Attachment 11

CLASS 7--RADIOACTIVE MATERIALS

A11.1. General Requirements. For military members, failure to obey the mandatory provisions from paragraphs A11.2. through A11.12. and any provisions of mandatory subparagraph(s) hereunder is a violation of Article 92, Uniform Code of Military Justice (UCMJ). Civilian employees who fail to obey the provisions from paragraph A11.2. through A11.12. and any provisions of mandatory subparagraph(s) hereunder are subject to administrative disciplinary action without regard to otherwise applicable criminal or civil sanctions. Personnel shall not deviate from these provisions and comply with the outer container options as specified in packaging paragraph. **(T-0)**. Not all packaging paragraphs are inclusive and packaging selection is determined by the type of radioactive material. This attachment contains information concerning the packaging and general handling instructions for Class 7 (Radioactive Material). See Attachment 3 for other details concerning Class 7 material.

A11.2. Activity Limits for Type A and Type B Packages:

A11.2.1. A Type A package may not contain a quantity of radioactivity greater than A_1 (for special form radioactive material) or A_2 for all other radioactive materials as listed in A11.4. Activity limits not listed in A11.4. are determined per 49 CFR Section 173.433.

A11.2.2. The limits on activity contained in a Type B(U) or Type B(M) package are those prescribed in A11.9. and A11.10. or in the applicable approval certificate in accordance with 49 CFR Sections 173.471, 173.472 or 173.473.

A11.3. Determining A1 and A2 Values for Radionuclides:

A11.3.1. For single radionuclides of known identity, the values of A_1 and A_2 are those given in A11.4. The values of A_1 and A_2 are also applicable for radionuclides contained in (a,n) or (h,n) neutron sources.

A11.3.2. Determine values of A_1 and A_2 for any single radionuclide of known identity that is not listed in A11.4. according to 49 CFR Section 173.433.

A11.4. Table A11.1. This table gives A_1 and A_2 values for radionuclides. This table also gives values on exempt material activity concentrations and exempt consignment activity limits for radionuclides. The information in this table is taken from 49 CFR Sections 173.435 and 173.436.

Table A11.1. Table of A1 and A2 Values for Common Radionuclides.

Symbol	Element and Atomic Number	A_1 (TBq) (Special Form)	A_2 (TBq) (Other Form)	Activity concentration for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
Ac-225[a]	Actinium (89)	0.8	0.006	1×10^{1}	1×10^{4}
Ac-227[a]		0.9	0.00009	1×10^{-1}	1×10^{3}
Ac-228		0.6	0.5	1×10^{1}	1×10^{6}
Ag-105	Silver (47)	2	2	1×10^{2}	1×10^{6}
Ag-108m[a]		0.7	0.7	1×10^{1}[b]	1×10^{6}[b]
Ag-110m[a]		0.4	0.4	1×10^{1}	1×10^{6}
Ag-111		2	0.6	1×10^{3}	1×10^{6}
Al-26	Aluminum (13)	0.1	0.1	1×10^{1}	1×10^{5}
Am-241	Americium (95)	10	0.001	1×10^{0}	1×10^{4}
Am-242m[a]		10	0.001	1×10^{0}[b]	1×10^{4}[b]
Am-243[a]		5	0.001	1×10^{0}[b]	1×10^{3}[b]
Ar-37	Argon (18)	40	40	1×10^{6}	1×10^{8}
Ar-39		40	20	1×10^{7}	1×10^{4}
Ar-41		0.3	0.3	1×10^{2}	1×10^{9}
As-72	Arsenic (33)	0.3	0.3	1×10^{1}	1×10^{5}
As-73		40	40	1×10^{3}	1×10^{7}
As-74		1	0.9	1×10^{1}	1×10^{6}
As-76		0.3	0.3	1×10^{2}	1×10^{5}
As-77		20	0.7	1×10^{3}	1×10^{6}
At-211	Astatine (85)	20	0.5	1×10^{3}	1×10^{7}
Au-193	Gold (79)	7	2	1×10^{2}	1×10^{7}
Au-194		1	1	1×10^{1}	1×10^{6}
Au-195		10	6	1×10^{2}	1×10^{7}
Au-198		1	0.6	1×10^{2}	1×10^{6}
Au-199		10	0.6	1×10^{2}	1×10^{6}
Ba-131[a]	Barium (56)	2	2	1×10^{2}	1×10^{6}
Ba-133		3	3	1×10^{2}	1×10^{6}
Ba-133m		20	0.6	1×10^{2}	1×10^{6}
Ba-140[a]		0.5	0.3	1×10^{1}[b]	1×10^{5}[b]
Be-7	Beryllium (4)	20	20	1×10^{3}	1×10^{7}
Be-10		40	0.6	1×10^{4}	1×10^{6}
Bi-205	Bismuth (83)	0.7	0.7	1×10^{1}	1×10^{6}
Bi-206		0.3	0.3	1×10^{1}	1×10^{5}
Bi-207		0.7	0.7	1×10^{1}	1×10^{6}
Bi-210		1	0.6	1×10^{3}	1×10^{6}
Bi-210m[a]		0.6	0.02	1×10^{1}	1×10^{5}
Bi-212[a]		0.7	0.6	1×10^{1}[b]	1×10^{5}[b]
Bk-247	Berkelium (97)	8	0.0008	1×10^{0}	1×10^{4}
Bk-249[a]		40	0.3	1×10^{3}	1×10^{6}
Br-76	Bromine (35)	0.4	0.4	1×10^{1}	1×10^{5}

