niobium (41)				
Nb-93m	4×10^{1}	3×10^{1}	1×10^{4}	1×10^{7}
Nb-94	7×10^{-1}	7×10^{-1}	1×10^{1}	1×10^{6}
Nb-95	1×10^{0}	1×10^{0}	1×10^{1}	1×10^{6}
Nb-97	9×10^{-1}	6×10^{-1}	1×10^{1}	1×10^{6}
Neodymium (60)				
Nd-147	6×10^{0}	6×10^{-1}	1×10^{2}	1×10^{6}
Nd-149	6×10^{-1}	5×10^{-1}	1×10^{2}	1×10^{6}
Nickel (28)				
Ni-59	Unlimited	Unlimited	1×10^{4}	1×10^{8}
Ni-63	4×10^{1}	3×10^{1}	1×10^{5}	1×10^{8}
Ni-65	4×10^{-1}	4×10^{-1}	1×10^{1}	1×10^{6}
Neptunium (93)				
Np-235	4×10^{1}	4×10^{1}	1×10^{3}	1×10^{7}
Np-236(short-lived)	2×10^{1}	2×10^{0}	1×10^{3}	1×10^{7}
Np-236(long-lived)	9×10^{0}	2×10^{-2}	1×10^{2}	1×10^{5}
Np-237	2×10^{1}	2×10^{-3}	1×10^{0}**(b)**	1×10^{3}**(b)**
Np-239	7×10^{0}	4×10^{-1}	1×10^{2}	1×10^{7}
Osmium (76)				
Os-185	1×10^{0}	1×10^{0}	1×10^{1}	1×10^{6}
Os-191	1×10^{1}	2×10^{0}	1×10^{2}	1×10^{7}
Os-191m	4×10^{1}	3×10^{1}	1×10^{3}	1×10^{7}
Os-193	2×10^{0}	6×10^{-1}	1×10^{2}	1×10^{6}
Os-194**(a)**	3×10^{-1}	3×10^{-1}	1×10^{2}	1×10^{5}
Phosphorus (15)				

(1) *Radionuclide (atomic number)*	*(2)* A_1 *(TBq)*	*(3)* A_2 *(TBq)*	*(4)* *Activity concentration for exempt material* *(Bq/g)*	*(5)* *Activity limit for an exempt consignment* *(Bq)*
P-32	5×10^{-1}	5×10^{-1}	1×10^{3}	1×10^{5}
P-33	4×10^{1}	1×10^{0}	1×10^{5}	1×10^{8}
Protactinium (91)				
Pa-230[a]	2×10^{0}	7×10^{-2}	1×10^{1}	1×10^{6}
Pa-231	4×10^{0}	4×10^{-4}	1×10^{0}	1×10^{3}
Pa-233	5×10^{0}	7×10^{-1}	1×10^{2}	1×10^{7}
Lead (82)				
Pb-201	1×10^{0}	1×10^{0}	1×10^{1}	1×10^{6}
Pb-202	4×10^{1}	2×10^{1}	1×10^{3}	1×10^{6}
Pb-203	4×10^{0}	3×10^{0}	1×10^{2}	1×10^{6}
Pb-205	Unlimited	Unlimited	1×10^{4}	1×10^{7}
Pb-210[a]	1×10^{0}	5×10^{-2}	1×10^{1}[b]	1×10^{4}[b]
Pb-212[a]	7×10^{-1}	2×10^{-1}	1×10^{1}[b]	1×10^{5}[b]
Palladium (46)				
Pd-103[a]	4×10^{1}	4×10^{1}	1×10^{3}	1×10^{8}
Pd-107	Unlimited	Unlimited	1×10^{5}	1×10^{8}
Pd-109	2×10^{0}	5×10^{-1}	1×10^{3}	1×10^{6}
Promethium (61)				
Pm-143	3×10^{0}	3×10^{0}	1×10^{2}	1×10^{6}
Pm-144	7×10^{-1}	7×10^{-1}	1×10^{1}	1×10^{6}
Pm-145	3×10^{1}	1×10^{1}	1×10^{3}	1×10^{7}
Pm-147	4×10^{1}	2×10^{0}	1×10^{4}	1×10^{7}
Pm-148m[a]	8×10^{-1}	7×10^{-1}	1×10^{1}	1×10^{6}
Pm-149	2×10^{0}	6×10^{-1}	1×10^{3}	1×10^{6}
Pm-151	2×10^{0}	6×10^{-1}	1×10^{2}	1×10^{6}
Polonium (84)				
Po-210	4×10^{1}	2×10^{-2}	1×10^{1}	1×10^{4}

(1) *Radionuclide (atomic number)*	*(2)* A_1 *(TBq)*	*(3)* A_2 *(TBq)*	*(4)* *Activity concentration for exempt material* *(Bq/g)*	*(5)* *Activity limit for an exempt consignment* *(Bq)*
Praseodymium (59)				
Pr-142	4×10^{-1}	4×10^{-1}	1×10^{2}	1×10^{5}
Pr-143	3×10^{0}	6×10^{-1}	1×10^{4}	1×10^{6}
Platinum (78)				
Pt-188[(a)]	1×10^{0}	8×10^{-1}	1×10^{1}	1×10^{6}
Pt-191	4×10^{0}	3×10^{0}	1×10^{2}	1×10^{6}
Pt-193	4×10^{1}	4×10^{1}	1×10^{4}	1×10^{7}
Pt-193m	4×10^{1}	5×10^{-1}	1×10^{3}	1×10^{7}
Pt-195m	1×10^{1}	5×10^{-1}	1×10^{2}	1×10^{6}
Pt-197	2×10^{1}	6×10^{-1}	1×10^{3}	1×10^{6}
Pt-197m	1×10^{1}	6×10^{-1}	1×10^{2}	1×10^{6}
Plutonium (94)				
Pu-236	3×10^{1}	3×10^{-3}	1×10^{1}	1×10^{4}
Pu-237	2×10^{1}	2×10^{1}	1×10^{3}	1×10^{7}
Pu-238	1×10^{1}	1×10^{-3}	1×10^{0}	1×10^{4}
Pu-239	1×10^{1}	1×10^{-3}	1×10^{0}	1×10^{4}
Pu-240	1×10^{1}	1×10^{-3}	1×10^{0}	1×10^{3}
Pu-241[(a)]	4×10^{1}	6×10^{-2}	1×10^{2}	1×10^{5}
Pu-242	1×10^{1}	1×10^{-3}	1×10^{0}	1×10^{4}
Pu-244[(a)]	4×10^{-1}	1×10^{-3}	1×10^{0}	1×10^{4}
Radium (88)				
Ra-223[(a)]	4×10^{-1}	7×10^{-3}	1×10^{2}[(b)]	1×10^{5}[(b)]
Ra-224[(a)]	4×10^{-1}	2×10^{-2}	1×10^{1}[(b)]	1×10^{5}[(b)]
Ra-225[(a)]	2×10^{-1}	4×10^{-3}	1×10^{2}	1×10^{5}
Ra-226[(a)]	2×10^{-1}	3×10^{-3}	1×10^{1}[(b)]	1×10^{4}[(b)]
Ra-228[(a)]	6×10^{-1}	2×10^{-2}	1×10^{1}[(b)]	1×10^{5}[(b)]
Rubidium (37)				

(1) *Radionuclide (atomic number)*	*(2)* *A_1* *(TBq)*	*(3)* *A_2* *(TBq)*	*(4)* *Activity concentration for exempt material* *(Bq/g)*	*(5)* *Activity limit for an exempt consignment* *(Bq)*
Rb-81	2×10^{0}	8×10^{-1}	1×10^{1}	1×10^{6}
Rb-83[(a)]	2×10^{0}	2×10^{0}	1×10^{2}	1×10^{6}
Rb-84	1×10^{0}	1×10^{0}	1×10^{1}	1×10^{6}
Rb-86	5×10^{-1}	5×10^{-1}	1×10^{2}	1×10^{5}
Rb-87	Unlimited	Unlimited	1×10^{4}	1×10^{7}
Rb(nat)	Unlimited	Unlimited	1×10^{4}	1×10^{7}
Rhenium (75)				
Re-184	1×10^{0}	1×10^{0}	1×10^{1}	1×10^{6}
Re-184m	3×10^{0}	1×10^{0}	1×10^{2}	1×10^{6}
Re-186	2×10^{0}	6×10^{-1}	1×10^{3}	1×10^{6}
Re-187	Unlimited	Unlimited	1×10^{6}	1×10^{9}
Re-188	4×10^{-1}	4×10^{-1}	1×10^{2}	1×10^{5}
Re-189[(a)]	3×10^{0}	6×10^{-1}	1×10^{2}	1×10^{6}
Re(nat)	Unlimited	Unlimited	1×10^{6}	1×10^{9}
Rhodium (45)				
Rh-99	2×10^{0}	2×10^{0}	1×10^{1}	1×10^{6}
Rh-10^{1}	4×10^{0}	3×10^{0}	1×10^{2}	1×10^{7}
Rh-10^{2}	5×10^{-1}	5×10^{-1}	1×10^{1}	1×10^{6}
Rh-10^{2}m	2×10^{0}	2×10^{0}	1×10^{2}	1×10^{6}
Rh-10^{3}m	4×10^{1}	4×10^{1}	1×10^{4}	1×10^{8}
Rh-10^{5}	1×10^{1}	8×10^{-1}	1×10^{2}	1×10^{7}
Radon (86)				
Rn-222[(a)]	3×10^{-1}	4×10^{-3}	1×10^{1}[(b)]	1×10^{8}[(b)]
Ruthenium (44)				
Ru-97	5×10^{0}	5×10^{0}	1×10^{2}	1×10^{7}
Ru-10^{3}[(a)]	2×10^{0}	2×10^{0}	1×10^{2}	1×10^{6}
Ru-10^{5}	1×10^{0}	6×10^{-1}	1×10^{1}	1×10^{6}
Ru-10^{6}[(a)]	2×10^{-1}	2×10^{-1}	1×10^{2}[(b)]	1×10^{5}[(b)]

(1) *Radionuclide (atomic number)*	*(2)* A_1 *(TBq)*	*(3)* A_2 *(TBq)*	*(4)* *Activity concentration for exempt material* *(Bq/g)*	*(5)* *Activity limit for an exempt consignment* *(Bq)*
Sulphur (16)				
S-35	4×10^{1}	3×10^{0}	1×10^{5}	1×10^{8}
Antimony (51)				
Sb-122	4×10^{-1}	4×10^{-1}	1×10^{2}	1×10^{4}
Sb-124	6×10^{-1}	6×10^{-1}	1×10^{1}	1×10^{6}
Sb-125	2×10^{0}	1×10^{0}	1×10^{2}	1×10^{6}
Sb-126	4×10^{-1}	4×10^{-1}	1×10^{1}	1×10^{5}
Scandium (21)				
Sc-44	5×10^{-1}	5×10^{-1}	1×10^{1}	1×10^{5}
Sc-46	5×10^{-1}	5×10^{-1}	1×10^{1}	1×10^{6}
Sc-47	1×10^{1}	7×10^{-1}	1×10^{2}	1×10^{6}
Sc-48	3×10^{-1}	3×10^{-1}	1×10^{1}	1×10^{5}
Selenium (34)				
Se-75	3×10^{0}	3×10^{0}	1×10^{2}	1×10^{6}
Se-79	4×10^{1}	2×10^{0}	1×10^{4}	1×10^{7}
Silicon (14)				
Si-31	6×10^{-1}	6×10^{-1}	1×10^{3}	1×10^{6}
Si-32	4×10^{1}	5×10^{-1}	1×10^{3}	1×10^{6}
Samarium (62)				
Sm-145	1×10^{1}	1×10^{1}	1×10^{2}	1×10^{7}
Sm-147	Unlimited	Unlimited	1×10^{1}	1×10^{4}
Sm-151	4×10^{1}	1×10^{1}	1×10^{4}	1×10^{8}
Sm-153	9×10^{0}	6×10^{-1}	1×10^{2}	1×10^{6}
Tin (50)				
Sn-113[(a)]	4×10^{0}	2×10^{0}	1×10^{3}	1×10^{7}
Sn-117m	7×10^{0}	4×10^{-1}	1×10^{2}	1×10^{6}
Sn-119m	4×10^{1}	3×10^{1}	1×10^{3}	1×10^{7}
Sn-121m[(a)]	4×10^{1}	9×10^{-1}	1×10^{3}	1×10^{7}

(1) *Radionuclide (atomic number)*	*(2)* A_1 *(TBq)*	*(3)* A_2 *(TBq)*	*(4)* *Activity concentration for exempt material* *(Bq/g)*	*(5)* *Activity limit for an exempt consignment* *(Bq)*
Sn-123	8×10^{-1}	6×10^{-1}	1×10^{3}	1×10^{6}
Sn-125	4×10^{-1}	4×10^{-1}	1×10^{2}	1×10^{5}
Sn-126[(a)]	6×10^{-1}	4×10^{-1}	1×10^{1}	1×10^{5}
Strontium (38)				
Sr-82[(a)]	2×10^{-1}	2×10^{-1}	1×10^{1}	1×10^{5}
Sr-85	2×10^{0}	2×10^{0}	1×10^{2}	1×10^{6}
Sr-85m	5×10^{0}	5×10^{0}	1×10^{2}	1×10^{7}
Sr-87m	3×10^{0}	3×10^{0}	1×10^{2}	1×10^{6}
Sr-89	6×10^{-1}	6×10^{-1}	1×10^{3}	1×10^{6}
Sr-90[(a)]	3×10^{-1}	3×10^{-1}	1×10^{2}[(b)]	1×10^{4}[(b)]
Sr-91[(a)]	3×10^{-1}	3×10^{-1}	1×10^{1}	1×10^{5}
Sr-92[(a)]	1×10^{0}	3×10^{-1}	1×10^{1}	1×10^{6}
Tritium (1)				
T(H-3)	4×10^{1}	4×10^{1}	1×10^{6}	1×10^{9}
Tantalum (73)				
Ta-178(long-lived)	1×10^{0}	8×10^{-1}	1×10^{1}	1×10^{6}
Ta-179	3×10^{1}	3×10^{1}	1×10^{3}	1×10^{7}
Ta-182	9×10^{-1}	5×10^{-1}	1×10^{1}	1×10^{4}
Terbium (65)				
Tb-157	4×10^{1}	4×10^{1}	1×10^{4}	1×10^{7}
Tb-158	1×10^{0}	1×10^{0}	1×10^{1}	1×10^{6}
Tb-160	1×10^{0}	6×10^{-1}	1×10^{1}	1×10^{6}
Technetium (43)				
Tc-95m[(a)]	2×10^{0}	2×10^{0}	1×10^{1}	1×10^{6}
Tc-96	4×10^{-1}	4×10^{-1}	1×10^{1}	1×10^{6}
Tc-96m[(a)]	4×10^{-1}	4×10^{-1}	1×10^{3}	1×10^{7}
Tc-97	Unlimited	Unlimited	1×10^{3}	1×10^{8}

