




**Package Contents Specification  
for Safkeg-HS  
Package Design No 3977A**

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	S Bryson		R A Vaughan
Approved		Date	28 Nov 13
	R A Vaughan		
Croft Associates Ltd, F4 Culham Science Centre, Abingdon, Oxfordshire, OX14 3DB. 01865 407740			

## 1 Specification of contents

### 1.1 General nature of contents

The Safkeg-HS 3977A package is designed as a Type B(U) general purpose package for radioactive material.

The package is designed for radioactive material that emits neutron, alpha, beta or gamma radiation.

The contents may be in solid, liquid or gaseous form and carried in various inserts as specified in the Table 1 below.

**Table 1 Contents Types**

Contents Type Designation	Material Form	Shielding Insert	General Requirements for each Contents Type (1)	Activity Limits for each Contents Type
CT-1	Solid	HS-12x95-Tu Design No 3982	See Table 1-3-1	See Table 3
CT-2	Solid	HS-31x114-Tu Design No 3985	See Table 1-3-2	See Table 4
CT-3	Solid	HS-55x138-SS Design No 3987 with PTFE liner	See Table 1-3-3	See Table 5
CT-4	Liquid	HS-31x114-Tu Design No 3985	See Table 1-3-4	See Table 6
CT-5	Liquid	HS-55x138-SS Design No 3987 with PTFE liner	See Table 1-3-5	See Table 7
CT-6	Gas	HS-31x114-Tu Design No 3985	See Table 1-3-6	See Table 8
CT-7	Solid/ Fissile Normal Form	HS-55x138-SS Design No 3987 with PTFE liner	See Table 1-3-7	See Table 9
CT-8	Solid/ Fissile Special Form	HS-55x138-SS Design No 3987 with PTFE liner	See Table 1-3-8	See Table 10

1 These are the tables in the SAR [1].

## **1.2 Shielding inserts**

The shielding inserts specified in Section 1 of the SAR for Safkeg-HS 3977A [1] and listed in Table 1 above are required for all contents.

Under NCT and HAC, the shielding inserts, together with the user defined product containers, provide confinement of the solid or liquid radioactive material.

## **1.3 Radionuclides included**

See Tables 3 to 9.

## **1.4 Quantity**

The maximum mass (and volume for gases) of each radionuclide carried in Type B quantities is detailed in Table 2 and Tables 3 to 9 for specific contents types CT-1 to CT-8.

## **1.5 Activity limit**

The package activity limits for individual nuclides, according to the insert used, are given in Tables 3 to 9. The activity limit is determined in accordance with the methodology in Section 2 below.

## **1.6 Other limiting factors**

Various restrictions and limits of quantity of radionuclides apply according to the insert used and for the form of the radioactive material (solid, liquid or gas). These restrictions and contents limits are detailed in Section 1 of the SARP for Safkeg-HS 3977A in Section 1.2.2 in the tables for contents types CT-1 to CT-8.

# **2 Calculation of allowable contents**

The package activity limit in Tables 3 to 9 is the least of the limits determined on the basis of heat output, mass limit, shielding limit and, for gas contents, the limit based on allowable leakage under NCT or HAC.

## **2.1 Heat limits**

The heat limit for solid and gaseous contents is 30 W and for liquid contents the heat limit is 5 W.

## **2.2 Mass limit**

The upper limit on the mass is different for each insert - as specified in section 1.4 above.

The maximum mass of the radionuclides is set at nominally 50% the mass of a steel cylinder that would fill the cavity of the insert (see Table 2).

**Table 2 Maximum mass of the radionuclides**

Shielding Insert	Mass of a steel cylinder that would fill the cavity of the insert (g)	Maximum mass of the radionuclides (g)
HS-12x95-Tu Design No 3982	90	45
HS-31x114-Tu Design No 3985	690	345
HS-55x138-SS Design No 3987 with PTFE liner	1,810	905

### 2.3 Shielding limit

The package design is such that the surface dose rate, as opposed to the TI, is the limiting factor under HAC. The shielding limits in Tables 3 to 9 for each radionuclide and each insert, are based on an assessment in Report CTR 2011/01 [2] of the maximum activity to give the maximum allowable package surface dose rate (for  $\beta$ ,  $\gamma$  and n emitters) of 2mSv/h (200 mrem/h). These calculations are based on the worst case assumption of the radioactive material being a point source at the centre of the base of the insert (neglecting spacing due to use of product containers). This location has been shown to produce the highest package surface dose rate in report AMEC/SF6652/001 [3]. This shielding limit has been further adjusted to take into account **some shielding calculation uncertainties** as discussed in Croft report CTR 2013/09 [7].