Symbol	Element and Atomic Number	A_1 (TBq) (Special Form)	A_2 (TBq) (Other Form)	Activity concentration for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
Br-77		3	3	1×10^2	1×10^6
Br-82		0.4	0.4	1×10^1	1×10^6
C-11	Carbon (6)	1	0.6	1×10^1	1×10^6
C-14		40	3	1×10^4	1×10^7
Ca-41	Calcium (20)	Unlimited	Unlimited	1×10^5	1×10^7
Ca-45		40	1	1×10^4	1×10^7
Ca-47[a]		3	0.3	1×10^1	1×10^6
Cd-109	Cadmium (48)	30	2	1×10^4	1×10^6
Cd-113m		40	0.5	1×10^3	1×10^6
Cd-115 [a]		3	0.4	1×10^2	1×10^6
Cd-115m		0.5	0.5	1×10^3	1×10^6
Ce-139	Cerium (58)	7	2	1×10^2	1×10^6
Ce-141		20	0.6	1×10^2	1×10^7
Ce-143		0.9	0.6	1×10^2	1×10^6
Ce-144[a]		0.2	0.2	1×10^{2b}	1×10^{5b}
Cf-248	Californium (98)	40	0.006	1×10^1	1×10^4
Cf-249		3	0.0008	1×10^0	1×10^3
Cf-250		20	0.002	1×10^1	1×10^4
Cf-251		7	0.0007	1×10^0	1×10^3
Cf-252		0.1	0.003	1×10^1	1×10^4
Cf-253[a]		40	0.04	1×10^2	1×10^5
Cf-254		0.001	0.001	1×10^0	1×10^3
Cl-36	Chlorine (17)	10	0.6	1×10^4	1×10^6
Cl-38		0.2	0.2	1×10^1	1×10^5
Cm-240	Curium (96)	40	0.02	1×10^2	1×10^5
Cm-241		2	1	1×10^2	1×10^6
Cm-242		40	0.01	1×10^2	1×10^5
Cm-243		9	0.001	1×10^0	1×10^4
Cm-244		20	0.002	1×10^1	1×10^4
Cm-245		9	0.0009	1×10^0	1×10^3
Cm-246		9	0.0009	1×10^0	1×10^3
Cm-247[a]		3	0.001	1×10^0	1×10^4
Cm-248		0.02	0.0003	1×10^0	1×10^3
Co-55	Cobalt (27)	0.5	0.5	1×10^1	1×10^6
Co-56		0.3	0.3	1×10^1	1×10^5
Co-57		10	10	1×10^2	1×10^6
Co-58m		40	40	1×10^4	1×10^7
Co-58		1	1	1×10^1	1×10^6
Co-60		0.4	0.4	1×10^1	1×10^5
Cr-51	Chromium (24)	30	30	1×10^3	1×10^7
Cs-129	Cesium (55)	4	4	1×10^2	1×10^5
Cs-131		30	30	1×10^3	1×10^6
Cs-132		1	1	1×10^3	1×10^6

Symbol	Element and Atomic Number	A_1 (TBq) (Special Form)	A_2 (TBq) (Other Form)	Activity concentration for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
Cs-134		0.7	0.7	1×10^1	1×10^4
Cs-134m		40	0.6	1×10^3	1×10^5
Cs-135		40	1	1×10^4	1×10^7
Cs-136		0.5	0.5	1×10^1	1×10^5
Cs-137[a]		2	0.6	1×10^{1b}	1×10^{4b}
Cu-64	Copper (29)	6	1	1×10^2	1×10^6
Cu-67		10	0.7	1×10^2	1×10^6
Dy-159	Dysprosium (66)	20	20	1×10^3	1×10^7
Dy-165		0.9	0.6	1×10^3	1×10^6
Dy-166[a]		0.9	0.3	1×10^3	1×10^6
Er-169	Erbium (68)	40	1	1×10^4	1×10^7
Er-171		0.8	0.5	1×10^2	1×10^6
Eu-147	Europium (63)	2	2	1×10^2	1×10^6
Eu-148		0.5	0.5	1×10^1	1×10^6
Eu-149		20	20	1×10^2	1×10^7
Eu-150 (short lived)		2	0.7	1×10^3	1×10^6
Eu-150 (long lived)		0.7	0.7	1×10^1	1×10^6
Eu-152		1	1	1×10^1	1×10^6
Eu-152m		0.8	0.8	1×10^2	1×10^6
Eu-154		0.9	0.6	1×10^1	1×10^6
Eu-155		20	3	1×10^2	1×10^7
Eu-156		0.7	0.7	1×10^1	1×10^6
F-18	Fluorine (9)	1	0.6	1×10^1	1×10^6
Fe-52[a]	Iron (26)	0.3	0.3	1×10^1	1×10^6
Fe-55		40	40	1×10^4	1×10^6
Fe-59		0.9	0.9	1×10^1	1×10^6
Fe-60[a]		40	0.2	1×10^2	1×10^5
Ga-67	Gallium (31)	7	3	1×10^2	1×10^6
Ga-68		0.5	0.5	1×10^1	1×10^5
Ga-72		0.4	0.4	1×10^1	1×10^5
Gd-146[a]	Gadolinium (64)	0.5	0.5	1×10^1	1×10^6
Gd-148		20	0.002	1×10^1	1×10^4
Gd-153		10	9	1×10^2	1×10^7
Gd-159		3	0.6	1×10^3	1×10^6
Ge-68[a]	Germanium (32)	0.5	0.5	1×10^1	1×10^5
Ge-71		40	40	1×10^4	1×10^8
Ge-77		0.3	0.3	1×10^1	1×10^5
Hf-172[a]	Hafnium (72)	0.6	0.6	1×10^1	1×10^6
Hf-175		3	3	1×10^2	1×10^6
Hf-181		2	0.5	1×10^1	1×10^6