(1) *Radionuclide (atomic number)*	*(2)* A_1 *(TBq)*	*(3)* A_2 *(TBq)*	*(4)* *Activity concentration for exempt material* *(Bq/g)*	*(5)* *Activity limit for an exempt consignment* *(Bq)*
Tc-97m	4×10^{1}	1×10^{0}	1×10^{3}	1×10^{7}
Tc-98	8×10^{-1}	7×10^{-1}	1×10^{1}	1×10^{6}
Tc-99	4×10^{1}	9×10^{-1}	1×10^{4}	1×10^{7}
Tc-99m	1×10^{1}	4×10^{0}	1×10^{2}	1×10^{7}
Tellurium (52)				
Te-121	2×10^{0}	2×10^{0}	1×10^{1}	1×10^{6}
Te-121m	5×10^{0}	3×10^{0}	1×10^{2}	1×10^{5}
Te-123m	8×10^{0}	1×10^{0}	1×10^{2}	1×10^{7}
Te-125m	2×10^{1}	9×10^{-1}	1×10^{3}	1×10^{7}
Te-127	2×10^{1}	7×10^{-1}	1×10^{3}	1×10^{6}
Te-127m[(a)]	2×10^{1}	5×10^{-1}	1×10^{3}	1×10^{7}
Te-129	7×10^{-1}	6×10^{-1}	1×10^{2}	1×10^{6}
Te-129m[(a)]	8×10^{-1}	4×10^{-1}	1×10^{3}	1×10^{6}
Te-131m[(a)]	7×10^{-1}	5×10^{-1}	1×10^{1}	1×10^{6}
Te-132[(a)]	5×10^{-1}	4×10^{-1}	1×10^{2}	1×10^{7}
Thorium (90)				
Th-227	1×10^{1}	5×10^{-3}	1×10^{1}	1×10^{4}
Th-228[(a)]	5×10^{-1}	1×10^{-3}	1×10^{0}[(b)]	1×10^{4}[(b)]
Th-229	5×10^{0}	5×10^{-4}	1×10^{0}[(b)]	1×10^{3}[(b)]
Th-230	1×10^{1}	1×10^{-3}	1×10^{0}	1×10^{4}
Th-231	4×10^{1}	2×10^{-2}	1×10^{3}	1×10^{7}
Th-232	Unlimited	Unlimited	1×10^{1}	1×10^{4}
Th-234[(a)]	3×10^{-1}	3×10^{-1}	1×10^{3}[(b)]	1×10^{5}[(b)]
Th(nat)	Unlimited	Unlimited	1×10^{0}[(b)]	1×10^{3}[(b)]
Titanium (22)				
Ti-44[(a)]	5×10^{-1}	4×10^{-1}	1×10^{1}	1×10^{5}
Thallium (81)				
Tl-200	9×10^{-1}	9×10^{-1}	1×10^{1}	1×10^{6}

(1) *Radionuclide (atomic number)*	*(2)* A_1 *(TBq)*	*(3)* A_2 *(TBq)*	*(4)* *Activity concentration for exempt material* *(Bq/g)*	*(5)* *Activity limit for an exempt consignment* *(Bq)*
Tl-201	1×10^{1}	4×10^{0}	1×10^{2}	1×10^{6}
Tl-202	2×10^{0}	2×10^{0}	1×10^{2}	1×10^{6}
Tl-204	1×10^{1}	7×10^{-1}	1×10^{4}	1×10^{4}
Thulium (69)				
Tm-167	7×10^{0}	8×10^{-1}	1×10^{2}	1×10^{6}
Tm-170	3×10^{0}	6×10^{-1}	1×10^{3}	1×10^{6}
Tm-171	4×10^{1}	4×10^{1}	1×10^{4}	1×10^{8}
Uranium (92)				
U-230 (fast lung absorption)[(a)(d)]	4×10^{1}	1×10^{-1}	1×10^{1}[(b)]	1×10^{5}[(b)]
U-230 (medium lung absorption)[(a)(e)]	4×10^{1}	4×10^{-3}	1×10^{1}	1×10^{4}
U-230 (slow lung absorption)[(a)(f)]	3×10^{1}	3×10^{-3}	1×10^{1}	1×10^{4}
U-232 (fast lung absorption)[(d)]	4×10^{1}	1×10^{-2}	1×10^{0}[(b)]	1×10^{3}[(b)]
U-232 (medium lung absorption)[(e)]	4×10^{1}	7×10^{-3}	1×10^{1}	1×10^{4}
U-232 (slow lung absorption)[(f)]	1×10^{1}	1×10^{-3}	1×10^{1}	1×10^{4}
U-233 (fast lung absorption)[(d)]	4×10^{1}	9×10^{-2}	1×10^{1}	1×10^{4}
U-233 (medium lung absorption)[(e)]	4×10^{1}	2×10^{-2}	1×10^{2}	1×10^{5}
U-233 (slow lung absorption)[(f)]	4×10^{1}	6×10^{-3}	1×10^{1}	1×10^{5}
U-234 (fast lung absorption)[(d)]	4×10^{1}	9×10^{-2}	1×10^{1}	1×10^{4}
U-234 (medium lung absorption)[(e)]	4×10^{1}	2×10^{-2}	1×10^{2}	1×10^{5}
U-234 (slow lung absorption)[(f)]	4×10^{1}	6×10^{-3}	1×10^{1}	1×10^{5}

(1) *Radionuclide (atomic number)*	*(2)* A_1 *(TBq)*	*(3)* A_2 *(TBq)*	*(4)* *Activity concentration for exempt material* *(Bq/g)*	*(5)* *Activity limit for an exempt consignment* *(Bq)*
U-235 (all lung absorption types)[(a)(d)(e)(f)]	Unlimited	Unlimited	1×10^{1}[(b)]	1×10^{4}[(b)]
U-236 (fast lung absorption)[(d)]	Unlimited	Unlimited	1×10^{1}	1×10^{4}
U-236 (medium lung absorption)[(e)]	4×10^{1}	2×10^{-2}	1×10^{2}	1×10^{5}
U-236 (slow lung absorption)[(f)]	4×10^{1}	6×10^{-3}	1×10^{1}	1×10^{4}
U-238 (all lung absorption types)[(d)(e)(f)]	Unlimited	Unlimited	1×10^{1}[(b)]	1×10^{4}[(b)]
U (nat)	Unlimited	Unlimited	1×10^{0}[(b)]	1×10^{3}[(b)]
U (enriched to 20% or less)[(g)]	Unlimited	Unlimited	1×10^{0}	1×10^{3}
U (dep)	Unlimited	Unlimited	1×10^{0}	1×10^{3}
Vanadium (23)				
V-48	4×10^{-1}	4×10^{-1}	1×10^{1}	1×10^{5}
V-49	4×10^{1}	4×10^{1}	1×10^{4}	1×10^{7}
Tungsten (74)				
W-178[(a)]	9×10^{0}	5×10^{0}	1×10^{1}	1×10^{6}
W-181	3×10^{1}	3×10^{1}	1×10^{3}	1×10^{7}
W-185	4×10^{1}	8×10^{-1}	1×10^{4}	1×10^{7}
W-187	2×10^{0}	6×10^{-1}	1×10^{2}	1×10^{6}
W-188[(a)]	4×10^{-1}	3×10^{-1}	1×10^{2}	1×10^{5}
Xenon (54)				
Xe-122[(a)]	4×10^{-1}	4×10^{-1}	1×10^{2}	1×10^{9}
Xe-123	2×10^{0}	7×10^{-1}	1×10^{2}	1×10^{9}
Xe-127	4×10^{0}	2×10^{0}	1×10^{3}	1×10^{5}
Xe-131m	4×10^{1}	4×10^{1}	1×10^{4}	1×10^{4}
Xe-133	2×10^{1}	1×10^{1}	1×10^{3}	1×10^{4}

(1) *Radionuclide (atomic number)*	*(2)* *A_1* *(TBq)*	*(3)* *A_2* *(TBq)*	*(4)* *Activity concentration for exempt material* *(Bq/g)*	*(5)* *Activity limit for an exempt consignment* *(Bq)*
Xe-135	3×10^{0}	2×10^{0}	1×10^{3}	1×10^{10}
Yttrium (39)				
Y-87[(a)]	1×10^{0}	1×10^{0}	1×10^{1}	1×10^{6}
Y-88	4×10^{-1}	4×10^{-1}	1×10^{1}	1×10^{6}
Y-90	3×10^{-1}	3×10^{-1}	1×10^{3}	1×10^{5}
Y-91	6×10^{-1}	6×10^{-1}	1×10^{3}	1×10^{6}
Y-91m	2×10^{0}	2×10^{0}	1×10^{2}	1×10^{6}
Y-92	2×10^{-1}	2×10^{-1}	1×10^{2}	1×10^{5}
Y-93	3×10^{-1}	3×10^{-1}	1×10^{2}	1×10^{5}
Ytterbium (79)				
Yb-169	4×10^{0}	1×10^{0}	1×10^{2}	1×10^{7}
Yb-175	3×10^{1}	9×10^{-1}	1×10^{3}	1×10^{7}
Zinc (30)				
Zn-65	2×10^{0}	2×10^{0}	1×10^{1}	1×10^{6}
Zn-69	3×10^{0}	6×10^{-1}	1×10^{4}	1×10^{6}
Zn-69m[(a)]	3×10^{0}	6×10^{-1}	1×10^{2}	1×10^{6}
Zirconium (40)				
Zr-88	3×10^{0}	3×10^{0}	1×10^{2}	1×10^{6}
Zr-93	Unlimited	Unlimited	1×10^{3}[(b)]	1×10^{7}[(b)]
Zr-95[(a)]	2×10^{0}	8×10^{-1}	1×10^{1}	1×10^{6}
Zr-97[(a)]	4×10^{-1}	4×10^{-1}	1×10^{1}[(b)]	1×10^{5}[(b)]

(a) A_1 and/or A_2 values include contributions from daughter nuclides with half-lives less than 10 days

(b) Parent nuclides and their progeny included in secular equilibrium are listed in the following—

Sr-90	Y-90
Zr-93	Nb-93m
Zr-97	Nb-97
Ru-10^{6}	Rh-10^{6}
Cs-137	Ba-137m
Ce-134	La-134

Ce-144	Pr-144
Ba-140	La-140
Bi-212	Tl-208 (0.36), Po-212 (0.64)
Pb-210	Bi-210, Po-210
Pb-212	Bi-212, Tl-208 (0.36), Po-212 (0.64)
Rn-220	Po-216
Rn-222	Po-218, Pb-214, Bi-214, Po-214
Ra-223	Rn-219, Po-215, Pb-211, Bi-211, Tl-207
Th-nat	Ra-228, Ac-228, Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)
Th-234	Pa-234m
U-230	Th-226, Ra-222, Rn-218, Po-214
U-232	Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)
U-235	Th-231
U-238	Th-234, Pa-234m
U-nat	Th-234, Pa-234m, U-234, Th-230, Ra-226, Rn-222, Po-218, Pb-214, Bi-214, Po-214, Pb-210, Bi-210, Po-210
U-240	Np-240m
Np-237	Pa-233
Am-242m	Am-242
Am-243	Np-239

(c) The quantity may be determined from a measurement of the rate of decay or a measurement of the radiation level at a prescribed distance from the source.

(d) These values apply only to compounds of uranium that take the chemical form of UF6, UO2F2 and UO2(NO3)2 in both normal and accident conditions of transport.

(e) These values apply only to compounds of uranium that take the chemical form of UO3, UF4, UCl4 and hexavalent compounds in both normal and accident conditions of transport.

(f) These values apply to all compounds of uranium other than those specified in (d) and (e) above.

(g) These values apply to unirradiated uranium only.

TABLE II

Basic Radionuclide Values For Unknown Radionuclides or Mixtures

(1) *Radioactive contents*	*(2)* A_1 *TBq*	*(3)* A_2 *TBq*	*(4)* *Activity concentration for exempt material* *Bq/g*	*(5)* *Activity limits for an exempt consignment* *Bq*
Only beta or gamma emitting nuclides are known to be present	0.1	0.02	1×10^1	1×10^4

(1) *Radioactive contents*	*(2)* *A_1*	*(3)* *A_2*	*(4)* *Activity concentration for exempt material*	*(5)* *Activity limits for an exempt consignment*
	TBq	*TBq*	*Bq/g*	*Bq*
Only alpha emitting nuclides are known to be present	0.2	9×10^{-5}	1×10^{-1}	1×10^{3}
No relevant data are available	0.001	9×10^{-5}	1×10^{-1}	1×10^{3}

TABLE III

ACTIVITY LIMITS FOR EXCEPTED PACKAGES

(1) *Physical state of contents*	*(2)* *Instrument or article*	*(3)*	*(4)* *Materials*
	Item limits[a]	*Package limits*[a]	*Package limits*[a]
Solids:			
special form	10^{-2} A_1	A_1	10^{-3} A_1
other forms	10^{-2} A_2	A_2	10^{-3} A_2
Liquids	10^{-3} A_2	10^{-1} A_2	10^{-4} A_2
Gases:			
tritium	2×10^{-2} A_2	2×10^{-1} A_2	2×10^{-2} A_2
special form	10^{-3} A_1	10^{-2} A_1	10^{-3} A_1
other forms	10^{-3} A_2	10^{-2} A_2	10^{-3} A_2

a For mixtures of radionuclides, see regulation 29(4) and (5)

TABLE IV

INDUSTRIAL PACKAGE REQUIREMENTS FOR LSA MATERIAL AND SCO

(1) *Radioactive contents*	*(2)* *Industrial package type*	*(3)*
	Exclusive use	*Not under exclusive use*
LSA-I		
Solid[a]	Type IP-1	Type IP-1
Liquid	Type IP-1	Type IP-2

a Under the conditions specified in regulation 43 (3), LSA-I material and SCO-I may be transported unpackaged.

(1) *Radioactive contents*	*(2)* *Industrial package type* *Exclusive use*	*(3)* *Not under exclusive use*
LSA-II		
Solid	Type IP-2	Type IP-2
Liquid and gas	Type IP-2	Type IP-3
LSA-III	Type IP-2	Type IP-3
SCO-I[a]	Type IP-1	Type IP-1
SCO-II	Type IP-2	Type IP-2

a Under the conditions specified in regulation 43 (3), LSA-I material and SCO-I may be transported unpackaged.

TABLE V

VEHICLE ACTIVITY LIMITS FOR LSA MATERIAL AND SCO IN INDUSTRIAL PACKAGES OR UNPACKAGED

(1) *Nature of material*	*(2)* *Activity limit for vehicles*
LSA-I	No limit
LSA-II and LSA-III non-combustible solids	No limit
LSA-II and LSA-III combustible solids, and all liquids and gases	100 A_2
SCO	100 A_2

TABLE VI

MULTIPLICATION FACTORS FOR LARGE DIMENSION LOADS

(1) *Size of load*[a]	*(2)* *Multiplication factor*
size of load $\leq 1\ m^2$	1
$1\ m^2 <$ size of load $\leq 5\ m^2$	2
$5\ m^2 <$ size of load $\leq 20\ m^2$	3
$20\ m^2 <$ size of load	10

a Largest cross-sectional area of the load being measured.

TABLE VII

CATEGORIES OF PACKAGES AND OVERPACKS

(1) *Conditions* *Transport index*	*(2)* *Maximum radiation level at any point on external surface*	*(3)* *Category*
0 [a]	More than 0.005 mSv/h	I-WHITE
More than 0 but not more than 1()	More than 0.005 mSv/h but not more than 0.5 mSv/h	II-YELLOW
More than 1 but not more than 10	More than 0.5 mSv/h but not more than 2 mSv/h	III-YELLOW
More than 10	More than 2 mSv/h but not more than 10 mSv/h	III-YELLOW Under exclusive use

a If the measured TI is not greater than 0.05, the value quoted may be zero in accordance with paragraph 1(c) of Schedule 5.

TABLE VIII

EXCERPTS FROM LIST OF UNITED NATIONS NUMBERS, PROPER SHIPPING NAME AND DESCRIPTION AND SUBSIDIARY RISKS

(1) *UN NO.*	*(2)* *PROPER SHIPPING NAME* [a]	*(3)* *Subsidiary risks*
2910	RADIOACTIVE MATERIAL, EXCEPTED PACKAGE — LIMITED QUANTITY OF MATERIAL	
2911	RADIOACTIVE MATERIAL, EXCEPTED PACKAGE — INSTRUMENTS or ARTICLES	
2909	RADIOACTIVE MATERIAL, EXCEPTED PACKAGE — ARTICLES MANUFACTURED FROM NATURAL URANIUM or	

a The “PROPER SHIPPING NAME” is found in the column“PROPER SHIPPING NAME and description” and is restricted to that part shown in CAPITAL LETTERS. In the case of UN 2909,UN 2911, UN 2913 and UN 3326 where alternative PROPER SHIPPING NAMES are separated by the word “or”, only the relevant PROPER SHIPPING NAME shall be used.

b “Fissile-excepted” applies only to those packages complying with Schedule 8 Part XIV paragraph 3.