### 2.4 Leakage limit

For solid and liquid contents, the contents are completely contained as the O-ring seal of the CV meets the requirement of Leaktight as defined in ANSI N 14.5 [4].

For gaseous radionuclides, it is assumed that they will escape from their product containers under HAC and leak past the seal in the insert within the CV and leak from the CV and the package past the O-ring seal of the CV.

The allowable gas leakage rates in 10CFR Part 71 [5][4] are  $1 \times 10^{-6}$  A<sub>2</sub>/h under NCT and A<sub>2</sub>/week under HAC.

The maximum gas contents are determined as the contents that would leak at the HAC rate of A<sub>2</sub>/week from a “Leaktight” seal (as defined in ANSI N14.5 [4] as a leakage rate less than or equal to  $1 \times 10^{-7}$  ref·cm<sup>3</sup>/s, of air at an upstream pressure of 1

atmosphere (atm) absolute (abs) and a downstream pressure of 0.01 atm abs or less).  
The calculation of the maximum gas contents is given in report CS 2012/05 [6].

## 2.5 Criticality Limits

The quantities of fissile material are restricted to the limits defined in 10 CFR 71.15 and those listed in this document whichever is the limiting quantity for the contents.

## 3 References

- [1] CTR 2008/11, SARP for Safkeg-HS 3977A, Docket No. 71-9337
- [2] Croft, CTR 2011/01, Issue **D**, SAFKEG LS 3977A, Package Activity Limits Based on Shielding
- [3] AMEC/SF6652/001, Issue **2**, Monte Carlo Modelling of Safkeg HS Container
- [4] ANSI N14.5, American National Standard for Radioactive Materials - Leakage Test on Packages for Shipment, American National Standards Institute, Inc., 1997
- [5] 10CFR PART 71, Packaging And Transportation Of Radioactive Material, U.S. Nuclear Regulatory Commission
- [6] CS 2012/05, Issue A, SAFKEG-HS 3977A - Gas contents limit for leaktight condition
- [7] CTR 2013/09, Issue **C**, Uncertainties Associated with the Proposed Shielding Calculation Method for the SAFKEG-HS 3977A Package

Table 3 Activity Limits for Contents Type 1 - CT-1 - Solid in heavy tungsten insert – Design No 3982