Symbol	Element and Atomic Number	A_1 (TBq) (Special Form)	A_2 (TBq) (Other Form)	Activity concentration for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
Hf-182		Unlimited	Unlimited	1×10^2	1×10^6
Hg-194[a]	Mercury (80)	1	1	1×10^1	1×10^6
Hg-195m[a]		3	0.7	1×10^2	1×10^6
Hg-197m		10	0.4	1×10^2	1×10^6
Hg-197		20	10	1×10^2	1×10^7
Hg-203		5	1	1×10^2	1×10^5
Ho-166	Holmium (67)	0.4	0.4	1×10^3	1×10^5
Ho-166m		0.6	0.5	1×10^1	1×10^6
I-123	Iodine (53)	6	3	1×10^2	1×10^7
I-124		1	1	1×10^1	1×10^6
I-125		20	3	1×10^3	1×10^6
I-126		2	1	1×10^2	1×10^6
I-129		Unlimited	Unlimited	1×10^2	1×10^5
I-131		3	0.7	1×10^2	1×10^6
I-132		0.4	0.4	1×10^1	1×10^5
I-133		0.7	0.6	1×10^1	1×10^6
I-134		0.3	0.3	1×10^1	1×10^5
I-135[a]		0.6	0.6	1×10^1	1×10^6
In-111	Indium (49)	3	3	1×10^2	1×10^6
In-113m		4	2	1×10^2	1×10^6
In-114m[a]		10	0.5	1×10^2	1×10^6
In-115m		7	1	1×10^2	1×10^6
Ir-189[a]	Iridium (77)	10	10	1×10^2	1×10^7
Ir-190		0.7	0.7	1×10^1	1×10^6
Ir-192		1[c]	0.6	1×10^1	1×10^4
Ir-194		0.3	0.3	1×10^2	1×10^5
K-40	Potassium (19)	0.9	0.9	1×10^2	1×10^6
K-42		0.2	0.2	1×10^2	1×10^6
K-43		0.7	0.6	1×10^1	1×10^6
Kr-81	Krypton (36)	40	40	1×10^4	1×10^7
Kr-85m		8	3	1×10^3	1×10^{10}
Kr-85		10	10	1×10^5	1×10^4
Kr-87		0.2	0.2	1×10^2	1×10^9
La-137	Lanthanum (57)	30	6	1×10^3	1×10^7
La-140		0.4	0.4	1×10^1	1×10^5
LSA		Note 4	Note 4		
Lu-172	Lutetium (71)	0.6	0.6	1×10^1	1×10^6
Lu-173		8	8	1×10^2	1×10^7
Lu-174m		20	10	1×10^2	1×10^7
Lu-174		9	9	1×10^2	1×10^7
Lu-177		30	0.7	1×10^3	1×10^7
MFP	Mixed Fission Products	Note 3	Note 3		

Symbol	Element and Atomic Number	A_1 (TBq) (Special Form)	A_2 (TBq) (Other Form)	Activity concentration for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
Mg-28[a]	Magnesium (12)	0.3	0.3	1×10^1	1×10^5
Mn-52	Manganese (25)	0.3	0.3	1×10^1	1×10^5
Mn-53		Unlimited	Unlimited	1×10^4	1×10^9
Mn-54		1	1	1×10^1	1×10^6
Mn-56		0.3	0.3	1×10^1	1×10^5
Mo-93	Molybdenum (42)	40	20	1×10^3	1×10^8
Mo-99[a]		1	0.6	1×10^2	1×10^6
N-13	Nitrogen (7)	0.9	0.6	1×10^2	1×10^9
Na-22	Sodium (11)	0.5	0.5	1×10^1	1×10^6
Na-24		0.2	0.2	1×10^1	1×10^5
Nb-93m	Niobium (41)	40	30	1×10^4	1×10^7
Nb-94		0.7	0.7	1×10^1	1×10^6
Nb-95		1	1	1×10^1	1×10^6
Nb-97		0.9	0.6	1×10^1	1×10^6
Nd-147	Neodymium (60)	6	0.6	1×10^2	1×10^6
Nd-149		0.6	0.5	1×10^2	1×10^6
Ni-59	Nickel (28)	Unlimited	Unlimited	1×10^4	1×10^8
Ni-63		40	30	1×10^5	1×10^8
Ni-65		0.4	0.4	1×10^1	1×10^6
Np-235	Neptunium (93)	40	40	1×10^3	1×10^7
Np-236 (short lived)		20	2	1×10^3	1×10^7
Np-236 (long lived)		9	0.02	1×10^2	1×10^5
Np-237		20	0.002	1×10^{0b}	1×10^{3b}
Np-239		7	0.4	1×10^2	1×10^7
Os-185	Osmium (76)	1	1	1×10^1	1×10^6
Os-191m		40	30	1×10^3	1×10^7
Os-191		10	2	1×10^2	1×10^7
Os-193		2	0.6	1×10^2	1×10^6
Os-194[a]		0.3	0.3	1×10^2	1×10^5
P-32	Phosphorus (15)	0.5	0.5	1×10^3	1×10^5
P-33		40	1	1×10^5	1×10^8
Pa-230[a]	Protactinium (91)	2	0.07	1×10^1	1×10^6
Pa-231		4	0.0004	1×10^0	1×10^3
Pa-233		5	0.7	1×10^2	1×10^7
Pb-201	Lead (82)	1	1	1×10^1	1×10^6
Pb-202		40	20	1×10^3	1×10^6
Pb-203		4	3	1×10^2	1×10^6
Pb-205		Unlimited	Unlimited	1×10^4	1×10^7
Pb-210[a]		1	0.05	1×10^{1b}	1×10^{4b}