()

(1) *UN NO.*	*(2)* *PROPER SHIPPING NAME* [a]	*(3)* *Subsidiary risks*
	DEPLETED URANIUM or NATURAL THORIUM	
2908	RADIOACTIVE MATERIAL, EXCEPTED PACKAGE — EMPTY PACKAGING	
2912	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-I) non fissile or fissile-excepted[b]	
3321	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-II) non fissile or fissile-excepted[b]	
3322	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-III) non fissile or fissile-excepted[b]	
2913	RADIOACTIVE MATERIAL, SURFACE CONTAMINATED OBJECTS (SCO-I or SCO-II) non fissile or fissile-excepted[b]	
2915	RADIOACTIVE MATERIAL, TYPE A PACKAGE, non-special form, non fissile or fissile-excepted[b]	
3332	RADIOACTIVE MATERIAL, TYPE A PACKAGE, SPECIAL FORM non fissile or fissile-excepted[b]	
2916	RADIOACTIVE MATERIAL, TYPE B(U) PACKAGE, non fissile or fissile-excepted[b]	
2917	RADIOACTIVE MATERIAL, TYPE B(M) PACKAGE, non fissile or fissile-excepted[b]	
3323	RADIOACTIVE MATERIAL, TYPE C PACKAGE, non fissile or fissile-excepted[b]	

a The “PROPER SHIPPING NAME” is found in the column“PROPER SHIPPING NAME and description” and is restricted to that part shown in CAPITAL LETTERS. In the case of UN 2909,UN 2911, UN 2913 and UN 3326 where alternative PROPER SHIPPING NAMES are separated by the word “or”, only the relevant PROPER SHIPPING NAME shall be used.

b “Fissile-excepted” applies only to those packages complying with Schedule 8 Part XIV paragraph 3.

(1) *UN NO.*	*(2)* *PROPER SHIPPING NAME* [a]	*(3)* *Subsidiary risks*
2919	RADIOACTIVE MATERIAL, TRANSPORTED UNDER SPECIAL ARRANGEMENT, non fissile or fissile-excepted[b]	
2978	RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE non fissile or fissile-excepted[b]	corrosive (UN Class 8)
3324	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-II), FISSILE	
3325	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-III), FISSILE	
3326	RADIOACTIVE MATERIAL, SURFACE CONTAMINATED OBJECTS (SCO-I or SCO-II) FISSILE	
3327	RADIOACTIVE MATERIAL, TYPE A PACKAGE, FISSILE non-special form	
3333	RADIOACTIVE MATERIAL, TYPE A PACKAGE, SPECIAL FORM, FISSILE	
3328	RADIOACTIVE MATERIAL, TYPE B(U) PACKAGE, FISSILE	
3329	RADIOACTIVE MATERIAL, TYPE B(M) PACKAGE, FISSILE	
3330	RADIOACTIVE MATERIAL, TYPE C PACKAGE, FISSILE	
3331	RADIOACTIVE MATERIAL, TRANSPORTED UNDER SPECIAL ARRANGEMENT, FISSILE	
2977	RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE, FISSILE	corrosive (UN Class 8)

a The “PROPER SHIPPING NAME” is found in the column“PROPER SHIPPING NAME and description” and is restricted to that part shown in CAPITAL LETTERS. In the case of UN 2909,UN 2911, UN 2913 and UN 3326 where alternative PROPER SHIPPING NAMES are separated by the word “or”, only the relevant PROPER SHIPPING NAME shall be used.

b “Fissile-excepted” applies only to those packages complying with Schedule 8 Part XIV paragraph 3.

TABLE IX

INSOLATION DATA

(1) *Form and location of surface*	*(2)* *Insolation in W/m^2 for 12 hours per day*
Flat surfaces transported horizontally:	
–base	none
–other surfaces	800
Flat surfaces not transported horizontally:	200[a]
–each surface	
Curved surfaces	400[a]

a Alternatively, a sine function may be used, with an absorption coefficient adopted and the effects of possible reflection from neighbouring objects neglected.

TABLE X

CONSIGNMENT MASS LIMITS FOR EXCEPTIONS FROM THE REQUIREMENTS FOR PACKAGES CONTAINING FISSILE MATERIAL

(1) *Fissile material*	*(2)* *Fissile material mass (g) mixed with substances having an average hydrogen density less than or equal to water*	*(3)* *Fissile material mass (g) mixed with substances having an average hydrogen density greater than water*
Uranium-235 (X)	400	290
Other fissile material (Y)	250	180

TABLE XI

FREE-DROP DISTANCE FOR TESTING PACKAGES TO NORMAL CONDITIONS OF TRANSPORT

(1) *package mass (kg)*	*(2)* *Free-drop distance (m)*
package mass < 5,000	1.2
5,000 ≤ package mass < 10,000	0.9
10,000 ≤ package mass < 15,000	0.6
15,000 ≤ package mass	0.3

TABLE XII

MINIMUM DISTANCES BETWEEN PACKAGES OF CATEGORY II-YELLOW OR OF CATEGORY III-YELLOW AND PERSONS

(1)	*(2)*	*(3)*	*(4)*	*(5)*
Sum of transport indexes not more than	*Exposure time per year* *Areas where members of the public have regular access*		*Regularly occupied working areas*	
	50 hours	*250 hours*	*50 hours*	*250 hours*
	Segregation distance in metres, no shielding material intervening, from:			
2	1	3	0.5	1
4	1.5	4	0.5	1.5
8	2.5	6	1.0	2.5
12	3	7.5	1.0	3
20	4	9.5	1.5	4
30	5	12	2	5
40	5.5	13.5	2.5	5.5
50	6.5	15.5	3	6.5

TABLE XIII

MINIMUM DISTANCES BETWEEN PACKAGES OF CATEGORY II-YELLOW OR OF CATEGORY III-YELLOW AND PACKAGES BEARING THE WORD “FOTO”, OR MAILBAGS

(1)		*(2)*	*(3)*							
Total number of packages not more than		*Sum of transport indexes not more than*	*Journey or storage duration, in hours*							
Category			*1*	*2*	*4*	*10*	*24*	*48*	*120*	*240*
III-yellow	*II-yellow*		*Minimum distances in metres*							
		0.2	0.5	0.5	1	1			2	3
		0.5	0.5	0.5	0.5	1	1	2	3	5
	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) *Total number of packages not more than*		*(2)* *Sum of transport indexes not more than*	*(3)* *Journey or storage duration, in hours*							
Category			*1*	*2*	*4*	*10*	*24*	*48*	*120*	*240*
III-yellow	*II-yellow*		*Minimum distances in metres*							
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

SCHEDULE 2

Regulation 29(3)

A_1 AND A_2 VALUES FOR UNSPECIFIED RADIONUCLIDES

In the calculations of A_1 and A_2 for a radionuclide not in Table I of Schedule 1, 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, and the activity to be taken into account and the A_1 or A_2 value to be applied must be those corresponding to the parent nuclide of that chain. 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 must be considered as mixtures of different nuclides.

SCHEDULE 3

Regulation 29(4)

A_1 AND A_2 VALUES FOR MIXTURES OF RADIONUCLIDES

1. For a mixture of radionuclides whose identities and respective activities are known the basic radionuclide values given in Table 1 of Schedule 1 may be determined as follows—

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

where

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

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

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

2. When the identity of each radionuclide is known but the individual activities of some of the radionuclides are not known, the radionuclides may be grouped and the lowest radionuclide value, as appropriate, for the radionuclides in each group may be used in applying the formulae in paragraph 1 above and paragraph 4(b) of Schedule 4. Groups may be based on the total alpha activity and the total beta/gamma activity when these are known, using the lowest radionuclide values for the alpha emitters or beta/gamma emitters, respectively.

SCHEDULE 4

Regulation 30(2)

CONTENTS LIMITS FOR PACKAGES

Excepted packages

1. An excepted package containing radioactive material other than articles manufactured of natural uranium, depleted uranium, or natural thorium must not contain activities greater than the following—

(a) where the radioactive material is enclosed in or is included as a component part of an instrument or other manufactured article, such as a clock or electronic apparatus, the limits specified in columns 2 and 3 of Table III in Schedule 1 for each individual item and each package respectively; and

(b) where the radioactive material is not so enclosed or is not included as a component of an instrument or other manufactured article, the package limits specified in column 4 of Table III in Schedule 1.

2. An excepted package containing articles manufactured of natural uranium, depleted uranium, or natural thorium may contain any quantity of such material provided that the outer surface of the uranium or thorium is enclosed in an inactive sheath made of metal or some other substantial material.

Industrial packages

3. The radioactive contents in a single package of LSA material or in a single package of SCO must be so restricted that the radiation level specified in regulation 43(2) must not be exceeded, and the activity in a single package must also be so restricted that the activity limits for a vehicle specified in column 2 of Table V of Schedule 1 must not be exceeded.

Type A packages

4. A Type A package must not contain activities greater than the following—

(a) for a Type A package containing a single radionuclide:

(i) for special form radioactive material : A_1 ; or

(ii) for all other radioactive material : A_2.

(b) for a Type A package containing a mixture of radionuclides whose identities and respective activities are known the following formula must apply—

$$\sum_i \frac{B(i)}{A_1(i)} + \sum_j \frac{C(j)}{A_2(j)} \leq 1$$

where:

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

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

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

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

Paragraph 2 of Schedule 3 is also applicable.

Type B(U), Type B(M) and Type C packages

5. A Type B(U), Type B(M) or Type C package must not contain:

(a) activities greater than those authorised for the package design;

(b) radionuclides different from those authorised for the package design; or

(c) contents in a form, or a physical or chemical state different from those authorised for the package design,

as specified in the package design approval certificate.

Packages containing fissile material

6. Packages containing fissile material, other than a package falling within paragraph 3 of Part XIV of Schedule 8, must not contain—

(a) a mass of fissile material different from that authorised for the package design,

(b) any contents different from those authorised for the package design, or

(c) contents in a form or physical or chemical state, or in a spatial arrangement, different from those authorised for the package design,

as specified in the package design approval certificate.

Packages containing uranium hexafluoride

7. The mass of uranium hexafluoride in a package must not exceed a value that would lead to an ullage smaller than 5% at the maximum temperature of the package as specified for the plant systems where the package must be used. The uranium hexafluoride must be in solid form and the internal pressure of the package must be below atmospheric pressure when presented for transport.

Special arrangement transport operations

8. A special arrangement transport operation must not contain—

(a) activities greater than those authorised for the special arrangement transport operation;

(b) radionuclides different from those authorised for the special arrangement transport operation; or

(c) contents in a form, or a physical or chemical state, or in a spatial arrangement different from those authorised for the special arrangement transport operation,

as specified in the package design approval certificate.

SCHEDULE 5

Regulations 44 and 45

DETERMINATION OF TRANSPORT INDEX (TI) OR CRITICALITY SAFETY INDEX (CSI)

1. The Transport Index (TI) for a package, overpack, freight container, or for unpackaged LSA-I or SCO-I, must be the number derived in accordance with the following procedure—

(a) determine the maximum radiation level in units of mSv/h at a distance of 1 metre from the external surfaces of the package, overpack, freight container, or unpackaged LSA-I and SCO-I. Multiply the value determined by 100. For uranium and thorium ores and their concentrates, the maximum radiation level at any point 1 metre from the external surface of the load may be taken as:

(i) 0.4 mSv/h for ores and physical concentrates of uranium and thorium;

(ii) 0.3 mSv/h for chemical concentrates of thorium; or

(iii) 0.02 mSv/h for chemical concentrates of uranium, other than uranium hexafluoride;

(b) for tanks, freight containers and unpackaged LSA-I and SCO-I, the value determined in step (a) above must be multiplied by the appropriate factor from Table VI of Schedule 1;

(c) the figure obtained in steps (a) and (b) above must be rounded up to the first decimal place (e.g., 1.13 becomes 1.2), except that a value of 0.05 or less may be considered as zero.

2. The TI for each overpack, freight container or vehicle must be determined as either the sum of the TIs of all the packages contained, or by direct measurement of radiation level, except in the case of non-rigid overpacks for which the transport index must be determined only as the sum of the TIs of all of the packages.

3. The Criticality Safety Index (CSI) for packages containing fissile material must be obtained by dividing the number 50 by the value of N derived using the procedures specified in paragraph 8 of Part XIV of Schedule 8 (i.e., CSI = 50/N). The value of the CSI may be zero, provided that an unlimited number of packages is subcritical (i.e., N is effectively equal to infinity).

4. The CSI for each consignment must be determined as the sum of the CSIs of all of the packages contained in that consignment.

SCHEDULE 6

Regulations 11(5),41(2)(c) and 48

ADDITIONAL RESPONSIBILITIES OF CONSIGNORS

Marking

1. Each package must be legibly and durably marked on the outside of the packaging with an identification of either the consignor or consignee, or both.

2. For each package, other than excepted packages, the United Nations number (see column 1 of Table VIII in Schedule 1), preceded by the letters “UN”, and the proper shipping name (see column 2 of Table VIII in Schedule 1) must be legibly and durably marked on the outside of the packaging. In the case of excepted packages, only the United Nations number, preceded by the letters “UN”, is required.

3. Each package of gross mass exceeding 50 kg must have its permissible gross mass legibly and durably marked on the outside of the packaging.

4. Each package which conforms to—

(a) an Industrial package Type 1, an Industrial package Type 2 or an Industrial package Type 3 design must be legibly and durably marked on the outside of the packaging with "TYPE IP-1", "TYPE IP-2" or "TYPE IP-3" as appropriate;

(b) a Type A package design must be legibly and durably marked on the outside of the packaging with "TYPE A"; or

(c) an Industrial package Type 2, an Industrial package Type 3 or a Type A package design must be legibly and durably marked on the outside of the packaging with the international vehicle registration identification code (VRI Code) of the country of origin of design and the name of the manufacturers, or other identification of the packaging specified by the competent authority of the country of origin of design.

5. Each package which conforms to a design approved under regulations 11, 12 or 55 to 58 must be legibly and durably marked on the outside of the packaging with—

(a) The identification mark allocated to that design by the competent authority;

(b) A serial number to uniquely identify each packaging which conforms to that design;

(c) In the case of a Type B(U) or Type B(M) package design, with "TYPE B(U)" or "TYPE B(M)"; and

(d) In the case of a Type C package design, with "TYPE C".

6. Each package which conforms to a Type B(U), Type B(M) or Type C package design must 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 Fig. 1 of Schedule 14.

7. Where LSA-I or SCO-I material is contained in receptacles or wrapping materials and is transported under exclusive use as permitted by regulation 43(3), the outer surface of these receptacles or wrapping materials may bear the marking "RADIOACTIVE LSA-I" or "RADIOACTIVE SCO-I", as appropriate.

Labelling

8. Each package, overpack and freight container must bear the labels which conform to the models in Fig 2, Fig 3 or, Fig 4 of Schedule 14 except as allowed under the alternative provisions of paragraph 13 for large freight containers and tanks, according to the appropriate category. In addition, each package, overpack and freight container containing fissile material, other than fissile material excepted under the provisions of paragraph 3 of Part XIV of Schedule 8, must bear labels which conform to the model in Fig 5 of Schedule 14. Any labels which do not relate to the contents must be removed or covered. For radioactive material having other dangerous properties see regulation 36(1).