										Contents heat limit			Contents mass limit		Shielding limit	Package limit			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Nuclide	Max Activity		A2	# A2s	Spec Ac	Mass	Heat gen	Heat output	Package Type	Heat output	Activity		Mass	Act	Act	Act	Code		
	TBq	Ci	TBq		TBq/g	g	W/Ci	W	A or B	W	Ci	Bq	g	Bq	Bq	Bq	H	M	S
Ac-225	2.51E+00	6.78E+01	6.00E-03	417.95	2.10E+03	1.19E-03	3.46E-02	2.34E+00	B	30.00	8.68E+02	3.2105E+13	45	9.45E+16	2.51E+12	2.51E+12			S
Ac-227	7.24E-01	1.96E+01	9.00E-05	8049.19	2.70E+00	2.68E-01	4.72E-04	9.24E-03	B	30.00	6.35E+04	2.3513E+15	45	1.22E+14	7.24E+11	7.24E+11			S
Ac-228	4.28E-01	1.16E+01	5.00E-01	0.86	8.40E+04	5.09E-06	8.04E-03	9.30E-02	A	30.00	3.73E+03	1.3807E+14	45	3.78E+18	4.28E+11	4.28E+11			S
Am-241	3.58E+00	9.68E+01	1.00E-03	3581.11	1.30E-01	2.75E+01	3.28E-02	3.18E+00	B	30.00	9.14E+02	3.3828E+13	45	5.85E+12	3.58E+12	3.58E+12			S
As-77	7.90E+02	2.13E+04	7.00E-01	1128.38	3.90E+04	2.03E-02	1.41E-03	3.00E+01	B	30.00	2.13E+04	7.8987E+14	45	1.76E+18	9.43E+19	7.90E+14	H		
Au-198	2.56E+02	6.92E+03	6.00E-01	426.50	9.00E+03	2.84E-02	4.34E-03	3.00E+01	B	30.00	6.92E+03	2.5590E+14	45	4.05E+17	6.99E+14	2.56E+14	H		
Ba-131	1.88E+02	5.08E+03	2.00E+00	94.05	3.10E+03	6.07E-02	3.06E-03	1.55E+01	B	30.00	9.82E+03	3.6334E+14	45	1.40E+17	1.88E+14	1.88E+14			S
C-14	7.20E+00	1.95E+02	3.00E+00	2.40	1.60E-01	4.50E+01	2.93E-04	5.71E-02	B	30.00	1.02E+05	3.7850E+15	45	7.20E+12	6.92E+27	7.20E+12		M	
Co-60	2.38E-01	6.44E+00	4.00E-01	0.60	4.20E+01	5.68E-03	1.54E-02	9.94E-02	A	30.00	1.95E+03	7.1970E+13	45	1.89E+15	2.38E+11	2.38E+11			S
Cs-131	6.71E+03	1.81E+05	3.00E+01	223.73	3.80E+03	1.77E+00	1.65E-04	3.00E+01	B	30.00	1.81E+05	6.7118E+15	45	1.71E+17	8.39E+35	6.71E+15	H		
Cs-134	7.05E+00	1.90E+02	7.00E-01	10.07	4.80E+01	1.47E-01	1.02E-02	1.94E+00	B	30.00	2.95E+03	1.0905E+14	45	2.16E+15	7.05E+12	7.05E+12			S
Cs-137	1.44E+02	3.89E+03	6.00E-01	240.00	3.20E+00	4.50E+01	1.01E-03	3.94E+00	B	30.00	2.96E+04	1.0966E+15	45	1.44E+14	1.58E+15	1.44E+14		M	
Cu-67	6.91E+02	1.87E+04	7.00E-01	986.75	2.80E+04	2.47E-02	1.61E-03	3.00E+01	B	30.00	1.87E+04	6.9073E+14	45	1.26E+18	6.50E+25	6.91E+14	H		
Hg-203	3.57E+01	9.66E+02	1.00E+00	35.75	5.10E+02	7.01E-02	1.99E-03	1.92E+00	B	30.00	1.51E+04	5.5787E+14	45	2.30E+16	3.57E+13	3.57E+13			S
Ho-166	2.04E+00	5.52E+01	4.00E-01	5.10	2.60E+04	7.85E-05	4.29E-03	2.37E-01	B	30.00	6.99E+03	2.5852E+14	45	1.17E+18	2.04E+12	2.04E+12			S
I-125	3.19E+03	8.61E+04	3.00E+00	1062.52	6.40E+02	4.98E+00	3.48E-04	3.00E+01	B	30.00	8.61E+04	3.1875E+15	45	2.88E+16	4.49E+35	3.19E+15	H		
I-129	2.93E-04	7.91E-03	< 1	< 1	6.50E-06	4.50E+01	4.68E-04	3.70E-06	B	30.00	6.41E+04	2.3720E+15	45	2.93E+08	3.31E+26	2.93E+08		M	
I-131	3.28E+02	8.85E+03	7.00E-01	468.01	4.60E+03	7.12E-02	3.39E-03	3.00E+01	B	30.00	8.85E+03	3.2761E+14	45	2.07E+17	4.11E+15	3.28E+14	H		
In-111	4.27E+02	1.15E+04	3.00E+00	142.34	1.50E+04	2.85E-02	2.60E-03	3.00E+01	B	30.00	1.15E+04	4.2702E+14	45	6.75E+17	1.45E+28	4.27E+14	H		
Ir-192	1.81E+02	4.90E+03	6.00E-01	302.02	3.40E+02	5.33E-01	6.13E-03	3.00E+01	B	30.00	4.90E+03	1.8121E+14	45	1.53E+16	2.71E+15	1.81E+14	H		
Ir-194	3.87E+01	1.04E+03	3.00E-01	128.87	3.10E+04	1.25E-03	5.35E-03	5.59E+00	B	30.00	5.61E+03	2.0766E+14	45	1.40E+18	3.87E+13	3.87E+13			S
Lu-177	1.03E+03	2.78E+04	7.00E-01	1470.30	4.10E+03	2.51E-01	1.08E-03	3.00E+01	B	30.00	2.78E+04	1.0292E+15	45	1.85E+17	1.56E+24	1.03E+15	H		