Symbol	Element and Atomic Number	A_1 (TBq) (Special Form)	A_2 (TBq) (Other Form)	Activity concentration for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
Pb-212 [a]		0.7	0.2	1×10^{1} [b]	1×10^{5} [b]
Pd-103	Palladium (46)	40	40	1×10^{3}	1×10^{8}
Pd-107		Unlimited	Unlimited	1×10^{5}	1×10^{8}
Pd-109		2	0.5	1×10^{3}	1×10^{6}
Pm-143	Promethium (61)	3	3	1×10^{2}	1×10^{6}
Pm-144		0.7	0.7	1×10^{1}	1×10^{6}
Pm-145		30	10	1×10^{3}	1×10^{7}
Pm-147		40	2	1×10^{4}	1×10^{7}
Pm-148m[a]		0.8	0.7	1×10^{1}	1×10^{6}
Pm-149		2	0.6	1×10^{3}	1×10^{6}
Pm-151		2	0.6	1×10^{2}	1×10^{6}
Po-210	Polonium (84)	40	0.02	1×10^{1}	1×10^{4}
Pr-142	Praseodymium (59)	0.4	0.4	1×10^{2}	1×10^{5}
Pr-143		3	0.6	1×10^{4}	1×10^{6}
Pt-188[a]	Platinum (78)	1	0.8	1×10^{1}	1×10^{6}
Pt-191		4	3	1×10^{2}	1×10^{6}
Pt-193m		40	0.5	1×10^{3}	1×10^{7}
Pt-193		40	40	1×10^{4}	1×10^{7}
Pt-195m		10	0.5	1×10^{2}	1×10^{6}
Pt-197m		10	0.6	1×10^{2}	1×10^{6}
Pt-197		20	0.6	1×10^{3}	1×10^{6}
Pu-236	Plutonium (94)	30	0.003	1×10^{1}	1×10^{4}
Pu-237		20	20	1×10^{3}	1×10^{7}
Pu-238		10	0.001	1×10^{0}	1×10^{4}
Pu-239		10	0.001	1×10^{0}	1×10^{4}
Pu-240		10	0.001	1×10^{0}	1×10^{3}
Pu-241[a]		40	0.06	1×10^{2}	1×10^{5}
Pu-242		10	0.001	1×10^{0}	1×10^{4}
Pu-244[a]		0.4	0.001	1×10^{0}	1×10^{4}
Ra-223[a]	Radium (88)	0.4	0.007	1×10^{2} [b]	1×10^{5} [b]
Ra-224 [a]		0.4	0.02	1×10^{1} [b]	1×10^{5} [b]
Ra-225 [a]		0.2	0.004	1×10^{2}	1×10^{5}
Ra-226 [a]		0.2	0.003	1×10^{1} [b]	1×10^{4} [b]
Ra-228 [a]		0.6	0.02	1×10^{1} [b]	1×10^{5} [b]
Rb-81	Rubidium (37)	2	0.8	1×10^{1}	1×10^{6}
Rb-83[a]		2	2	1×10^{2}	1×10^{6}
Rb-84		1	1	1×10^{1}	1×10^{6}
Rb-86		0.5	0.5	1×10^{2}	1×10^{5}
Rb-87		Unlimited	Unlimited	1×10^{4}	1×10^{7}
Rb (natural)		Unlimited	Unlimited	1×10^{4}	1×10^{7}
Re-184	Rhenium (75)	1	1	1×10^{1}	1×10^{6}
Re-184m		3	1	1×10^{2}	1×10^{6}

Symbol	Element and Atomic Number	A_1 (TBq) (Special Form)	A_2 (TBq) (Other Form)	Activity concentration for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
Re-186		2	0.6	1×10^3	1×10^6
Re-187		Unlimited	unlimited	1×10^6	1×10^9
Re-188		0.4	0.4	1×10^2	1×10^5
Re-189[a]		3	0.6	1×10^2	1×10^6
Re (natural)		Unlimited	Unlimited	1×10^6	1×10^9
Rh-99	Rhodium (45)	2	2	1×10^1	1×10^6
Rh-101		4	3	1×10^2	1×10^7
Rh-102		0.5	0.5	1×10^1	1×10^6
Rh-102m		2	2	1×10^2	1×10^6
Rh-103m		40	40	1×10^4	1×10^8
Rh-105		10	0.8	1×10^2	1×10^7
Rn-222[a]	Radon (86)	0.3	0.004	1×10^{1b}	1×10^{8b}
Ru-97	Ruthenium (44)	5	5	1×10^2	1×10^7
Ru-103[a]		2	2	1×10^2	1×10^6
Ru-105		1	0.6	1×10^1	1×10^6
Ru-106 [a]		0.2	0.2	1×10^{2b}	1×10^{5b}
S-35	Sulphur (16)	40	3	1×10^5	1×10^8
Sb-122	Antimony (51)	0.4	0.4	1×10^2	1×10^4
Sb-124		0.6	0.6	1×10^1	1×10^6
Sb-125		2	1	1×10^2	1×10^6
Sb-126		0.4	0.4	1×10^1	1×10^5
Sc-44	Scandium (21)	0.5	0.5	1×10^1	1×10^5
Sc-46		0.5	0.5	1×10^1	1×10^6
Sc-47		10	0.7	1×10^2	1×10^6
Sc-48		0.3	0.3	1×10^1	1×10^5
SCO		Note 5	Note 5		
Se-75	Selenium (34)	3	3	1×10^2	1×10^6
Se-79		40	2	1×10^4	1×10^7
Si-31	Silicon (14)	0.6	0.6	1×10^3	1×10^6
Si-32		40	0.5	1×10^3	1×10^6
Sm-145	Samarium (62)	10	10	1×10^2	1×10^7
Sm-147		Unlimited	Unlimited	1×10^1	1×10^4
Sm-151		40	10	1×10^4	1×10^8
Sm-153		9	0.6	1×10^2	1×10^6
Sn-113[a]	Tin (50)	4	2	1×10^3	1×10^7
Sn117m		7	0.4	1×10^2	1×10^6
Sn-119m		40	30	1×10^3	1×10^7
Sn-121m[a]		40	0.9	1×10^3	1×10^7
Sn-123		0.8	0.6	1×10^3	1×10^6
Sn-125		0.4	0.4	1×10^2	1×10^5
Sn-126[a]		0.6	0.4	1×10^1	1×10^5

Symbol	Element and Atomic Number	A_1 (TBq) (Special Form)	A_2 (TBq) (Other Form)	Activity concentration for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
Sr-82[a]	Strontium (38)	0.2	0.2	1×10^1	1×10^5
Sr-85m		5	5	1×10^2	1×10^7
Sr-85		2	2	1×10^2	1×10^6
Sr-87m		3	3	1×10^2	1×10^6
Sr-89		0.6	0.6	1×10^3	1×10^6
Sr-90[a]		0.3	0.3	1×10^{2b}	1×10^{4b}
Sr-91[a]		0.3	0.3	1×10^1	1×10^5
Sr-92[a]		1	0.3	1×10^1	1×10^6
T (All Forms) (see note)	Tritium (1)	40	40	1×10^6	1×10^9
Ta-178 (long lived)	Tantalum (73)	1	0.8	1×10^1	1×10^6
Ta-179		30	30	1×10^3	1×10^7
Ta-182		0.9	0.5	1×10^1	1×10^4
Tb-157	Terbium (65)	40	40	1×10^4	1×10^7
Tb-158		1	1	1×10^1	1×10^6
Tb-160		1	0.6	1×10^1	1×10^6
Tc-95m[a]	Technetium (43)	2	2	1×10^1	1×10^6
Tc-96m[a]		0.4	0.4	1×10^3	1×10^7
Tc-96		0.4	0.4	1×10^1	1×10^6
Tc-97m		40	1	1×10^3	1×10^7
Tc-97		Unlimited	Unlimited	1×10^3	1×10^8
Tc-98		0.8	0.7	1×10^1	1×10^6
Tc-99m		10	4	1×10^2	1×10^7
Tc-99		40	0.9	1×10^4	1×10^7
Te-121m	Tellurium (52)	5	3	1×10^2	1×10^5
Te-121		2	2	1×10^1	1×10^6
Te-123m		8	1	1×10^2	1×10^7
Te-125m		20	0.9	1×10^3	1×10^7
Te-127m[a]		20	0.5	1×10^3	1×10^7
Te-127		20	0.7	1×10^3	1×10^6
Te-129m[a]		0.8	0.4	1×10^3	1×10^6
Te-129		0.7	0.6	1×10^2	1×10^6
Te-131m[a]		0.7	0.5	1×10^1	1×10^6
Te-132[a]		0.5	0.4	1×10^2	1×10^7
Th-227	Thorium (90)	10	0.005	1×10^1	1×10^4
Th-228[a]		0.5	0.001	1×10^{0b}	1×10^{4b}
Th-229		5	0.0005	1×10^{0b}	1×10^{3b}
Th-230		10	0.001	1×10^0	1×10^4
Th-231		40	0.02	1×10^3	1×10^7
Th-232		Unlimited	Unlimited	1×10^1	1×10^4
Th-234[a]		0.3	0.3	1×10^{3b}	1×10^{5b}
Th (natural)		Unlimited	Unlimited	1×10^{0b}	1×10^{3b}
Ti-44[a]	Titanium (22)	0.5	0.4	1×10^1	1×10^5