9. The labels conforming to the models in Fig 2, Fig. 3 and Fig. 4 of Schedule 14 must be affixed to two opposite sides of the outside of a package or overpack or on the outside of all four sides of a freight container or tank. The labels conforming to the model in Fig. 5 of Schedule 14, where applicable, must be affixed adjacent to the labels conforming to the models in Fig. 2, Fig. 3 and Fig. 4 of Schedule 14. The labels must not cover the markings specified in paragraphs 1-6.

Labelling for radioactive contents

10. Each label conforming to the models in Fig. 2, Fig.3 and Fig. 4 of Schedule 14 must be completed with the following information—

(a) Contents—

(i) Except for LSA-I material, the name(s) of the radionuclide(s) as taken from Table I of Schedule 1, using the symbols prescribed therein. For mixtures of radionuclides,

the most restrictive nuclides must be listed to the extent the space on the line permits. The group of LSA or SCO must be shown following the name(s) of the radionuclide(s). The terms "LSA-II","LSA-III", "SCO-I" and "SCO-II" must be used for this purpose.

(ii) For LSA-I material, the term "LSA-I" is all that is necessary; the name of the radionuclide is not necessary.

(b) Activity: The maximum activity of the radioactive contents during transport expressed in units of becquerels (Bq) with the appropriate SI prefix. For fissile material, the mass of fissile material in units of grams (g), or multiples thereof, may be used in place of activity.

(c) For overpacks and freight containers, the "contents" and "activity" entries on the label must bear the information required in sub-paragraphs (a) and (b) respectively, totalled together for the entire contents of the overpack or freight container except that on labels for overpacks or freight containers containing mixed loads of packages containing different radionuclides, such entries may read "See Transport Documents".

(d) Transport index: The value calculated in accordance with regulation 44. (No transport index entry is required for category I-WHITE.)

Labelling for criticality safety

11. Each label conforming to the model in Fig.5 of Schedule 14 must be completed with the criticality safety index (CSI) as stated in the certificate of approval for special arrangement or the certificate of approval for the package design issued by the competent authority.

12. For overpacks and freight containers, the criticality safety index (CSI) on the label must bear the information required in paragraph 11 totalled together for the fissile contents of the overpack or freight container.

Placarding

13. Large freight containers carrying packages other than excepted packages, and tanks must bear four placards which conform to the model given in Fig. 6 of Schedule 14. The placards must be affixed in a vertical orientation to each side wall and each end wall of the large freight container or tank. Any placards which do not relate to the contents must be removed. Instead of using both labels and placards, it is permitted as an alternative to use enlarged labels only, as shown in Fig. 2, Fig. 3, Fig. 4, and Fig. 5 of Schedule 14 where appropriate, with dimensions of the minimum size shown in Fig. 6 of Schedule 14.

14. Where the consignment in the freight container or tank is unpackaged LSA-I or SCO-I or where an exclusive use consignment in a freight container is packaged radioactive material with a single United Nations number, the appropriate United Nations number for the consignment (as shown in column 1 of Table VIII in Schedule 1) must also be displayed, in black digits not less than 65 mm high, either—

(a) in the lower half of the placard shown in Fig. 6 of Schedule 14, (and may be preceded by the letters "UN") and against the white background; or

(b) on the placard specified in paragraph 30.

When the alternative given in (b) above is used, the subsidiary placard must be affixed immediately adjacent to the main placard, on all four sides of the freight container or tank.

15. Vehicles carrying packages, overpacks or freight containers labelled with any of the labels shown in Fig. 2, Fig. 3, Fig. 4 or Fig. 5 of Schedule 14, or carrying consignments under exclusive use, must display the placard shown in Fig. 6 of Schedule 14 on each of the two external lateral walls and the external rear wall.

In the case of a vehicle without sides the placards may be affixed directly on the cargo-carrying unit provided that they are readily visible; in the case of physically large tanks or freight containers, the placards on the tanks or freight containers will suffice. In the case of vehicles which have insufficient area to allow the fixing of larger placards, the dimensions of the placard as described in Fig. 6 of Schedule 14 may be reduced to 100 mm. Any placards which do not relate to the contents must be removed.

16. Where the consignment in or on the vehicle is unpackaged LSA-I material or SCO-I or where an exclusive use consignment is packaged radioactive material with a single United Nations number, the appropriate United Nations number (see Table VIII) must also be displayed, in black digits not less than 65 mm high, either—

(a) in the lower half of the placard shown in Fig. 6 of Schedule 14, (and may be preceded by the letters "UN") and against the white background; or

(b) on the placard specified in paragraph 30.

When the alternative given in (b) above is used, the subsidiary placard must be affixed immediately adjacent to the main placard, either on the two external lateral walls in the case of a rail vehicle or the two external lateral walls and the external rear wall in the case of a road vehicle.

Particulars of consignment

17. The consignor must include in the transport documents with each consignment the following information, as applicable—

(a) a heading or a reference to these regulations;

(b) the name of the consignor and an address and telephone number by which he can be contacted in the event of an accident occurring during the transport of a consignment;

(c) the name and address of the consignee;

(d) the proper shipping name, as specified in column 2 of Table VIII in Schedule 1;

(e) the United Nations Class Number "7";

(f) the United Nations Number assigned to the material as specified in column 1 of Table VIII in Schedule 1, the number is to be prefixed with the letters "UN";

(g) the name or symbol of each radionuclide or, for mixtures of radionuclides, an appropriate general description or a list of the most restrictive nuclides;

(h) a description of the physical and chemical form of the material, or a notation that the material is special form radioactive material or low dispersible radioactive material. A generic chemical description is acceptable for chemical form;

(i) the maximum activity of the radioactive contents during transport expressed in units of becquerels with an appropriate SI prefix. For fissile material, the mass of fissile material in grams (g), or appropriate multiples thereof, may be used in place of activity;

(j) the category of the package, i.e., I-WHITE, II-YELLOW, or III-YELLOW;

(k) the Transport Index (TI) (categories II-YELLOW and III-YELLOW only);

(l) for consignments including fissile material other than consignments where all of the packages meet the requirements of paragraph 3 of Part XIV of Schedule 8, the criticality safety index (CSI);

(m) the identification mark for each competent authority approval certificate (special form radioactive material, low dispersible radioactive material, special arrangement, package design, or shipment) applicable to the consignment;

(n) for consignments of packages in an overpack or freight container, a detailed statement of the contents of each package within the overpack or freight container and, where

appropriate, of each overpack or freight container in the consignment. If packages are to be removed from the overpack or freight container at a point of intermediate unloading, appropriate transport documentation must be made available;

(o) where a consignment is required to be shipped under exclusive use, the statement "EXCLUSIVE USE SHIPMENT"; and

(p) for LSA-II, LSA-III, SCO-I and SCO-II the total activity of the consignment as a multiple of A_2.

Declaration

18. The consignor must include in the transport documents a declaration in the following terms or in terms having an equivalent meaning:

"I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name and are classified, packed, marked and labelled, and are in all respects in proper condition for transport by (insert mode(s) of transport involved) according to the applicable international and national governmental regulations."

19. If the intent of the declaration is already a condition of transport within a particular international convention, the consignor need not provide such a declaration for that part of the transport covered by the convention.

20. The declaration must be signed and dated by the consignor. A facsimile signature is authorised.

21. The declaration must be made on the same transport document that contains the particulars of consignment listed in paragraph 17.

Removal or covering of labels

22. When an empty packaging is transported as an excepted package in accordance with regulation 42, the previously displayed labels must not be visible.

Information for carriers

23. The consignor must provide in the transport documents a statement regarding actions, if any, that are required to be taken by the carrier. The statement must be in the languages deemed necessary by the carrier or the authorities concerned, and must include at least the following points—

(a) supplementary requirements for loading, stowage, carriage, handling and unloading of the package, overpack or freight container including any special stowage provisions for the safe dissipation of heat (see paragraph 5 of Schedule 7), or a statement that no such requirements are necessary;

(b) restrictions on the mode of transport or conveyance and any necessary routing instructions;

(c) emergency arrangements appropriate to the consignment.

24. The applicable competent authority certificates need not necessarily accompany the consignment. The consignor must make them available to the carrier before loading and unloading.

Notification of competent authorities

25. Before the first shipment of any package requiring competent authority approval, the consignor must ensure that copies of each applicable competent authority certificate applying to that package design have been submitted to the competent authority of each country through or into which the consignment is to be transported. The consignor is not required to await an

acknowledgement from the competent authority, nor is the competent authority required to make such acknowledgement of receipt of the certificate.

26. For each shipment listed in (a), (b), (c) or (d) below, the consignor must notify the competent authority of each country through or into which the consignment is to be transported. This notification must be in the hands of each competent authority prior to the commencement of the shipment, and preferably at least 7 days in advance.

(a) Type C packages containing radioactive material with an activity greater than 3000 A_1 or 3000 A_2, as appropriate, or 1000 TBq, whichever is the lower;

(b) Type B(U) packages containing radioactive material with an activity greater than 3000 A_1 or 3000 A_2, as appropriate, or 1000 TBq, whichever is the lower;

(c) Type B(M) packages;

(d) Shipment under special arrangement.

27. The consignment notification must include—

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

(b) information on the date of shipment, the expected date of arrival and proposed routeing;

(c) the names of the radioactive materials or nuclides;

(d) descriptions of the physical and chemical forms of the radioactive material, or whether it is special form radioactive material or low dispersible radioactive material; and

(e) the maximum activity of the radioactive contents during transport expressed in units of becquerels (Bq) with an appropriate SI prefix. For fissile material, the mass of fissile material in units of grams (g), or multiples thereof, may be used in place of activity.

28. The consignor is not required to send a separate notification if the required information has been included in the application for shipment approval; see part V of Schedule 10.

Possession of certificates and instructions

29. The consignor must have in his or her possession a copy of each certificate of approval required under Part XI of these Regulations and a copy of the instructions with regard to the proper closing of the package and other preparations for shipment before making any shipment under the terms of the certificates.

"ADR" orange plate

30. Vehicles must be placarded according to the applicable provisions of ADR paragraph 5.3.2.

SCHEDULE 7

Regulations 20(1) and 49

RESPONSIBILITIES OF CARRIERS

Segregation of packages etc during transport and storage in transit

1. Packages, overpacks and freight containers containing radioactive material must be segregated during transport and during storage in transit—

(a) from places occupied by persons and from undeveloped photographic film, for radiation exposure control purposes, in accordance with regulation 25; and

(b) from other dangerous goods in accordance with regulation 36.

2. Category II-YELLOW or III-YELLOW packages or overpacks must not be carried in compartments occupied by passengers, except those exclusively reserved for couriers specially authorised to accompany such packages or overpacks.

3. No persons other than the driver and assistants must be permitted in vehicles carrying packages, overpacks or freight containers bearing category II-YELLOW or III-YELLOW labels.

Stowage during transport and storage in transit

4. Consignments must be securely stowed.

5. Provided that its average surface heat flux does not exceed 15 W/m^2 and that the immediately surrounding cargo is not in sacks or bags, a package or overpack may be carried or stored among packaged general cargo without any special stowage provisions except as may be specifically required by the competent authority in an applicable approval certificate.

6. Loading of freight containers and accumulation of packages, overpacks and freight containers must be controlled as follows—

(a) except under the condition of exclusive use, the total number of packages, overpacks and freight containers aboard a single vehicle must be so limited that the total sum of the transport indexes aboard the vehicle does not exceed 50. For consignments of LSA-I material there shall be no limit on the sum of the transport indexes;

(b) where a consignment is transported under exclusive use, there shall be no limit on the sum of the transport indexes aboard a single vehicle;

c) the radiation level under routine conditions of transport must not exceed 2 mSv/h at any point on, and 0.1 mSv/h at 2 m from, the external surface of the vehicle;

(d) the total sum of the criticality safety indexes (CSI) in a freight container not under exclusive use and aboard a vehicle not under exclusive use must not exceed 50. For large containers and vehicles under exclusive use, the CSI must not exceed 100.

7. Any package or overpack having either a transport index greater than 10, or any consignment having a criticality safety index greater than 50, must be transported only under exclusive use.

8. For consignments under exclusive use, the radiation level must not exceed—

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

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

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

(iii) there is no loading or unloading during the shipment;

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

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

Segregation of packages containing fissile material during transport and storage in transit

9. The number of packages, overpacks and freight containers containing fissile material stored in transit in any one storage area must be so limited that the total sum of the criticality safety indexes in any group of such packages, overpacks or freight containers does not exceed 50. Groups of such packages, overpacks and freight containers must be stored so as to maintain a spacing of at least 6 m from other groups of such packages, overpacks or freight containers.

10. Where the total sum of the criticality safety indexes on board a vehicle or in a freight container exceeds 50, storage must be such as to maintain a spacing of at least 6 m from other groups of packages, overpacks or freight containers containing fissile material or other conveyances carrying radioactive material.

Undeliverable Consignments

11. Where a consignment is undeliverable, the consignment must be placed in a safe location and the Secretary of State must be informed as soon as possible and a request made for instructions on further action.

12. Vehicles must be equipped in accordance with the provisions of ADR paragraph 8.1.4

SCHEDULE 8

Regulations 31(2)(c), 32(2), 41(2)(b) and (c) and others 50, 55(1)(b), 58(1) and 60(1)(a)

REQUIREMENTS FOR RADIOACTIVE MATERIALS AND FOR PACKAGINGS AND PACKAGES

PART I

REQUIREMENTS FOR LSA-III MATERIAL

LSA-III material must be a solid of such a nature that if the entire contents of a package were subjected to the test specified in paragraph Part I of Schedule 9 the activity in the water would not exceed 0.1 A_2.

PART II

REQUIREMENTS FOR SPECIAL FORM RADIOACTIVE MATERIAL

1. Special form radioactive material must have at least one dimension not less than 5 mm.

2. Special form radioactive material must be of such a nature or must be so designed that if it is subjected to the tests specified in Part II of Schedule 9, it meets the following requirements—

(a) it would not break or shatter under the impact, percussion and bending tests in paragraphs 4, 5, 6 and 8(a) of that Part of that Schedule as applicable;

(b) it would not melt or disperse in the heat test in paragraphs 7 and 8(b) of that Part of that Schedule as applicable; and

(c) the activity in the water from the leaching tests specified in paragraphs 9 and 10 of that Part of that Schedule would not exceed 2 kBq; or alternatively for sealed sources, the leakage

rate for the volumetric leakage assessment test specified in the ISO leak test document would not exceed the applicable acceptance threshold acceptable to the Secretary of State.

3. When a sealed capsule constitutes part of the special form radioactive material, the capsule must be so manufactured that it can be opened only by destroying it.

PART III

REQUIREMENTS FOR LOW DISPERSIBLE RADIOACTIVE MATERIAL

Low dispersible radioactive material must be such that the total amount of this radioactive material in a package must meet the following requirements—

(a) the radiation level at 3 m from the unshielded radioactive material does not exceed 10 mSv/h;

(b) if subjected to the tests specified in paragraphs 25 and 26 of Part IV of Schedule 9, the airborne release in gaseous and particulate forms of up to 100 μm aerodynamic equivalent diameter would not exceed 100 A_2. A separate specimen may be used for each test; and

(c) if subjected to the test specified in Part I of Schedule 9 the activity in the water would not exceed 100 A_2. In the application of this test, the damaging effects of the tests specified in (b) above must be taken into account.

PART IV

GENERAL REQUIREMENTS FOR PACKAGINGS AND PACKAGES

1. A package must be so designed in relation to its mass, volume and shape that it can easily and safely be handled and transported and so that it can be properly secured in or on the vehicle during transport.

2. The design of a package must be such that any lifting attachments on it will not fail when used in the intended manner and such that, if failure of the attachments should occur, the ability of the package to meet other requirements of these Regulations would not be impaired, taking into account appropriate safety factors to cover snatch lifting.