Mo-99	5.27E+01	1.42E+03	6.00E-01	87.87	1.80E+04	2.93E-03	3.27E-03	4.66E+00	B	30.00	9.18E+03	3.3972E+14	45	8.10E+17	5.27E+13	5.27E+13			S
Na-24	2.63E-02	7.12E-01	2.00E-01	0.13	3.20E+05	8.23E-08	2.77E-02	1.97E-02	A	30.00	1.08E+03	4.0053E+13	45	1.44E+19	2.63E+10	2.63E+10			S
Np-237	1.17E-03	3.16E-02	2.00E-03	0.59	2.60E-05	4.50E+01	2.88E-02	9.10E-04	A	30.00	1.04E+03	3.8570E+13	45	1.17E+09	3.58E+12	1.17E+09		M	
P-32	5.58E+00	1.51E+02	5.00E-01	11.15	1.10E+04	5.07E-04	4.12E-03	6.21E-01	B	30.00	7.28E+03	2.6946E+14	45	4.95E+17	5.58E+12	5.58E+12			S
P-33	2.44E+03	6.61E+04	1.00E+00	2444.45	5.80E+03	4.21E-01	4.54E-04	3.00E+01	B	30.00	6.61E+04	2.4444E+15	45	2.61E+17	5.10E+37	2.44E+15	H		
Pb-203	5.20E+02	1.40E+04	3.00E+00	173.28	1.10E+04	4.73E-02	2.14E-03	3.00E+01	B	30.00	1.40E+04	5.1983E+14	45	4.95E+17	1.18E+17	5.20E+14	H		
Pb-210	8.04E+00	2.17E+02	5.00E-02	160.79	2.80E+00	2.87E+00	2.31E-04	5.01E-02	B	30.00	1.30E+05	4.8135E+15	45	1.26E+14	8.04E+12	8.04E+12			S
Pd-109	2.96E+02	7.99E+03	5.00E-01	591.05	7.90E+04	3.74E-03	2.14E-03	1.71E+01	B	30.00	1.40E+04	5.1809E+14	45	3.56E+18	2.96E+14	2.96E+14			S
Ra-223	1.02E+01	2.75E+02	7.00E-03	1451.55	1.90E+03	5.35E-03	3.50E-02	9.60E+00	B	30.00	8.58E+02	3.1739E+13	45	8.55E+16	1.02E+13	1.02E+13			S
Ra-224	8.86E-02	2.40E+00	2.00E-02	4.43	5.90E+03	1.50E-05	3.37E-02	8.08E-02	B	30.00	8.90E+02	3.2924E+13	45	2.66E+17	8.86E+10	8.86E+10			S
Ra-226	1.02E-01	2.75E+00	3.00E-03	33.89	3.70E-02	2.75E+00	2.84E-02	7.80E-02	B	30.00	1.06E+03	3.9093E+13	45	1.67E+12	1.02E+11	1.02E+11			S
Re-186	1.56E+02	4.23E+03	6.00E-01	260.64	6.90E+03	2.27E-02	2.14E-03	9.04E+00	B	30.00	1.40E+04	5.1910E+14	45	3.11E+17	1.56E+14	1.56E+14			S
Re-188	1.22E+00	3.31E+01	4.00E-01	3.06	3.60E+04	3.40E-05	4.97E-03	1.64E-01	B	30.00	6.04E+03	2.2355E+14	45	1.62E+18	1.22E+12	1.22E+12			S
Rh-105	8.12E+02	2.19E+04	8.00E-01	1014.40	3.10E+04	2.62E-02	1.37E-03	3.00E+01	B	30.00	2.19E+04	8.1152E+14	45	1.40E+18	1.05E+31	8.12E+14	H		
Se-75	4.61E+02	1.25E+04	3.00E+00	153.81	5.40E+02	8.55E-01	2.41E-03	3.00E+01	B	30.00	1.25E+04	4.6144E+14	45	2.43E+16	8.89E+18	4.61E+14	H		
Sm-153	6.12E-01	1.65E+01	6.00E-01	1.02	1.60E+04	3.82E-05	1.94E-03	3.21E-02	B	30.00	1.54E+04	5.7134E+14	45	7.20E+17	6.12E+11	6.12E+11			S
Sr-89	1.22E+01	3.30E+02	6.00E-01	20.34	1.10E+03	1.11E-02	3.46E-03	1.14E+00	B	30.00	8.68E+03	3.2113E+14	45	4.95E+16	1.22E+13	1.22E+13			S
Sr-90	1.73E+00	4.67E+01	3.00E-01	5.76	5.10E+00	3.39E-01	3.46E-03	1.61E-01	B	30.00	8.68E+03	3.2113E+14	45	2.30E+14	1.73E+12	1.73E+12			S
Tb-161	1.61E+01	4.36E+02	2.00E-02	806.28	4.35E+03	3.71E-03	1.16E-03	5.06E-01	B	30.00	2.59E+04	9.5690E+14	45	1.96E+17	1.61E+13	1.61E+13			S
Th-227	1.01E+01	2.73E+02	5.00E-03	2020.21	1.10E+03	9.18E-03	3.59E-02	9.79E+00	B	30.00	8.36E+02	3.0947E+13	45	4.95E+16	1.01E+13	1.01E+13			S
Th-228	6.79E-02	1.84E+00	1.00E-03	67.95	3.00E+01	2.26E-03	3.21E-02	5.90E-02	B	30.00	9.33E+02	3.4537E+13	45	1.35E+15	6.79E+10	6.79E+10			S
Ti-201	1.45E+03	3.92E+04	4.00E+00	362.71	7.90E+03	1.84E-01	7.65E-04	3.00E+01	B	30.00	3.92E+04	1.4508E+15	45	3.56E+17	1.59E+22	1.45E+15	H		
W-187	2.24E+01	6.06E+02	6.00E-01	37.36	2.60E+04	8.62E-04	4.54E-03	2.75E+00	B	30.00	6.61E+03	2.4460E+14	45	1.17E+18	2.24E+13	2.24E+13			S
W-188	1.23E+00	3.31E+01	3.00E-01	4.08	3.70E+02	3.31E-03	5.98E-04	1.98E-02	B	30.00	5.02E+04	1.8558E+15	45	1.67E+16	1.23E+12	1.23E+12			S
Y-90	1.73E+00	4.67E+01	3.00E-01	5.76	2.00E+04	8.63E-05	5.54E-03	2.59E-01	B	30.00	5.41E+03	2.0032E+14	45	9.00E+17	1.73E+12	1.73E+12			S