Symbol	Element and Atomic Number	A_1 (TBq) (Special Form)	A_2 (TBq) (Other Form)	Activity concentration for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
Tl-200	Thallium (81)	0.9	0.9	1×10^{1}	1×10^{6}
Tl-201		10	4	1×10^{2}	1×10^{6}
Tl-202		2	2	1×10^{2}	1×10^{6}
Tl-204		10	0.7	1×10^{4}	1×10^{4}
Tm-167	Thulium (69)	7	0.8	1×10^{2}	1×10^{6}
Tm-170		3	0.6	1×10^{3}	1×10^{6}
Tm-171		40	40	1×10^{4}	1×10^{8}
U-230 (fast lung absorption)[a, d]	Uranium (92)	40	0.1	1×10^{1}[b]	1×10^{5}[b]
U-230 (medium lung absorption)[a, e]		40	0.004	1×10^{1}	1×10^{4}
U-230 (slow lung absorption)[a, f]		30	0.003	1×10^{1}	1×10^{4}
U-232 (fast lung absorption)[d]		40	0.01	1×10^{0}[b]	1×10^{3}[b]
U-232 (medium lung absorption)[e]		40	0.007	1×10^{1}	1×10^{4}
U-232 (slow lung absorption)[f]		10	0.001	1×10^{1}	1×10^{4}
U-233 (fast lung absorption)[d]		40	0.09	1×10^{1}	1×10^{4}
U-233 (medium lung absorption)[e]		40	0.02	1×10^{2}	1×10^{5}
U-233 (slow lung absorption)[f]		40	0.006	1×10^{1}	1×10^{5}
U-234 (fast lung absorption) [d]		40	0.09	1×10^{1}	1×10^{4}
U-234 (medium lung absorption)[e, f]		40	0.02	1×10^{2}	1×10^{5}
U-234 (slow lung absorption)[f]		40	0.006	1×10^{1}	1×10^{5}
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]		40	0.02	1×10^{2}	1×10^{5}
U-236 (slow lung absorption)[f]		40	0.006	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 (natural)		Unlimited	Unlimited	1×10^{0}[b]	1×10^{3}[b]

Symbol	Element and Atomic Number	A_1 (TBq) (Special Form)	A_2 (TBq) (Other Form)	Activity concentration for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
U (enriched 20% or less)[g]		Unlimited	Unlimited	1×10^0	1×10^3
U (depleted)		Unlimited	Unlimited	1×10^0	1×10^3
V-48	Vanadium (23)	0.4	0.4	1×10^1	1×10^5
V-49		40	40	1×10^4	1×10^7
W-178	Tungsten (74)	9	5	1×10^1	1×10^6
W-181		30	30	1×10^3	1×10^7
W-185		40	0.8	1×10^4	1×10^7
W-187		2	0.6	1×10^2	1×10^6
W-188[a]		0.4	0.3	1×10^2	1×10^5
Xe-122[a]	Xenon (54)	0.4	0.4	1×10^2	1×10^9
Xe-123		2	0.7	1×10^2	1×10^9
Xe-127		4	2	1×10^3	1×10^5
Xe-131m		40	40	1×10^4	1×10^4
Xe-133		20	10	1×10^3	1×10^4
Xe-135		3	2	1×10^3	1×10^{10}
Y-87[a]	Yttrium (39)	1	1	1×10^1	1×10^6
Y-88		0.4	0.4	1×10^1	1×10^6
Y-90		0.3	0.3	1×10^3	1×10^5
Y-91m		2	2	1×10^2	1×10^6
Y-91		0.6	0.6	1×10^3	1×10^6
Y-92		0.2	0.2	1×10^2	1×10^5
Y-93		0.3	0.3	1×10^2	1×10^5
Yb-169	Ytterbium (70)	4	1	1×10^2	1×10^7
Yb-175		30	0.9	1×10^3	1×10^7
Zn-65	Zinc (30)	2	2	1×10^1	1×10^6
Zn-69m		3	0.6	1×10^2	1×10^6
Zn-69		3	0.6	1×10^4	1×10^6
Zr-88	Zirconium (40)	3	3	1×10^2	1×10^6
Zr-93		Unlimited	Unlimited	1×10^{3b}	1×10^{7b}
Zr-95[a]		2	0.8	1×10^1	1×10^6
Zr-97[a]		0.4	0.4	1×10^{1b}	1×10^{5b}

Table A11.1. Notes:

[a] A_1 and/or A_2 values include contributions from daughter nuclides with half-lives less than 10 calendar 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-106 --- Rh-106

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

Ra-224 --- Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)

Ra-226 --- Rn-222, Po-218, Pb-214, Bi-214, Po-214, Pb-210, Bi-210, Po-210

Ra-228 --- Ac-228

Th-226 --- Ra-222, Rn-218, Po-214

Th-228 --- Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)

Th-229 --- Ra-225, Ac-225, Fr-221, At-217, Bi-213, Po-213, Pb-209

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 UF_6, $U0_2F_2$ and $UO_2(NO_3)_2$ in both normal and accident conditions of transport.