3. Any attachment or other feature on the outer surface of a package which could be used to lift it but is not designed to support its mass in accordance with paragraph 2 above must be removed or otherwise rendered incapable of being used during transport.

4. As far as reasonably practicable, packaging must be so designed and finished that the external surfaces are free from protruding features and can easily be decontaminated.

5. As far as reasonably practicable, the outer layer of a package must be so designed as to prevent the collection and retention of water.

6. No feature, not forming an integral part of a package, is to be added to the package at the time of transport if it will reduce the safety of the package.

7. A package must be capable of withstanding the effects of any acceleration, vibration or vibration resonance which may arise under routine conditions of 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, and in particular nuts, bolts, and other securing devices must be so designed as to prevent them from becoming loose or being released unintentionally, even after repeated use.

8. The materials of the packaging and any components or structures thereof must be physically and chemically compatible with each other and with the radioactive contents, taking into account their behaviour under irradiation.

9. All valves through which radioactive contents could otherwise escape must be protected against unauthorised operation.

10. The design of the package must take into account ambient temperatures and pressures that are likely to be encountered in routine conditions of transport.

11. For radioactive material having other dangerous properties, the package design must take into account those properties; see regulations 6(2) and 36.

PART V

REQUIREMENTS FOR EXCEPTED PACKAGES

The package must comply with Part IV of this Schedule.

PART VI

REQUIREMENTS FOR AN INDUSTRIAL PACKAGE TYPE 1 (IP-1)

An industrial package Type 1 (IP-1) must be designed to meet the requirements of Part IV of this Schedule and the smallest overall external dimension must not be less than 10 cm.

PART VII

REQUIREMENTS FOR AN INDUSTRIAL PACKAGE TYPE 2 (IP-2)

1. An industrial package Type 2 (IP-2) must be designed to meet the requirements of Part VI of this Schedule and, when subjected to the tests specified in paragraphs 10 and 11 of Part IV of Schedule 9, it must prevent—

(a) the loss or dispersal of the radioactive contents; and

(b) the loss of shielding integrity which would result in more than a 20% increase in the radiation level at any external surface of the package; or alternatively paragraph 2.

2. An industrial package Type 2 (IP-2) must be designed—

(a) to meet the requirements of Part VI of this Schedule and

(b) to conform to the standards prescribed in chapter 6.1 of ADR, or other requirements at least equivalent to those standards, and

(c) when subjected to the tests required for UN packing group I or II in chapter 6.1 of ADR, must prevent:

(i) the loss or dispersal of the radioactive contents; and

(ii) the loss of shielding integrity which would result in more than a 20% increase in the radiation level at any external surface of the package; or alternatively meet the requirements of paragraph 3, 4, 5 or 6.

3. A tank container may be used as an industrial package Type 2 (IP-2) provided that it is designed—

(a) to meet the requirements of Part VI of this Schedule, and

(b) to conform to the standards prescribed in the Chapter 6.8 of ADR, or other requirements at least equivalent to those standards, and is capable of withstanding a test pressure of 265kPa, and

(c) so that any additional shielding which is provided is capable of withstanding the static and dynamic stresses resulting from handling and routine conditions of transport and of preventing a loss of shielding integrity which would result in more than a 20% increase in the radiation level at any external surface of the tank container.

4. A tank may be used as an industrial package Type 2 (IP-2) provided that it conforms to standards at least equivalent to those required in the case of tank containers by paragraph 3, but substitute the ADR reference in paragraph 3(b) for "Chapter 6.7 of ADR", and it is limited to transporting LSA-I or LSA-II liquids or gases as prescribed in Table IV of Schedule 1.

5. A freight container may be used as an industrial package Type 2 (IP-2) provided that—

(a) it is designed to meet the requirements of Part VI of this Schedule and

(b) it is designed to conform to the requirements prescribed in the ISO freight containers document, and

(c) the radioactive contents are restricted to solid materials, and

(d) if it were subjected to the tests prescribed in ISO freight containers document and the accelerations occurring during routine conditions of transport, it would prevent—

(i) loss or dispersal of the radioactive contents; and

(ii) loss of shielding integrity which would result in more than a 20% increase in the radiation level at any external surface of the freight container.

6. An intermediate bulk container may be used as an industrial package Type 2 (IP-2) provided that—

(a) it is designed to meet the requirements of Part VI of this Schedule and

(b) it is metal, and

(c) it is designed to conform to the requirements prescribed Chapter 6.1 of ADR, and if it were subjected to the tests for UN Packing Group I or II prescribed in that document, but with the drop test conducted in the most damaging orientation, it would prevent—

(i) loss or dispersal of the radioactive contents; and

(ii) loss of shielding integrity which would result in more than a 20% increase in the radiation level at any external surface of the intermediate bulk container.

PART VIII

REQUIREMENTS FOR AN INDUSTRIAL PACKAGE TYPE 3 (IP-3)

1. An industrial package Type 3 (IP-3) must be designed to meet the requirements of Part VI of this Schedule and, in addition the requirements of paragraphs 2 to 15 of Part X of this Schedule; or alternatively may meet the requirements of paragraphs 2,3,4 or 5.

2. A tank container may be used as an industrial package Type 3 (IP-3) provided that it is designed—

(a) to meet the requirements of Part VI of this Schedule, and

(b) to conform to the standards prescribed in the Chapter 6.8 of ADR, or other requirements at least equivalent to those standards, and is capable of withstanding a test pressure of 265 kPa, and

(c) so that any additional shielding which is provided must be capable of withstanding the static and dynamic stresses resulting from handling and routine conditions of transport and of preventing a loss of shielding integrity which would result in more than a 20% increase in the radiation level at any external surface of the tank container.

3. A tank may be used as an industrial package Type 3 (IP-3) provided that it conforms to standards at least equivalent to those required in the case of tank containers by paragraph 2, but substitute "to conform to the standards prescribed in chapter 6.7 of ADR" for paragraph 2(b), and it must be limited to transporting LSA-I or LSA-II liquids or gases as prescribed in Table IV of Schedule 1.

4. A freight container may be used as an industrial package Type 3 (IP-3) provided that—

(a) it is designed to meet the requirements of Part VI of this Schedule and

(b) it is designed to conform to the requirements prescribed in the ISO freight containers document, and

(c) the radioactive contents are restricted to solid materials, and

(d) if it were subjected to the tests prescribed in ISO freight containers document and the accelerations occurring during routine conditions of transport, it would prevent:

(i) loss or dispersal of the radioactive contents; and

(ii) loss of shielding integrity which would result in more than a 20% increase in the radiation level at any external surface of the freight container.

5. An intermediate bulk container may be used as an industrial package Type 3 (IP-3) provided that—

(a) it must be designed to meet the requirements of Part VI of this Schedule and

(b) it is metal, and

(c) it is designed to conform to the requirements prescribed Chapter 6.1 of the Dangerous Goods Recommendations, and if it were subjected to the tests for UN Packing Group I or II prescribed in that document, but with the drop test conducted in the most damaging orientation, it would prevent—

(i) loss or dispersal of the radioactive contents; and

(ii) loss of shielding integrity which would result in more than a 20% increase in the radiation level at any external surface of the intermediate bulk container.

PART IX

REQUIREMENTS FOR PACKAGES CONTAINING URANIUM HEXAFLUORIDE

1. The package must also meet the requirements prescribed elsewhere in these Regulations which pertain to the radioactive and fissile properties of the material. Except as allowed in paragraph 4, uranium hexafluoride in quantities of 0.1 kg or more must also be packaged and transported in accordance with the provisions of the International Organisation for Standardisation document ISO 7195:, "Packaging of uranium hexafluoride (UF_6) for transport", and the requirements of paragraphs 2 and 3.

2. Each package designed to contain 0.1 kg or more of uranium hexafluoride must be designed so that it would meet the following requirements—

(a) withstand without leakage and without unacceptable stress, as specified in the International Organization for Standardization document ISO 7195 , the structural test as specified in paragraph 6 of Part IV of Schedule 9;

(b) withstand without loss or dispersal of the uranium hexafluoride the test specified in paragraph 10 of Part IV of Schedule 9; and

(c) withstand without rupture of the containment system the test specified in paragraph 16 of Part IV of Schedule 9.

3. Packages designed to contain 0.1 kg or more of uranium hexafluoride must not be provided with pressure relief devices.

4. Subject to the approval of the competent authority, packages designed to contain 0.1 kg or more of uranium hexafluoride may be transported if—

(a) the packages are designed to requirements other than those given in ISO 7195 and paragraphs 2-3 but, notwithstanding, the requirements of paragraphs 2-3 are met as far as practicable;

(b) the packages are designed to withstand without leakage and without unacceptable stress a test pressure less than 2.76 MPa as specified in paragraph 6 of Part IV of Schedule 9; or

(c) for packages designed to contain 9000 kg or more of uranium hexafluoride, the packages do not meet the requirement of paragraph 2(c).

PART X

REQUIREMENTS FOR TYPE A PACKAGES

1. A Type A package must meet the requirements of Part IV of this Schedule.

2. The smallest overall external dimension of the package must not be less than 10 cm.

3. The outside of the package must incorporate a feature such as a seal, which is not readily breakable and which, while intact, will be evidence that it has not been opened.

4. Any tie-down attachments on the package must be so designed that, under both normal and accident conditions of transport, the forces in those attachments do not impair the ability of the package to meet the requirements of these Regulations.

5. The design of the package must take into account temperatures ranging from −40°C to 70°C for the components of the packaging, giving attention to freezing temperatures for liquid contents and to the potential degradation of packaging materials within the given temperature range.

6. The design and manufacturing techniques must be in accordance with national or international standards, or other requirements, acceptable to the Secretary of State

7. The design must include a containment system securely closed by a positive fastening device which cannot be opened unintentionally or by a pressure which may arise within the package.

8. Special form radioactive material may be considered as a component of the containment system.

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

10. The design of any component of the containment system must 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 must retain its radioactive contents under a reduction of ambient pressure to 60 kPa.

12. All valves, other than pressure relief valves, must be provided with an enclosure to retain any leakage from the valve.

13. A radiation shield which encloses a component of the package specified as a part of the containment system must 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 must be capable of being securely closed by a positive fastening device which is independent of any other packaging structure.

14. A package must be so designed that, if it were subjected to the tests specified in paragraphs 7 to 12 of Part IV of Schedule 9, it would prevent—

(a) loss or dispersal of the radioactive contents; and

(b) loss of shielding integrity which would result in more than a 20% increase in the radiation level at any external surface of the package.

15. The design of a package intended for liquid radioactive material must make provision for ullage to accommodate variations in the temperature of the contents, dynamic effects and filling dynamics.

16. A Type A package designed to contain liquids must,in addition—

(a) be adequate to meet the conditions specified in paragraph 14 if the package is subjected to the tests specified in paragraph 13 of Part IV of Schedule 9; and

(b) either—

(i) be provided with sufficient absorbent material to absorb twice the volume of the liquid contents (such absorbent material must be suitably positioned so as to contact the liquid in the event of leakage); or

(ii) be provided with a containment system composed of primary inner and secondary outer containment components designed to ensure retention of the liquid contents, within the secondary outer containment components, even if the primary inner components leak.

17. A package designed for gases must prevent loss or dispersal of the radioactive contents if the package were subjected to the tests specified in paragraph 13 of Part IV of Schedule 9. A package designed for tritium in gaseous form or for noble gases with contents not exceeding A_2 is excepted from this requirement.

PART XI

REQUIREMENTS FOR TYPE B(U) PACKAGES

1. A Type B(U) package must be designed to meet the requirements of Part IV, and of paragraphs 2 to 13, and 15, of Part X, and of paragraph 14 of Part X except as specified in paragraph 7(a) below.

2. A package must be so designed that, under the ambient conditions specified in paragraphs 4 and 5, heat generated within the package by the radioactive contents must not, under normal conditions of transport, as demonstrated by the tests in paragraphs 7 – 12 of Part IV of Schedule 9, adversely affect the package in such a way that it would fail to meet the applicable requirements for containment and shielding if left unattended for a period of one week. Particular attention is to be paid to the effects of heat which may—

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

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

(c) in combination with moisture, accelerate corrosion.

3. A package must be so designed that, under the ambient condition specified in paragraph 4, the temperature of its accessible surfaces must not exceed 50°C, unless the package is transported under exclusive use.

4. The ambient temperature must be assumed to be 38°C.

5. The solar insolation conditions must be assumed to be as specified in Table IX of Schedule 1.

6. A package which includes thermal protection for the purpose of satisfying the requirements of the thermal test specified in paragraph 16 of Part IV of Schedule 9 must be so designed that such protection will remain effective if the package is subjected to the tests specified in paragraphs 7 – 12 and 15(a) and (b) or 15(b) and (c) of Part IV of Schedule 9, as appropriate. Any such protection on the exterior of the package must not be rendered ineffective by ripping, cutting, skidding, abrasion, or rough handling.

7. A package must be so designed that, if it were subjected to—

(a) the tests specified in paragraphs 7 – 12 of Part IV of Schedule 9, it would restrict the loss of radioactive contents to not more than $10^{-6}A_2$ per hour; and

(b) the tests specified in paragraphs 14, 15(b), 16 and 17 of that Part of that Schedule and the test in paragraph—

(i) 15(c) of that Part of that Schedule, when the package has a mass not greater than 500 kg, an overall density not greater than 1000 kg/m^3 based on the external dimensions, and radioactive contents greater than 1000 A_2 not as special form radioactive material, or

(ii) 15(a) of that Part of that Schedule for all other packages,

it would retain sufficient shielding to ensure that the radiation level at 1 metre from the surface of the package would not exceed 10 mSv/h with the maximum radioactive contents which the package is designed to contain and it would restrict the accumulated loss of radioactive contents in a period of one week to not more than 10 A_2 for krypton-85 and not more than A_2 for all other radionuclides. Where mixtures of different radionuclides are present, the provisions of parts 4 and 5 of regulation 29 must apply except that for krypton-85 an effective A_2(i) value equal to 10 A_2 may be used. For the purposes of sub-paragraph (a) above, the evaluation must take into account the requirements of regulation 37(2)(a).

8. A package for radioactive contents with activity greater than 105 A_2 must be so designed that if it were subjected to the water immersion test specified in paragraph 18 of Part IV of Schedule 9, there would be no rupture of the containment system.

9. Compliance with the permitted activity release limits must not depend either upon filters or upon a mechanical cooling system.

10. A package must not include a pressure relief system from the containment system which would allow the release of radioactive material to the environment under the conditions of the tests specified in paragraphs 7 – 12 and 14 – 17 of Part IV of Schedule 9.

11. A package must be so designed that if it were at the maximum normal operating pressure and it were subjected to the tests specified in paragraphs 7 – 12 and 14 – 17 of Part IV of Schedule 9, the level of strains in the containment system would not attain values which would adversely affect the package in such a way that it would fail to meet the applicable requirements.

12. A package must not have a maximum normal operating pressure in excess of a gauge pressure of 700 kPa.

13. The maximum temperature of any surface readily accessible during transport of a package must not exceed 85°C in the absence of insolation under the ambient condition specified in paragraph 4. Account may be taken of barriers or screens intended to give protection to persons without the need for the barriers or screens being subject to any test.

14. A package containing low dispersible radioactive material must be so designed that any features added to the low dispersible radioactive material that are not part of it, or any internal components of the packaging must not adversely affect the performance of the low dispersible radioactive material.

15. A package must be designed for an ambient temperature range from −40°C to +38°C.

PART XII

REQUIREMENTS FOR TYPE B(M) PACKAGES

1. A Type B(M) package must meet the requirements of Part XI, except that for packages to be transported within the United Kingdom or between the United Kingdom and another State, conditions other than those given in paragraph 5 of Part X, paragraph 4, 5 and 8-15 of Part XI may be assumed with the approval of the Secretary of State and the competent authority of any State through or to which it is be transported. As far as reasonably practicable the requirements of paragraphs 8-15 of Part XI must be met.