										Contents heat limit			Contents mass limit		Shielding limit	Package limit			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Nuclide	Max Activity		A2	# A2s	Spec Ac	Mass	Heat gen	Heat output	Package Type	Heat output	Activity		Mass	Act	Act	Act	Code		
	TBq	Ci	TBq		TBq/g	g	W/Ci	W	A or B	W	Ci	Bq	g	Bq	Bq	Bq	H	M	S
Yb-169	4.42E+02	1.19E+04	1.00E+00	442.11	8.90E+02	4.97E-01	2.51E-03	3.00E+01	B	30.00	1.19E+04	4.4211E+14	45	4.01E+16	1.88E+19	4.42E+14	H		
Yb-175	1.11E+03	2.99E+04	9.00E-01	1228.91	6.60E+03	1.68E-01	1.00E-03	3.00E+01	B	30.00	2.99E+04	1.1060E+15	45	2.97E+17	6.04E+23	1.11E+15	H		
Max	6.71E+03	1.81E+05		8.05E+03		4.50E+01		3.00E+01											

Column		Colour codes	
1	Identifies nuclide		
2	Package activity limit for this Contents Type - from Col 17		Radionuclides
3	Calculated from Bq amount in Col 2		Package limit
4	A2 from 10CFR71		Physics data
5	# of A2's of nuclide at package activity limit		Contents limit based on heat, mass or shielding
6	Specific activity from 10CFR71		
7	Mass of nuclide at package activity limit		
8	Heat generation rate of nuclide - from Microshield.		
9	Heat output of nuclide at package activity limit		
10	Package Type [A or B] based on individual nuclide limit		
11	Mass limit of nuclide based on package heat limit		
12	Calculated from limit in Col 11		
13	Calculated from Bq amount in Col 12		
14	Mass limit of nuclide based on capacity of insert		
15	Calculated from Bq amount in Col 14		
16	Package shielding limit from CTR2011/01		
17	Package limit = least of heat, mass and shielding limits in Cols 13, 15 & 16		
18	H shown where package limit is Heat limit		
19	M shown where package limit is Mass limit		
20	S shown where package limit is Shielding limit		