[e] These values apply only to compounds of uranium that take the chemical form of $U0_3$, UF_4, UCI_4 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.

1. In Table A11.1, the symbols for the various radionuclides are styled thus "Ir-192". The alternative form of "192 Ir" is equally acceptable.

2. Tritium (T) is a synonym for the radionuclide Hydrogen-3.

3. For Mixed Fission Products values for A_1 and A_2 are calculated using the formula for mixtures found in 49 CFR Paragraph 173.433(h).

4. For Low Specific Activity (LSA) material, consult IATA, section 10.3.5.

5. For Surface Contaminated Objects (SCO) consult IATA, section 10.3.6.

6. Type A packages may not contain activities greater than the following values: for special form radioactive material: A_1; or for all other radioactive materials: A_2.

A11.5. Excepted Packages. An Excepted Package is a packaging used for containing radioactive material, that is designed to meet the general packaging requirements of A3.3.7. as applicable.

A11.5.1. General Requirements. Radioactive materials in limited quantities, instruments, manufactured articles, and empty packagings may be transported as excepted packages, provided that:

A11.5.1.1. The radiation level at any point on the external surface of the package is not over 5 μSv/h (0.5 mrem/h).

A11.5.1.2. The nonfixed (removable) radioactive surface contamination on the external surface of the package is not over the limits specified in A3.3.7.6.

A11.5.2. **Exceptions**.

A11.5.2.1. Excepted packages are subject to the following:

A11.5.2.1.1. Package marking requirements in A14.4.6.2.

A11.5.2.1.2. Reporting accidents/incidents.

A11.5.2.1.3. The materials are packaged in strong, tight packages that will not leak any of the radioactive materials under normal transportation conditions. Ensure packaging meets the general requirements of A3.3.7.8.

A11.5.2.2. Excepted packages are not subject to the following:

A11.5.2.2.1. Specification Packaging.

A11.5.2.2.2. Marking requirements (except A14.4.6.2.).

A11.5.2.2.3. Shipper's Declaration for Dangerous Goods requirements.

A11.5.3. Other Hazards. For excepted packages of radioactive materials possessing any other dangerous characteristics, the other hazard takes precedence. Package as required by this manual relevant to the other hazard.

A11.5.4. Radioactive Materials in Limited Quantities. Radioactive material whose activities do not exceed the relevant exception limits listed in the column headed "Materials – Package Limits" in Table A11.2. may be transported in an excepted package, provided that:

A11.5.4.1. These materials are packaged in such a manner that, in conditions likely to be encountered during routine transport (incident-free conditions), there can be no leakage of radioactive material from the package.

A11.5.4.2. The package bears the marking "RADIOACTIVE" on an internal surface in such a manner that a warning of the presence of radioactive material is visible on opening the package.

A11.5.5. Instruments and Manufactured Articles. Instruments and manufactured articles (including clocks, electronic tubes, or apparatus) or similar devices having radioactive materials in gaseous or nondispersible solid form as a component part may be transported in an excepted package if:

A11.5.5.1. Each package meets the general requirements of A3.3.7.8.

A11.5.5.2. The activity of the instrument or article is not over the applicable limit listed in Table A11.2.

A11.5.5.3. The total activity per package is not over the applicable limit listed in Table A11.2.

A11.5.5.4. The active material is completely enclosed by a nonactive component.

A11.5.5.5. The radiation level at 10 cm (4 inches) from any point on the external surface of any unpackaged instrument or article is not over 0.1 mSv/h (10 mrem/h). The radiation level at any point on the external surface of a package bearing the article or instrument does not exceed 0.005 mSv/hour (0.5 mrem/hour), or, for exclusive use domestic shipments, 0.02 mSv/hour (2 mrem/hour).

A11.5.5.6. Each instrument or article is marked "RADIOACTIVE" except:

A11.5.5.6.1. Radioluminescent time-pieces or devices. **Note**: Some radioluminescent devices require marking as radioactive 10 CFR.

A11.5.5.6.2. Consumer products that either have received regulatory approval, following their sale to the end user or do not individually exceed the activity limit for an exempt consignment in Table A11.1. provided such products are transported in a package that bears the marking "RADIOACTIVE" on an internal surface in such a manner that warning of the presence of radioactive material is visible upon opening the package.

A11.5.5.7. The active material is completely enclosed by non-active components (a device performing the sole function of containing radioactive material may not be considered to be an instrument or manufactured article).

Table A11.2. Activity Limits for Limited Quantities Instruments and Articles.

Nature of Contents	**Materials**	**Instruments and Articles**	
	Package Limits (Note 1)	**Limits for each instrument and article (Note 1)**	**Package Limits (Note 1)**
Solids			
Special Form	10^{-3} A_1	10^{-2} A_1	A_1
Other Form	10^{-3} A_2	10^{-2} A_2	A_2
Liquids			
Tritiated Water:			
<0.0037 TBq/liter (0.1 Ci/L)	37 TBq (1000 Ci)		
0.0037 TBq to 0.037 TBq/L (0.1 Ci to 1.0 Ci/L)	3.7 TBq (100 Ci)		
>0.037 TBq/L (1.0 Ci/L)	0.037 TBq (1 Ci)		
Other Liquids	10^{-4} A_2	10^{-3} A_2	10^{-1} A_2
Gases			
Tritium (Note 2)	2×10^{-2} A_2	2×10^{-2} A_2	2×10^{-1} A_2
Special Form	10^{-3} A_1	10^{-3} A_1	10^{-2} A_1
Other Forms	10^{-3} A_2	10^{-3} A_2	10^{-2} A_2

Notes:

1. For mixture of radionuclides see 49 CFR Paragraph 173.433(d).

2. These values also apply to tritium in activated luminous paint and tritium absorbed on solid carriers.

A11.5.6. Articles Manufactured from Natural Uranium, Depleted Uranium, or Natural Thorium. Manufactured articles, in which the sole radioactive material is unirradiated natural uranium, unirradiated depleted uranium, or unirradiated natural thorium, may be transported as an excepted package, provided that the outer surface of the uranium or thorium is enclosed in an inactive sheath made of metal or some other substantial material.