2. Intermittent venting of Type B(M) packages may be permitted during transport, provided that the operational controls for venting are acceptable to the Secretary of State.

PART XIII

REQUIREMENTS FOR TYPE C PACKAGES

1. A Type C package must be designed to meet the requirements of Part IV, and of paragraphs 2 to 13, and 15, of Part X, of paragraph 14 of Part X except as specified in paragraph 3(a) below, of paragraphs 2-5 and 9-15 of Part XI.

2. A package must be capable of meeting the assessment criteria prescribed for tests in paragraphs 7(b) and 11 of Part XI after burial in an environment defined by a thermal conductivity of 0.33 W/m.K and a temperature of 38°C in the steady state. Initial conditions for the assessment must assume that any thermal insulation of the package remains intact, the package is at the maximum normal operating pressure and the ambient temperature is 38°C.

3. A package must be so designed that, if it were at the maximum normal operating pressure and subjected to—

(a) the tests specified in paragraphs 7-12 of Part IV of Schedule 9, it would restrict the loss of radioactive contents to not more than 10^{-6} A_2 per hour; and

(b) the test sequences in paragraph 22 of Part IV of Schedule 9:

(c) it would retain sufficient shielding to ensure that the radiation level at 1 metre from the surface of the package would not exceed 10 mSv/h with the maximum radioactive contents which the package is designed to contain and it would restrict the accumulated loss of radioactive contents in a period of one week to not more than 10 A_2 for krypton-85 and not more than A_2 for all other radionuclides.

Where mixtures of different radionuclides are present, the provisions of paragraphs (4) and (5) of regulation 29 must apply except that for krypton-85 an effective A_2(i) value equal to 10 A_2 may be used. For the purposes of sub-paragraph (a) above, the evaluation must take into account the requirements of regulation 37(2)(a).

4. A package must be so designed that there will be no rupture of the containment system following performance of the enhanced water immersion test specified in paragraph 18 of Part IV of Schedule 9.

PART XIV

REQUIREMENTS FOR PACKAGES CONTAINING FISSILE MATERIAL

1. Fissile material must be packaged and shipped in such a manner that subcriticality is maintained under conditions likely to be encountered during normal and accident conditions of transport. The following contingencies must be considered—

(a) water leaking into or out of packages;

(b) the loss of efficiency of built-in neutron absorbers or moderators;

(c) rearrangement of the radioactive contents either within the package or as a result of loss from the package;

(d) reduction of spaces within or between packages;

(e) packages becoming immersed in water or buried in snow; and

(f) temperature changes.

2. A package containing fissile material must meet the requirements of paragraph 2 of Part X and those requirements prescribed elsewhere in these Regulations which pertain to the radioactive properties of the material.

3. Packages are excepted from meeting the requirements of paragraphs 4- 10 where they are transported in a consignment meeting one of the exception criteria (a), (b), (c) or (d)—

(a) the mass of fissile material in the consignment is controlled such that—

$$\frac{\text{mass of uranium 235 (g)}}{X} - \frac{\text{mass of other fissile material (g)}}{Y} < 1$$

where X and Y are the mass limits defined in Table X of Schedule 1, and the mass of beryllium and deuterium is controlled such that it does not exceed 0.1% of the fissile material mass allowed and provided that either—

(i) for packaged material each package contains individually not more than 15g of fissile material, or

(ii) for unpackaged material the vehicle contains not more than 15g of fissile material, or

(iii) the fissile material is a homogeneous hydrogenous solution or mixture where the ratio of fissile nuclides to hydrogen is less than 5% by mass, or

(iv) there is not more than 5g of fissile material in any 10 litre volume of material.

b) each package containing uranium enriched in uranium-235 to a maximum of 1% by mass, and with a total plutonium and uranium-233 content not exceeding 1% of the mass of uranium-235, provided that the fissile material is distributed essentially homogeneously throughout the material; provided also that if uranium-235 is present in metallic, oxide, or carbide forms, it does not form a lattice arrangement.

c) each package containing liquid solutions of uranyl nitrate enriched in uranium-235 to a maximum of 2% by mass, with a total plutonium and uranium-233 content not exceeding 0.002% of the mass of uranium-235, and with a minimum nitrogen to uranium atomic ratio (N/U) of 2.

d) each package containing individually not more than 1 kg of total plutonium, of which not more than 20% by mass may consist of plutonium-239, plutonium-241, or any combination of those radionuclides.

4. A packaging for fissile material must be so designed that, if it were subjected to the tests specified in paragraphs 7 -12 of Part IV of Schedule 9 the construction of the packaging would prevent the entry of a 10 cm cube.

5. For the purposes of this Part:

"undamaged", in relation to a package means the evaluated or demonstrated condition of the package if it had been subjected to the tests specified in paragraphs 7 – 12 of Part IV of Schedule 9;

"damaged", in relation to a package, means the evaluated or demonstrated condition of the package if it had been subjected to whichever of the following combination of tests is the more limiting—

(a) the tests specified in paragraphs 7 – 12 of Part IV of Schedule 9 followed by the tests specified in paragraphs 15 and 16 of that Part of that Schedule and completed by the tests specified in paragraphs 19 – 21 of that Part of that Schedule (the mechanical test of paragraph 15 of that Part of that Schedule must be the tests specified in paragraphs 15(b)) and the test in paragraph—

(i) 15(c) of that Part of that Schedule, when the package has a mass not greater than 500 kg and an overall density not greater than 1000 kg/m^3 based on the external dimensions, or

(ii) 15(a) of that Part of that Schedule for all other packages, or

b) the tests specified in paragraphs 7 – 12 of Part IV of Schedule 9 followed by the test in paragraph 17 of Part IV of Schedule 9.

6. In determining the subcriticality of individual packages in isolation for the purposes of this Schedule, it must be assumed that water can leak into or out of all void spaces of the package, including those within the containment system. However, if the design incorporates special features to prevent such 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. Special features shall include the following—

(a) multiple high standard water barriers, each of which would remain watertight if the package were damaged; a high degree of quality control in the production and maintenance of packagings; and special tests to demonstrate the closure of each package before shipment; or

(b) for packages containing uranium hexafluoride only—

(i) where for damaged packages there is no physical contact between the valve and any other component of the packaging other than its original point of attachment and where, in addition, following the test specified in paragraph 16 of Part IV of Schedule 9 the valves remain leaktight; and

(ii) a high degree of quality control in the production and maintenance and repair of packagings; and special tests to demonstrate the closure of each package before each shipment

7. The individual package damaged or undamaged must be subcritical under the conditions specified in paragraphs 5 and 6 taking into account the physical and chemical characteristics including any change in those characteristics which could occur when the package is damaged and with the conditions of moderation and reflection as specified below.

For all material within the confinement system: the material arranged in the confinement system—

(a) in the configuration and moderation that results in maximum neutron multiplication; and

(b) with close reflection of the containment system by water 20 cm thick (or equivalent), or such greater reflection of the containment system as may additionally be provided by the surrounding material of the packaging unless it can be demonstrated that the confinement system remains within the damaged packaging;

8. An array of packages must be subcritical. A number, "N" must be derived assuming that if packages were stacked together in any arrangement with the stack closely reflected on all sides by water 20 cm thick (or its equivalent) both of the following conditions would be satisfied—

(a) five times "N" undamaged packages without anything between the packages would be subcritical; and

(b) two times "N" damaged packages with hydrogenous moderation between packages to the extent which results in the greatest neutron multiplication would be subcritical and, in addition if any part of the fissile material escapes from the containment system: that material, from two times "N" damaged packages must be subcritical when arranged in—

(i) the configuration and moderation that results in maximum neutron multiplication; and

(ii) with close reflection of that material by water 20 cm thick (or equivalent).

9. In evaluating the subcriticality of fissile material in its transport configuration, the following must apply—

(a) the determination of subcriticality for irradiated fissile material must be based on an isotopic composition demonstrated to provide—

(i) the maximum neutron multiplication during the irradiation history, or

(ii) a conservative estimate of the neutron multiplication for the package assessments. After irradiation but prior to shipment, a measurement must be performed to confirm the conservatism of the isotopic composition; and

(b) for fissile material whose chemical or physical form, isotopic composition, mass or concentration, moderation ratio or density, or geometric configuration is not known, each parameter that is not known must have the value which gives the maximum neutron multiplication consistent with the known conditions and parameters in paragraphs 5 to 8.

10. The package must be designed for an ambient temperature range of −40°C to +38°C unless the Secretary of State specifies otherwise in the certificate of approval for the package design.

SCHEDULE 9 Regulation 51

TEST PROCEDURES

PART I

LEACHING TEST FOR LSA-III MATERIAL AND LOW DISPERSIBLE RADIOACTIVE MATERIAL

A solid material sample representing the entire contents of the package is to be immersed for 7 days in water at ambient temperature. The volume of water to be used in the test must be sufficient to ensure that at the end of the 7-day test period, the free volume of the unabsorbed and unreacted water remaining must be at least 10% of the volume of the solid test sample itself. The water must have an initial pH of 6-8 and a maximum conductivity of 1 mS/m at 20 176 C. The total activity of the free volume of water must be measured following the 7-day immersion of the test sample.

PART II

TESTS FOR SPECIAL FORM RADIOACTIVE MATERIAL

1. The tests which must be performed on specimens that comprise or simulate special form radioactive material are: the impact test, the percussion test, the bending test and the heat test.

2. A different specimen may be used for each of the tests.

3. After each test specified in paragraphs 4 – 8 below, a leaching assessment or volumetric leakage test must be performed on the specimen by a method no less sensitive than the methods given in paragraph 9 below for indispersible solid material and paragraph 10 below for encapsulated material.

4. Impact test: The specimen must drop onto the target from a height of 9 metres. The target must be as defined in paragraph 5 of Part IV of this Schedule.

5. Percussion test: The specimen must be placed on a sheet of lead which is supported by a smooth solid surface and struck by the flat face of a mild steel bar so as to cause an impact equivalent to that resulting from a free drop of 1.4 kg through 1 metre. The lower part of the bar must be 25 mm in diameter with the edges rounded off to a radius of (3.0 ± 0.3)mm. The lead, of hardness number 3.5 to 4.5 on the Vickers scale and not more than 25 mm thick, must cover an area greater than that covered by the specimen. A fresh surface of lead must be used for each impact. The bar must strike the specimen so as to cause maximum damage.

6. Bending test: This test applies 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 must 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 must be such that the specimen will suffer maximum damage when its free end is struck by the flat face of a steel bar. The bar must strike the specimen so as to cause an impact equivalent to that resulting from a free vertical drop of 1.4 kg through 1 metre. The lower part of the bar must be 25 mm in diameter with the edges rounded off to a radius of (3.0 ± 0.3)mm.

7. Heat test: The specimen must be heated in air to a temperature of 800°C and held at that temperature for a period of 10 minutes and must then be allowed to cool.

8. Specimens that comprise or simulate radioactive material enclosed in a sealed capsule may be excepted from—

(a) the tests prescribed in paragraphs 4 and 5 provided the mass of the special form radioactive material is less than 200 g and provided they are alternatively subjected to the Class 4 impact test prescribed in the ISO classification document; and

(b) the test prescribed in paragraph 7 provided they are alternatively subjected to the Class 6 temperature test specified in the ISO classification document.

9. For specimens which comprise or simulate indispersible solid material, a leaching assessment must be performed as follows—

(a) the specimen must be immersed for 7 days in water at ambient temperature. The volume of water to be used in the test must be sufficient to ensure that at the end of the 7-day test period the free volume of the unabsorbed and unreacted water remaining must be at least 10% of the volume of the solid test sample itself. The water must have an initial pH of 6-8 and a maximum conductivity of 1 mS/m at 20°C;

(b) the water with specimen must then be heated to a temperature of (50 ± 5)°C and maintained at this temperature for 4 hours;

(c) the activity of the water must then be determined;

(d) the specimen must then be stored for at least 7 days in still air at a temperature not less than 30°C and relative humidity of not less than 90%;

(e) the specimen must then be immersed in water of the same specification as in (a) above and the water with the specimen heated to (50 ± 5)°C and maintained at this temperature for 4 hours;

(f) the activity of the water must then be determined.

10. For specimens which comprise or simulate radioactive material enclosed in a sealed capsule, either a leaching assessment or a volumetric leakage assessment must be performed as follows—

(a) the leaching assessment must consist of the following steps—

(i) the specimen must be immersed in water at ambient temperature. The water must have an initial pH of 6-8 with a maximum conductivity of 1 mS/m at 20°C;

(ii) the water and specimen must be heated to a temperature of (50 ± 5)°C and maintained at this temperature for 4 hours;

(iii) the activity of the water must then be determined;

(iv) the specimen must then be stored for at least 7 days in still air at a temperature not less than 30°C and relative humidity of not less than 90%;

(v) the process in (i), (ii) and (iii) must be repeated;

(b) the alternative volumetric leakage assessment shall comprise any of the tests prescribed in the ISO leak test document which are acceptable to the Secretary of State.

PART III

TESTS FOR LOW DISPERSIBLE RADIOACTIVE MATERIAL

1. The tests which must be performed on specimens that comprise or simulate low dispersible radioactive material are: the enhanced thermal test and the impact test.

2. A different specimen may be used for each of the tests.

3. After each test specified in paragraphs 4 − 5 below, a leaching assessment must be performed on the specimen according to the method set out in Part I.

4. Enhanced thermal test: This test must be the test set out in paragraph 25 of Part IV.

5. Impact test: This test must be the test set out in paragraph 26 of Part IV.

PART IV

TESTS FOR PACKAGES

1. All specimens must be inspected before testing in order to identify and record faults or damage including the following—

(a) divergence from the design;

(b) defects in manufacture;

(c) corrosion or other deterioration; and

(d) distortion of features.

2. The containment system of the package must be clearly specified.

3. The external features of the specimen must be clearly identified so that reference may be made simply and clearly to any part of such specimen.

4. After each of the applicable tests specified in paragraphs 6 — 26 below—

(a) faults and damage must be identified and recorded;

(b) it must be determined whether the integrity of the containment system and shielding has been retained to the extent required in Schedule 8 for the package under test; and

(c) for packages containing fissile material, it must be determined whether the assumptions and conditions made in the assessments required by paragraphs 1 to 9 of Part XIV Schedule 8 regarding the most reactive configuration and degree of moderation of the fissile contents, of any escaped material, and for one or more packages are valid.

Target for Drop Tests

5. The target for the drop tests specified in paragraph 4 of Part II and paragraphs 10, 13(a), 15, and 24 and 26 of Part IV must 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.

Packages Designed to contain Uranium Hexafluoride

6. Specimens that comprise or simulate packagings designed to contain 0.1 kg or more of uranium hexafluoride must be tested hydraulically at an internal pressure of at least 1.38 MPa but, when the test pressure is less than 2.76 MPa, the design must require multilateral approval. For retesting packagings, any other equivalent non-destructive testing may be applied subject to multilateral approval.

Tests for demonstrating ability to withstand normal conditions of transport

7. The tests are: the water spray test, the free drop test, the stacking test, and the penetration test. Specimens of the package must be subjected to the free drop test, the stacking test and the penetration test, preceded in each case by the water spray test. One specimen may be used for all the tests, provided that the requirements of paragraph 8 are fulfilled.

8. The time interval between the conclusion of the water spray test and the succeeding test must 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 must be taken

to be two hours if the water spray is applied from four directions simultaneously. No time interval shall elapse, however, if the water spray is applied from each of the four directions consecutively.

9. Water spray test: The specimen must be subjected to a water spray test that simulates exposure to rainfall of approximately 5 cm per hour for at least one hour.