A11.5.7. Empty Packages. An empty packaging which had previously contained radioactive material may be transported as an excepted package if the following conditions are met:

A11.5.7.1. It is in a well-maintained condition and securely closed.

A11.5.7.2. The outer surface of any uranium or thorium in its structure is covered with an active sheath made of metal or some other substantial material.

A11.5.7.3. The level of internal non-fixed contamination does not exceed one hundred times the levels specified in A3.3.7.6. for an excepted package.

A11.5.7.4. Hazardous materials labels used on the package previously are removed or no longer visible.

A11.5.7.5. The 'Empty' label is applied to the package.

A11.5.8. Activity Limit Per Package.

A11.5.8.1. Excepted Package of Radioactive Material. For radioactive material other than articles manufactured of natural uranium, or natural thorium, an excepted package may not contain activities greater than the following:

A11.5.8.1.1. Where the radioactive material is enclosed in, or forms a component part of an instrument or other manufactured article, such as a clock or electronic apparatus, the limits specified in A11.5.5. for each individual item and each package respectively.

A11.5.8.1.2. Where the radioactive material is not so enclosed in or is not included as a component of an instrument or other manufactured article, the limits specified in A11.5.4.

A11.5.8.2. Manufactured Articles. For articles manufactured of natural uranium, depleted uranium, or natural thorium, an excepted package 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.

A11.6. Industrial Packaging. Industrial Packaging may be used for Low Specific Activity (LSA) material and Surface Contaminated Objects (SCO). LSA and SCO materials may not be transported unpackaged.

A11.6.1. Activity Limit. The total activity in a single package of LSA material or in a single package of SCO must be so restricted that the radiation level specified in A11.6.5. is not exceeded, and the activity in a single package must also be so restricted that the activity limits for an aircraft specified in **Table A11.3** are not exceeded. A single package of non-combustible solid LSA-II or LSA-III material shall not contain an activity greater than 3,000 A_2. **(T-0)**.

Table A11.3. Aircraft Activity Limits for LSA Material and SCO in Industrial Packages.

Nature of Material	Activity Limit Per Aircraft
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

A11.6.2. Industrial Package Type 1. A packaging or freight container containing LSA material or SCO that is designed to meet the requirements of 49 CFR Section 173.411 is an Industrial Package Type 1 (Type IP-1).

A11.6.3. Industrial Package Type 2. A packaging or freight container containing LSA material or SCO that is designed to meet the requirements of 49 CFR Section 173.411 is an Industrial Package Type 2 (Type IP-2).

A11.6.4. Industrial Package, Type 3. A packaging or freight container containing LSA material or SCO that is designed to meet the requirements of 49 CFR Section 173.411 is an Industrial Package Type 3 (Type IP-3).

A11.6.5. LSA and SCO Quantity Limit. The quantity of LSA material or SCO in a single Industrial Package Type 1, Industrial Package Type 2, or Industrial Package Type 3 must be so restricted that the external radiation level at 3m (10 ft) from the unshielded material does not exceed 10 mSv/h (1 rem/h). **(T-0)**.

A11.6.6. LSA and SCO – Fissile. LSA material and SCO which is, or contains, fissile material, must meet the applicable requirements of either 49 CFR Section 173.457 or 10 CFR Part 71. **(T-0)**.

A11.6.7. LSA and SCO – Restrictions. Packages and Freight containers containing LSA material or SCO must meet the requirements of A3.3.7.6. and A3.3.7.18. LSA material in group LSA-I and SCO in group SCO-I must not be transported unpackaged. **(T-0)**.

A11.6.8. LSA and SCO – Integrity Limits. LSA material and SCO must be packaged in accordance with Table A11.4. **(T-0)**.

Table A11.4. Industrial Package Integrity Requirements for LSA and SCO.

Contents	Industrial Package Type	
	Exclusive Use	NOT Under Exclusive Use
LSA-I:		
Solid	Type 1	Type 1
Liquid	Type 1	Type 2
LSA-II		
Solid	Type 2	Type 2
Liquid and gas	Type 2	Type 3
LSA-III	Type 2	Type 3
SCO-I	Type 1	Type 1
SCO-II	Type 2	Type 2

A11.7. Packages Containing Uranium Hexafluoride(fissile, fissile excepted, and nonfissile). The mass of uranium hexafluoride in a package shall not have a value that would lead to a ullage smaller than 5% at the maximum temperature of the package as specified for the plant systems where the package is used. **(T-0)**. The uranium hexafluoride shall be in solid form and the internal pressure of the package shall be below atmospheric pressure when presented for transport. **(T-0)**. Prepare this material for military air shipment according to 49 CFR Section 173.420.

A11.8. Authorized Type A Packages. Use the following packages for shipment, if they do not contain quantities over A_1 or A_2 as appropriate:

A11.8.1. DOT 7A packaging. DOT 7A packaging designed according to the requirements of 49 CFR Section 178.350 in effect after 30 June 1983.

A11.8.2. Any Type A packaging authorized in 49 CFR Section 173.415.

A11.8.3. For fissile material, any Type A packaging that meets the applicable standards for fissile materials in 10 CFR Part 71 and authorized in 49 CFR Section 173.471.

A11.8.4. Type B, B(U), or B(M) Packaging. Any Type B, B(U), or B(M) packaging, authorized in A11.9.2.1. or A11.9.2.2.

A11.8.5. Foreign-Made Packaging. Any foreign-made packaging that meets the standards of IAEA "*Regulations for the Safe Transport of Radioactive Materials*, *No. TS-R-1*" and bears the marking "Type A" used for the import of radioactive materials. The packaging must conform to the requirements of the country of origin (as indicated by the packaging marking) and the IAEA regulations applicable to Type A packaging. **(T-0)**.

A11.9. Type B Packages.

A11.9.1. Activity Limits. Type B(U) and B(M) may not contain activities greater than the following:

A11.9.1.1. Low dispersible material - as authorized for the package design.

A11.9.1.2. Special Form Radioactive Material – 3,000 A_1 or 100,000 A_2, whichever is lower.