10. Free drop test: The specimen must drop on to the target so as to suffer maximum damage in respect of the safety features to be tested and—

(a) the height of drop measured from the lowest point of the specimen to the upper surface of the target must be not less than the distance specified in Table XI of Schedule 1 for the applicable mass. The target must be as defined in paragraph 5 above;

(b) for rectangular fibreboard or wood packages not exceeding a mass of 50 kg, a separate specimen must be subjected to a free drop on to each corner from a height of 0.3 metres;

(c) for cylindrical fibreboard packages not exceeding a mass of 100 kg, a separate specimen must be subjected to a free drop on to each of the quarters of each rim from a height of 0.3 metres.

11. Stacking test: Unless the shape of the packaging effectively prevents stacking, the specimen must 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 mass of the actual package; and

(b) the equivalent of 13 kPa multiplied by the vertically projected area of the package.

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

12. Penetration test: The specimen must be placed on a rigid, flat, horizontal surface which will not move significantly while the test is carried out—

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

(b) the height of drop of the bar measured from its lower end to the intended point of impact on the upper surface of the specimen must be 1 metre.

Tests for Type A packages designed to carry liquids and gases

13. A specimen or separate specimens must 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 must be subjected to the more severe test—

(a) free drop test: The specimen must drop on to the target so as to suffer the maximum damage in respect of containment. The height of the drop measured from the lowest part of the specimen to the upper surface of the target must be 9 metres. The target must be as defined in paragraph 5 above;

(b) penetration test: The specimen must be subjected to the test specified in paragraph 12 above except that the height of drop must be increased to 1.7 metres from the 1 metre specified in paragraph 12(b).

Tests for demonstrating ability to withstand accident conditions of transport

14. The specimen must be subjected to the cumulative effects of the tests specified in paragraphs 15 and 16, in that order. Following these tests, either this specimen or a separate specimen must

be subjected to the effect(s) of the water immersion test(s) as specified in paragraph 17 and, if applicable, paragraph 18.

15. Mechanical test: The mechanical test consists of three different drop tests. Each specimen must be subjected to the applicable drops as specified in paragraph 7 of Part XI of Schedule 8 or paragraphs 5 and 8 of Part XIV of Schedule 8. The order in which the specimen is subjected to the drops must be such that, on completion of the mechanical test, the specimen must have suffered such damage as will lead to the maximum damage in the thermal test which follows—

(a) for drop I, the specimen must drop on to the target so as to suffer the maximum damage, and the height of the drop measured from the lowest point of the specimen to the upper surface of the target must be 9 metres. The target must be as defined in paragraph 5 above;

(b) for drop II, the specimen must drop so as to suffer the maximum damage on to a bar rigidly mounted perpendicularly on the target. The height of the drop measured from the intended point of impact of the specimen to the upper surface of the bar must be 1 metre. The bar must be of solid mild steel of circular section, (15.0 ± 0.5)cm in diameter, and 20 cm long unless a longer bar would cause greater damage, in which case a bar of sufficient length to cause maximum damage must be used. The upper end of the bar must be flat and horizontal with its edges rounded off to a radius of not more than 6 mm. The target on which the bar is mounted must be as described in paragraph 5;

(c) for drop III, the specimen must be subjected to a dynamic crush test by positioning the specimen on the target so as to suffer maximum damage by the drop of a 500 kg mass from 9 metres on to the specimen. The mass must consist of a solid mild steel plate 1 metre × 1 metre which must fall in a horizontal attitude. The height of the drop must be measured from the underside of the plate to the highest point of the specimen. The target on which the specimen rests must be as defined in paragraph 5.

16. Thermal test: The thermal test must consist of—

(a) the specimen must be in thermal equilibrium under the conditions of ambient temperature of 38°C, subject to the solar insolation conditions specified in Table IX of Schedule I and subject to the design maximum rate of internal heat generation from the radioactive contents. Alternatively, any of these parameters are allowed to have different values prior to and during the test, providing due account is taken of them in the subsequent assessment of package response, followed by;

(b) the exposure of a specimen to a thermal environment which provides a heat flux at least equal to that of a hydrocarbon fuel/air fire in sufficiently quiescent ambient conditions to give an average emissivity coefficient of at least 0.9 and an average flame temperature of at least 800°C fully engulfing the specimen for a period of 30 minutes, with a surface absorptivity coefficient of either 0.8 or that value which the package may be demonstrated to possess if exposed to the fire specified, followed by;

(c) exposure of the specimen to an ambient temperature of 38°C, subject to the solar insolation conditions specified in Table IX of Schedule I and subject to the design maximum rate of heat generation from the radioactive contents for a sufficient period to ensure that temperatures in the specimen are everywhere decreasing and/or are approaching steady state conditions. Alternatively, any of these parameters are allowed to have different values following cessation of heating, providing due account is taken of them in the subsequent assessment of package response.

During and following the test the specimen must not be artificially cooled and any combustion of materials of the specimen must be permitted to proceed naturally.

17. Water immersion test: The specimen must be immersed under a head of water of at least 15 metres for a period of not less than eight hours in the attitude which will lead to maximum damage.

For demonstration purposes, an external gauge pressure of at least 150 kPa must be considered to meet these conditions.

Enhanced water immersion test

18. The specimen must be immersed under a head of water of at least 200 metres for a period of not less than one hour. For demonstration purposes, an external gauge pressure of at least 2 MPa must be considered to meet these conditions.

Water leakage test for packages containing fissile material

19. 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 paragraphs 5 to 8 of Part XIV of Schedule 8 shall be excepted from the test specified in paragraph 21.

20. Before the specimen is subjected to the water leakage test specified in paragraph 21, it must be subjected to the tests in paragraph 15(b), and either paragraph 15(a) or (c), and the test specified in paragraph 16.

21. The specimen must be immersed under a head of water of at least 0.9 metres for a period of not less than eight hours and in the attitude for which maximum leakage is expected.

Tests for Type C packages

22. Specimens must be subjected to the effects of each of the following test sequences in the orders specified—

(a) the tests specified in paragraphs 15(a), 15(c), 24 and 25; and

(b) the test specified in paragraph 26.

23. Separate specimens are allowed to be used for each of the sequences 22 (a) and (b).

24. Puncture/tearing test: The specimen must be subjected to the damaging effects of a solid probe made of mild steel. The orientation of the probe to the surface of the specimen must be as to cause maximum damage at the conclusion of the test sequence specified in paragraph 22(a)—

(a) The specimen, representing a package having a mass less than 250 kg, must be placed on a target and subjected to a probe having a mass of 250 kg falling from a height of 3 m above the intended impact point. For this test, the probe must be a 20 cm diameter cylindrical bar with the striking end forming a frustum of a right circular cone with the following dimensions: 30 cm height and 2.5 cm in diameter at the top. The target on which the specimen is placed must be as specified in paragraph 5.

(b) For packages having a mass of 250 kg or more, the base of the probe must be placed on a target and the specimen dropped onto the probe. The height of the drop, measured from the point of impact with the specimen to the upper surface of the probe must be 3 m. For this test the probe must have the same properties and dimensions as specified in (a) above, except that the length and mass of the probe must be such as to incur maximum damage to the specimen. The target on which the base of the probe is placed must be as specified in paragraph 5.

25. Enhanced thermal test: The conditions for this test are as specified in paragraph 16, except that the exposure to the thermal environment must be for a period of 60 minutes.

26. Impact test: The specimen must be subjected to an impact on a target at a velocity of not less than 90 m/s, at such an orientation as to suffer maximum damage. The target must be as defined in paragraph 5.

PART V

DEMONSTRATION OF COMPLIANCE

Demonstration of compliance with the performance standards required by Schedule 8 shall be accomplished by any of the following methods or by a combination thereof—

1. Performance of tests with specimens or prototypes or samples of the packaging simulating as closely as practicable the expected range of radioactive contents, and with the specimen or packaging to be tested prepared as normally presented for transport.

2. Reference to previous satisfactory demonstrations of a sufficiently similar nature.

3. 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 penetrator diameter or compressive load, must be taken into account.

4. Calculation, or reasoned argument, when the calculation procedures and parameters are agreed by the Secretary of State to be reliable or conservative.

5. After the specimen, prototype or sample has been subjected to the tests, appropriate methods of assessment must be used to ensure that the requirements of this section have been fulfilled in compliance with the performance and acceptance standards prescribed in Schedule 8.

SCHEDULE 10

Regulations 54(2), 56(3), 57(2)(b), 58(2), 60(2) and 61(2)

APPLICATION REQUIREMENTS

PART I

APPLICATION FOR APPROVAL OF DESIGN FOR SPECIAL FORM RADIOACTIVE MATERIAL OR LOW DISPERSIBLE RADIOACTIVE MATERIAL

An application for approval must include the following—

1. A detailed description of the radioactive material or, if a capsule, the contents. Particular reference must be made to both physical and chemical states.

2. A detailed statement of the design of any capsule to be used.

3. A statement of the tests which have been done and their results, or evidence based on calculative methods to show that the radioactive material is capable of meeting the performance standards, or other evidence that the special form radioactive material or low dispersible radioactive material meets the applicable requirements of these Regulations.

4. Evidence of a suitable quality assurance programme.

5. Any proposed pre-shipment actions for use in the consignment of special form radioactive material or low dispersible radioactive material.

PART II

APPLICATION FOR PACKAGE DESIGN APPROVAL CERTIFICATE FOR A TYPE B(U) OR TYPE C PACKAGE

An application for a package design approval certificate for a Type B(U) package must include the following—

1. A detailed description of the proposed radioactive contents with reference to their physical and chemical states and the nature of the radiation emitted.

2. A detailed statement of the design, including complete engineering drawings and schedules of materials and methods of manufacture to be used.

3. A statement of the tests which have been done and their results, or evidence based on calculative methods or other evidence that the design is adequate to meet the applicable requirements of these Regulations.

4. The proposed operating and maintenance instructions for the use of the packaging.

5. If the package is designed to have a maximum normal operating pressure in excess of 100 kPa gauge, a specification of the materials of manufacture of the containment system, the samples to be taken, and the tests to be made.

6. Where the proposed radioactive contents are irradiated fuel, the applicant must state and justify any assumption in the safety analysis relating to the characteristics of the fuel and describe any pre-shipment measurement required by paragraph 9(a)(ii) of Part XIV of Schedule 8.

7. Any special stowage provisions necessary to ensure the safe dissipation of heat from the package; considering the various modes of transport to be used and type of conveyance or freight container.

8. A reproducible illustration not larger than 21 cm × 30 cm showing the make-up of the package.

9. A specification of the applicable quality assurance programme.

10. Evidence of a suitable emergency plan.

PART III

APPLICATION FOR PACKAGE DESIGN APPROVAL CERTIFICATE FOR A TYPE B(M) PACKAGE

An application for a package design approval certificate for a Type B(M) package design must include the following—

1. The information required in Part II for Type B(U) or Type C packages.

2. A list of the requirements specified in paragraph 5 of Part X of Schedule 8, paragraph 4, 5 and 8-15 of Part XI of Schedule 8, with which the package does not conform.

3. Any proposed supplementary operational controls to be applied during transport not regularly provided for in these Regulations, but which are necessary to ensure the safety of the package or to compensate for the deficiencies listed in paragraph 2 above.

4. A statement relative to any restrictions on the mode of transport and to any special loading, carriage, unloading or handling procedures.

5. 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.

PART IV

APPLICATION FOR PACKAGE DESIGN APPROVAL CERTIFICATE FOR FISSILE MATERIAL

An application for a package design approval certificate for fissile material must include the following—

1. All information necessary to satisfy the Secretary of State that the package design meets the requirements of Part XIV of Schedule 8, as applicable, taking into account the nature, activity and form of the contents.

2. A specification of the applicable quality assurance programme.

PART V

APPLICATION FOR A SHIPMENT APPROVAL CERTIFICATE

An application for a shipment approval certificate must include—

1. The period of time, related to the shipment, for which the approval is sought.

2. The actual radioactive contents, the expected modes of transport and the type of conveyance and the probable, or proposed route.

3. The details of how the precautions and administrative or operational controls, referred to in the package design approval certificates are to be put into effect.

4. Evidence of a suitable emergency plan.

PART VI

APPLICATION FOR A SPECIAL ARRANGEMENT APPROVAL CERTIFICATE

An application for approval of shipments under special arrangement must include—

1. All the information necessary to satisfy the competent authority that the overall level of safety in transport is at least equivalent to that which would be provided if all the applicable requirements of these Regulations had been met.

2. A statement of the respects in which, and justification of why, the transport of the consignment cannot be made in full accordance with the applicable requirements.

3. A statement of any special precautions or special administrative or operational controls which are to be employed during transport to compensate for the failure to meet the applicable requirements.

4. Evidence of a suitable emergency plan.

SCHEDULE 11

Regulation 23

DETERMINATION OF CATEGORIES

Packages and overpacks must be assigned to either category I-WHITE, II-YELLOW or III-YELLOW in accordance with the conditions specified in Table VII of Schedule 1 and with the following requirements—

(a) For a package or overpack, both the Transport Index (TI) and the surface radiation level conditions must be taken into account in determining which is the appropriate category. Where the Transport Index (TI) satisfies the condition for one category but the surface radiation level satisfies the condition for a different category, the package or overpack must be assigned to the higher category of the two. For this purpose, category I-WHITE must be regarded as the lowest category.

(b) The Transport Index (TI) must be determined following the procedures specified in regulation 44.

(c) If the surface radiation level is greater than 2 mSv/h, the package or overpack must be transported under exclusive use and in accordance with the conditions prescribed in paragraph 8(a) of Schedule 7.

(d) A package transported under special arrangement must be assigned to category III-YELLOW.

(e) An overpack which contains packages transported under special arrangement must be assigned to category III-YELLOW.

SCHEDULE 12

Regulation 64

CONTENTS OF APPROVAL CERTIFICATES.

PART I

SPECIAL FORM RADIOACTIVE MATERIAL AND LOW DISPERSIBLE RADIOACTIVE MATERIAL APPROVAL CERTIFICATES

Each approval certificate issued by the Secretary of State for special form radioactive material or low dispersible radioactive material should include the following information—

(a) Type of certificate.

(b) The Secretary of State identification mark.

(c) The issue date and an expiry date.

(d) List of applicable national and international regulations, including the edition of the IAEA Regulations for the Safe Transport of Radioactive Material under which the special form radioactive material or low dispersible radioactive material is approved.

(e) The identification of the special form radioactive material or low dispersible radioactive material.

(f) A description of the special form radioactive material or low dispersible radioactive material.

(g) Design specifications for the special form radioactive material or low dispersible radioactive material which may include references to drawings.

(h) A specification of the radioactive contents which includes the activities involved and which may include the physical and chemical form.

(i) A specification of the applicable quality assurance programme as required in regulation 18.

(j) Reference to information provided by the applicant relating to specific actions to be taken prior to shipment.

(k) If deemed appropriate by the Secretary of State, reference to the identity of the applicant.

(l) Signature and identification of the certifying official.

PART II

SPECIAL ARRANGEMENT APPROVAL CERTIFICATES

Each approval certificate issued by the Secretary of State for a special arrangement must include the following information—

(a) Type of certificate.

(b) The Secretary of State identification mark.

(c) The issue date and an expiry date.

(d) Mode of transport.

(e) Any restrictions on the modes of transport, type of conveyance, freight container, and any necessary routing instructions.

(f) List of applicable national and international regulations, including the edition of the IAEA Regulations for the Safe Transport of Radioactive Material under which the special arrangement is approved.

(g) 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."

(h) References to certificates for alternative radioactive contents, other competent authority validation, or additional technical data or information, as deemed appropriate by the Secretary of State.

(i) Description of the packaging by a reference to the drawings or a specification of the design. If deemed appropriate by the Secretary of State, a reproducible illustration, not larger than 21 cm by 30 cm, showing the make-up of the package may also be included, accompanied by a brief description of the packaging, including materials of manufacture, gross mass, general outside dimensions and appearance.

(j) A specification of the authorised radioactive contents, including any restrictions on the radioactive contents which might not be obvious from the nature of the packaging. This must include the physical and chemical forms, the activities involved (including those of the various isotopes, if appropriate), amounts in grams (for fissile material), and whether special form radioactive material or low dispersible radioactive material, if applicable.

(k) Additionally, for packages containing fissile material—

(i) a detailed description of the authorised radioactive contents;

(ii) the value of the criticality safety index;

(iii) reference to the documentation that demonstrates the criticality safety of the contents;

(iv) any special features, on the basis of which the absence of water from certain void spaces has been assumed in the criticality assessment;

(v) any allowance (based on paragraph 9 of Part XIV of Schedule 8) for a change in neutron multiplication assumed in the criticality assessment as a result of actual irradiation experience; and

(vi) the ambient temperature range for which the special arrangement has been approved.

(l) A detailed listing of any supplementary operational controls required for preparation, loading, carriage, unloading and handling of the consignment, including any special stowage provisions for the safe dissipation of heat.

(m) If deemed appropriate by the Secretary of State, reasons for the special arrangement.

(n) Description of the compensatory measures to be applied as a result of the shipment being under special arrangement.

(o) Reference to information provided by the applicant relating to the use of the packaging or specific actions to be taken prior to the shipment.

(p) A statement regarding the ambient conditions assumed for purposes of design if these are not in accordance with those specified in paragraphs 4,5 and 15 of Part XI of Schedule 8, as applicable.

(q) Any emergency arrangements deemed necessary by the Secretary of State.

(r) A specification of the applicable quality assurance programme as required in regulation 18.

(s) If deemed appropriate by the Secretary of State, reference to the identity of the applicant and to the identity of the carrier.

(t) Signature and identification of the certifying official.

PART III

SHIPMENT APPROVAL CERTIFICATES

Each approval certificate for a shipment issued by the Secretary of State must include the following information—

(a) Type of certificate.

(b) The Secretary of State identification mark.

(c) The issue date and an expiry date.

(d) List of applicable national and international regulations, including the edition of the IAEA Regulations for the Safe Transport of Radioactive Material under which the shipment is approved.

(e) Any restrictions on the modes of transport, type of conveyance, freight container, and any necessary routeing instructions.

(f) 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."

(g) A detailed listing of any supplementary operational controls required for preparation, loading, carriage, unloading and handling of the consignment, including any special stowage provisions for the safe dissipation of heat or maintenance of criticality safety.

(h) Reference to information provided by the applicant relating to specific actions to be taken prior to shipment.

(i) Reference to the applicable design approval certificate.

(j) A specification of the actual radioactive contents, including any restrictions on the radioactive contents which might not be obvious from the nature of the packaging. This must include the physical and chemical forms, the total activities involved (including those of the various isotopes, if appropriate), amounts in grams (for fissile material), and whether special form radioactive material or low dispersible radioactive material, if applicable.

(k) Any emergency arrangements deemed necessary by the Secretary of State.

(l) A specification of the applicable quality assurance programme as required in regulation 18.

(m) If deemed appropriate by the Secretary of State, reference to the identity of the applicant.

(n) Signature and identification of the certifying official.

PART IV

PACKAGE DESIGN APPROVAL CERTIFICATES

Each approval certificate of the design of a package issued by the Secretary of State must include the following information—

(a) Type of certificate.

(b) The Secretary of State identification mark.

(c) The issue date and an expiry date.

(d) Any restriction on the modes of transport, if appropriate.

(e) List of applicable national and international regulations, including the edition of the IAEA Regulations for the Safe Transport of Radioactive Material under which the design is approved.

(f) 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."

(g) References to certificates for alternative radioactive contents, other competent authority validation, or additional technical data or information, as deemed appropriate by the Secretary of State.

(h) Identification of the packaging.

(i) Description of the packaging by a reference to the drawings or specification of the design. If deemed appropriate by the Secretary of State, a reproducible illustration, not larger than 21 cm by 30 cm, showing the make-up of the package may also be included, accompanied by a brief description of the packaging, including materials of manufacture, gross mass, general outside dimensions and appearance.

(j) Specification of the design by reference to the drawings.

(k) A specification of the authorised radioactive content, including any restrictions on the radioactive contents which might not be obvious from the nature of the packaging. This must include the physical and chemical forms, the activities involved (including those of the various isotopes, if appropriate), amounts in grams (for fissile material), and whether special form radioactive material or low dispersible radioactive material, if applicable.

(l) Additionally, for packages containing fissile material—

(i) a detailed description of the authorised radioactive contents;

(ii) the value of the criticality safety index;

(iii) reference to the documentation that demonstrates the criticality safety of the contents;

(iv) any special features, on the basis of which the absence of water from certain void spaces has been assumed in the criticality assessment;

(v) any allowance (based on paragraph 9 of Part XIV of Schedule 8) for a change in neutron multiplication assumed in the criticality assessment as a result of actual irradiation experience; and

(vi) the ambient temperature range for which the package design has been approved.

(m) For Type B(M) packages, a statement specifying those prescriptions of paragraph 5 of Part X of Schedule 8 and paragraphs 4, 5 and 8 to 15 of Part XI of Schedule 8 with which the package does not conform and any amplifying information which may be useful to other competent authorities.

(n) A detailed listing of any supplementary operational controls required for preparation, loading, carriage, unloading and handling of the consignment, including any special stowage provisions for the safe dissipation of heat.

(o) Reference to information provided by the applicant relating to the use of the packaging or specific actions to be taken prior to shipment.

(p) A statement regarding the ambient conditions assumed for purposes of design if these are not in accordance with those specified in paragraphs 4, 5 and 15 of Part XI of Schedule 8, as applicable.

(q) A specification of the applicable quality assurance programme as required in regulation 18.

(r) Any emergency arrangements deemed necessary by the Secretary of State.

(s) If deemed appropriate by the Secretary of State, reference to the identity of the applicant.

(t) Signature and identification of the certifying official.

PART V

COMBINED PACKAGE DESIGN APPROVAL AND SHIPMENT APPROVAL CERTIFICATES.

As for Part IV and also a statement authorising shipment where shipment approval is required under regulation 60, if deemed appropriate.

SCHEDULE 13

Regulation 75

CONTENTS OF REGULAR CONSIGNMENT CERTIFICATE

A regular consignment certificate must include the following:

1. A statement that the certificate is a regular consignment certificate.

2. The issue date.

3. The information listed in paragraph 17 of Schedule 6 with the exception of paragraph (c) of that Schedule, relating to the package at the date the certificate is issued.

SCHEDULE 14 Regulations 6, 15, 21, 36, 42, 48

FIGURES

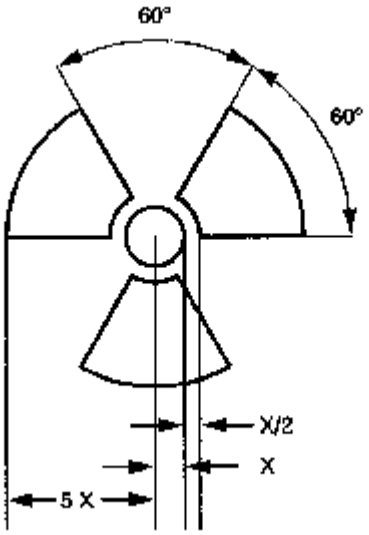

Fig. 1. Basic trefoil symbol with proportions based on a central circle of radius X. The minimum allowable size of X must be 4 mm.

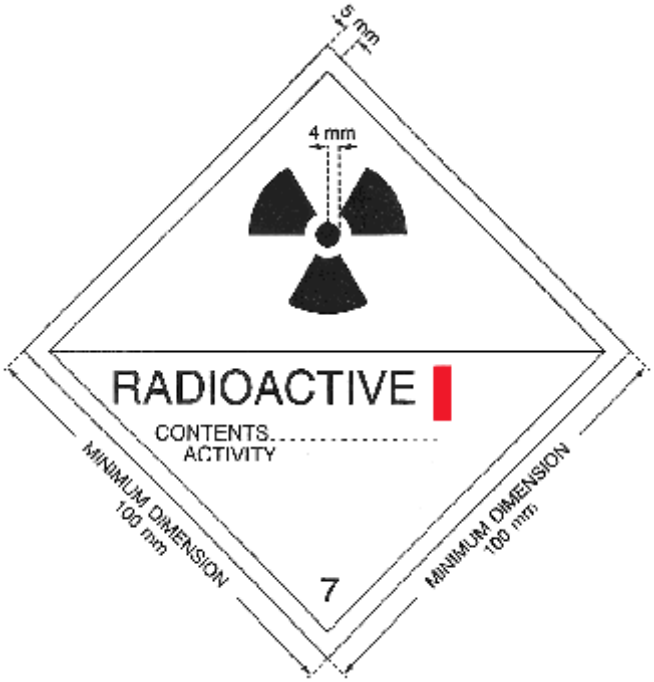

Fig. 2. Category I-WHITE label. The background colour of the label must be white, the colour of the trefoil and the printing must be black, and the colour of the category bar must be red.

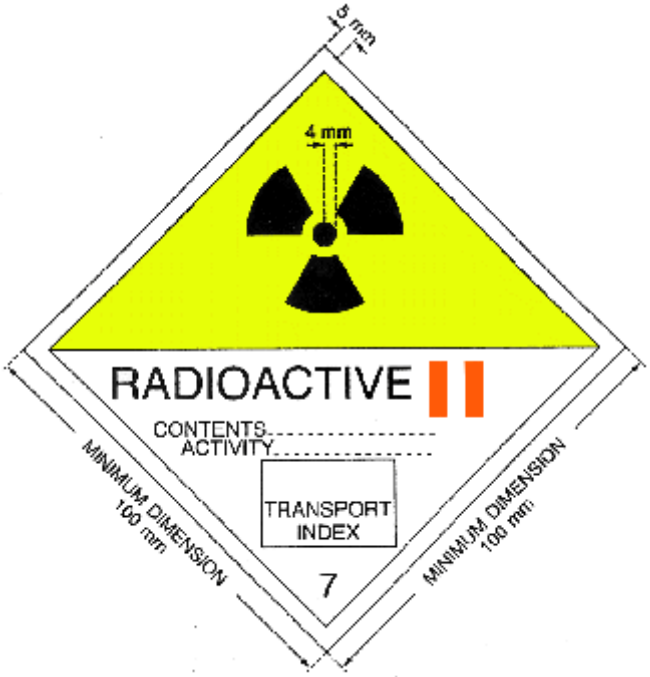

Fig. 3. Category II-YELLOW label. The background colour of the upper half of the label must be yellow and the lower half white, the colour of the trefoil and the printing must be black, and the colour of the category bars must be red.

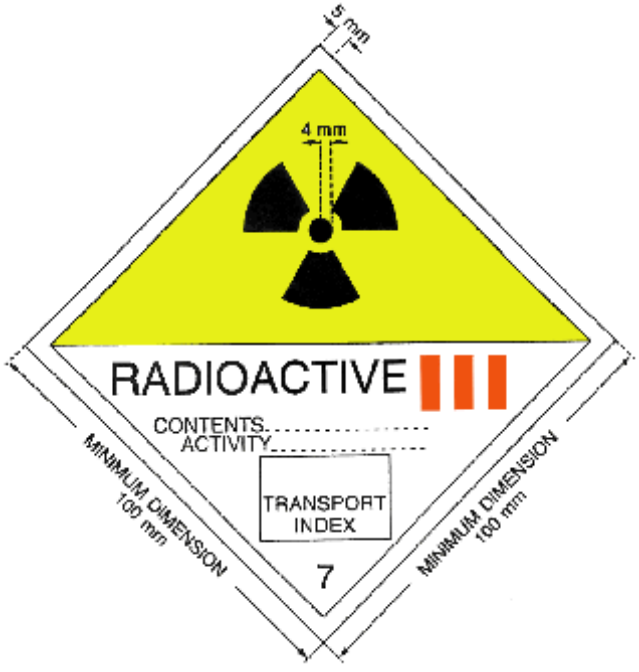

Fig. 4. Category III-YELLOW label. The background colour of the upper half of the label must be yellow and the lower half white, the colour of the trefoil and the printing must be black, and the colour of the category bars must be red.

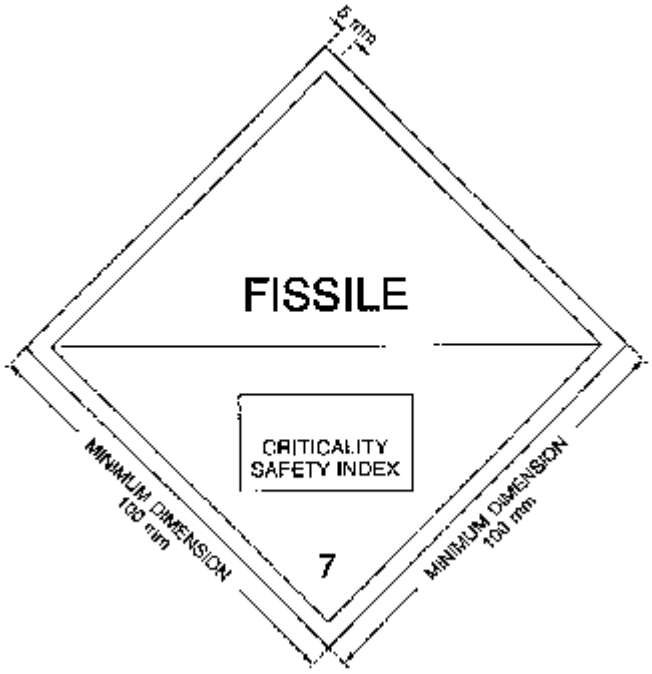

Fig. 5. Criticality safety index label. The background colour of the label must be white, the colour of the printing must be black.

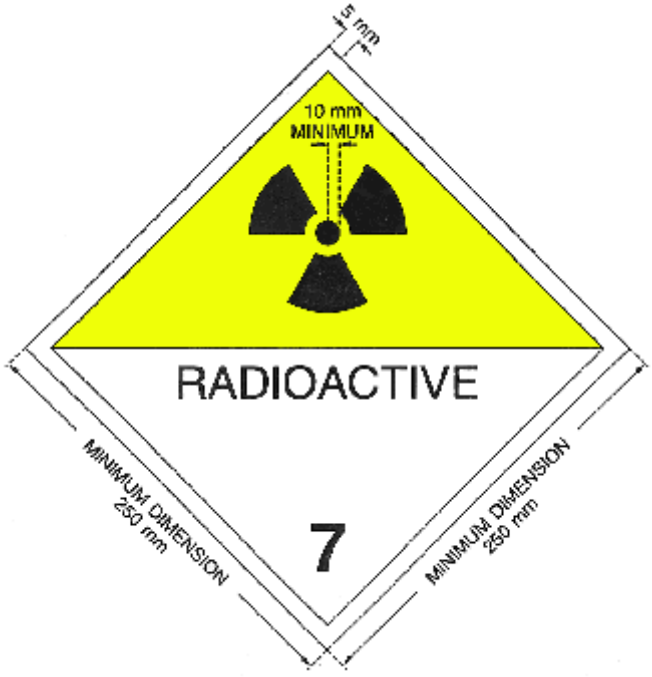

Fig. 6. Placard. Except as permitted by paragraph 15 of Schedule 6 the minimum dimensions must be as shown; when different dimensions are used the relative proportions must be maintained. The number '7' must not be less than 25 mm high. The background colour of the upper half of the placard must be yellow and of the lower half white, the colour of the trefoil and the printing must be black. The use of the word "RADIOACTIVE" in the bottom half is

optional to allow the alternative use of this placard to display the appropriate United Nations number for the consignment.