A11.9.1.3. All other radioactive material – 3,000 A2.

A11.9.2. Authorized Packages. Use the following packages for shipment of quantities over A_1 or A_2, as appropriate:

A11.9.2.1. Any Type B, Type B(U), or Type B(M) packaging that meets the applicable requirements in 10 CFR Part 71 and has been approved by the US Nuclear Regulatory Commission may be shipped per 49 CFR Section 173.471.

A11.9.2.2. Any Type B, B(U) or B(M) packaging that meets the applicable requirements of the regulations of the IAEA "*Regulations for the Safe Transport of Radioactive Materials*, *No. TS-R-1*" and for which the foreign competent authority certificate has been revalidated by DOT according to 49 CFR Section 173.473. Authorized only for export and import shipments.

A11.10. Authorized Packaging-Fissile Materials.

A11.10.1. Except as provided in A3.3.7.3.4.1., package fissile materials containing not more than A_1 or A_2 (as appropriate) in:

A11.10.1.1. Any packaging listed in A11.8., limited to radioactive materials specified in 10 CFR Part 71, Subpart C.

A11.10.1.2. Any other Type AF, Type BF, Type B(U)F, or Type B(M)F packaging for fissile radioactive materials that also meets the applicable standards for fissile materials in 10 CFR Part 71.

A11.10.1.3. Any other Type AF, Type B(U)F, or Type B(M)F packaging that also meets the applicable requirements for fissile material packaging in section VI of the IAEA "*Regulations for the Safe Transport of Radioactive Materials*, *No. TS-R-1*" and for which the foreign competent authority certificate has been revalidated by the DOT according to 49 CFR Section 173.473. Authorized only for export and import shipments.

A11.10.1.4. Any metal cylinder that meets the performance requirements of A11.5. and 49 CFR Section 178.350 for DOT 7A Type A packaging may be used for the transport of residual "heels" of enriched solid uranium hexafluoride without a protective overpack per Table A11.5.

A11.10.1.5. DOT 20PF-1, 20PF-2, 20PF-3 or 21PF-1A, 21PF-1B, or 21PF-2 phenolic-foam insulated overpacks with snug fitting inner metal cylinders meeting all of the applicable requirements of A3.3.7.9., A3.3.7.10., and the following:

A11.10.1.5.1. Handling procedures and packaging criteria complying with US Enrichment Corporation Report Number USEC-651 or ANSI N14.1 is required.

A11.10.1.5.2. Quantities of uranium hexafluoride are authorized as shown in Table A11.6., with each package assigned a minimum transport index as also shown.

Table A11.5. Allowable Content of Uranium Hexafluoride (UF6) "Heels" in a Specification 7A Cylinder.

Maximum Cylinder Diameter		**Cylinder Volume**		**Maximum Uranium 235 Enrichment (Weight %)**	**Maximum "Heel" Weight Per Cylinder** UF_6 **Uranium** ^{235}			
Inches	Centimeters	Cubic Feet	L		kg	(lb)	kg	(lb)
5	12.7	0.311	8.8	100.0	0.045	0.1	0.031	0.07
8	20.3	1.359	39	12.5	0.227	0.5	.019	0.04
12	30.5	2.410	68	5.0	0.454	1.0	.015	0.03
30	76	25.64	725	5.0	11.3	25	.383	0.84
48	122	108.9 (10 ton)	3084	4.5	22.7	50	.690	1.52
48	122	142.7 (14 ton)	4041	4.5	22.7	50	.690	1.52

A11.10.2. Fissile Radioactive Materials with Radioactive Content Over A1 or A2. Package in either:

A11.10.2.1. Type B(U) or B(M) packaging that meets the standards for packaging of fissile materials in 10 CFR Part 71, and is approved by the US Nuclear Regulatory Commission per 49 CFR Section 173.471.

A11.10.2.2. Type B(U) or B(M) packaging that meets the applicable requirements for fissile radioactive materials in section VI of the IAEA "*Regulations for the Safe Transport of Radioactive Materials*, *No. TS-R-1*" and for which the foreign competent authority certificate has been revalidated by the DOT according to 49 CFR Section 173.473. Authorized only for export and import shipments.

A11.10.2.3. DOT 20PF-1, 20PF-2, 20PF-3, 21PF-1A, or 21PF-1B phenolic-foam insulated overpacks with snug fitting inner metal cylinders meeting all of the applicable requirements of A3.3.7.9., A3.3.7.10., and the following:

A11.10.2.3.1. Handling procedures and packaging criteria complying with US Enrichment Corporation Report Number USEC-651 or ANSI Standard N14.1.

A11.10.2.3.2. Uranium hexafluoride in packaging and quantities authorized in 49 CFR Subparagraph 173.417(a)(2).

A11.11. Special Arrangement (Competent Authority Approval). If the radioactive material does not comply with any of the methods of packing provided in this manual, the material may be permitted to be transported by CAA. The provisions for carrying the radioactive material using a CAA must be approved by all countries concerned. **(T-0)**. These provisions must be adequate to ensure that the overall level of safety in transport and in-transit storage is at least equivalent to the level of safety which would be provided if all the applicable requirements of

these regulations had been met. **(T-0)**. Each consignment must have multilateral approval. **(T-0)**.

A11.12. Authorized Packaging-Pyrophoric Radioactive Materials. Package pyrophoric radioactive materials in quantities not over A_2 per package in DOT Type 7A packagings constructed of materials that do not react nor be decomposed by the contents. Contents must be:

A11.12.1. In solid form and must not be fissile unless excepted by A3.3.7.3.4.2.

A11.12.2. Contained in sealed and corrosion resistant receptacles with positive closures (friction or slip-fit covers or stoppers are not authorized).

A11.12.3. Free of water and any contaminants that increase the reactivity of the material.

A11.12.4. Made inert to prevent self-ignition during transport by either:

A11.12.4.1. Mixing with large volumes of inerting materials such as graphite or dry sand, or other suitable inerting material, or blended into a matrix of hardened concrete.

A11.12.4.2. Filling the innermost receptacle with an appropriate inert gas or liquid.

A11.12.4.3. Pyrophoric Class 7 (Radioactive) materials transported by aircraft must be packaged in Type B packages. **(T-0)**.