**Table 4 Activity Limits for Contents Type 2 - CT-2 - Solid in light tungsten insert – Design No 3985**

										Contents heat limit			Contents mass limit		Shielding limit	Package limit			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Nuclide	Max Activity		A2	# A2s	Spec Ac	Mass	Heat gen	Heat output	Package Type	Heat output	Act		Mass	Act	Act	Act	Code		
	TBq	Ci	TBq		TBq/g	g	W/Ci	W	A or B	W	Ci	Bq	g	Bq	Bq	Bq	H	M	S
Ac-225	1.09E+00	2.96E+01	6.00E-03	182.45	2.10E+03	5.21E-04	3.46E-02	1.02E+00	B	30.00	8.68E+02	3.2105E+13	345	7.25E+17	1.09E+12	1.09E+12			S
Ac-227	3.26E-01	8.81E+00	9.00E-05	3622.61	2.70E+00	1.21E-01	4.72E-04	4.16E-03	B	30.00	6.35E+04	2.3513E+15	345	9.32E+14	3.26E+11	3.26E+11			S
Ac-228	1.86E-01	5.03E+00	5.00E-01	0.37	8.40E+04	2.21E-06	8.04E-03	4.04E-02	A	30.00	3.73E+03	1.3807E+14	345	2.90E+19	1.86E+11	1.86E+11			S
Am-241	1.58E+00	4.28E+01	1.00E-03	1584.58	1.30E-01	1.22E+01	3.28E-02	1.41E+00	B	30.00	9.14E+02	3.3828E+13	345	4.49E+13	1.58E+12	1.58E+12			S
As-77	7.90E+02	2.13E+04	7.00E-01	1128.38	3.90E+04	2.03E-02	1.41E-03	3.00E+01	B	30.00	2.13E+04	7.8987E+14	345	1.35E+19	1.14E+19	7.90E+14	H		
Au-198	2.43E+02	6.57E+03	6.00E-01	405.30	9.00E+03	2.70E-02	4.34E-03	2.85E+01	B	30.00	6.92E+03	2.5590E+14	345	3.11E+18	2.43E+14	2.43E+14			S
Ba-131	6.12E+01	1.65E+03	2.00E+00	30.60	3.10E+03	1.97E-02	3.06E-03	5.05E+00	B	30.00	9.82E+03	3.6334E+14	345	1.07E+18	6.12E+13	6.12E+13			S
C-14	5.52E+01	1.49E+03	3.00E+00	18.40	1.60E-01	3.45E+02	2.93E-04	4.38E-01	B	30.00	1.02E+05	3.7850E+15	345	5.52E+13	6.13E+27	5.52E+13		M	
Co-60	9.37E-02	2.53E+00	4.00E-01	0.23	4.20E+01	2.23E-03	1.54E-02	3.91E-02	A	30.00	1.95E+03	7.1970E+13	345	1.45E+16	9.37E+10	9.37E+10			S
Cs-131	6.71E+03	1.81E+05	3.00E+01	223.73	3.80E+03	1.77E+00	1.65E-04	3.00E+01	B	30.00	1.81E+05	6.7118E+15	345	1.31E+18	7.43E+35	6.71E+15	H		
Cs-134	2.63E+00	7.11E+01	7.00E-01	3.76	4.80E+01	5.48E-02	1.02E-02	7.24E-01	B	30.00	2.95E+03	1.0905E+14	345	1.66E+16	2.63E+12	2.63E+12			S
Cs-137	3.16E+02	8.55E+03	6.00E-01	527.06	3.20E+00	9.88E+01	1.01E-03	8.65E+00	B	30.00	2.96E+04	1.0966E+15	345	1.10E+15	3.16E+14	3.16E+14			S
Cu-67	6.91E+02	1.87E+04	7.00E-01	986.75	2.80E+04	2.47E-02	1.61E-03	3.00E+01	B	30.00	1.87E+04	6.9073E+14	345	9.66E+18	2.84E+24	6.91E+14	H		
Hg-203	5.58E+02	1.51E+04	1.00E+00	557.87	5.10E+02	1.09E+00	1.99E-03	3.00E+01	B	30.00	1.51E+04	5.5787E+14	345	1.76E+17	5.32E+34	5.58E+14	H		
Ho-166	9.20E-01	2.49E+01	4.00E-01	2.30	2.60E+04	3.54E-05	4.29E-03	1.07E-01	B	30.00	6.99E+03	2.5852E+14	345	8.97E+18	9.20E+11	9.20E+11			S
I-125	3.19E+03	8.61E+04	3.00E+00	1062.52	6.40E+02	4.98E+00	3.48E-04	3.00E+01	B	30.00	8.61E+04	3.1875E+15	345	2.21E+17	3.98E+35	3.19E+15	H		
I-129	2.24E-03	6.06E-02	< 1	< 1	6.50E-06	3.45E+02	4.68E-04	2.84E-05	B	30.00	6.41E+04	2.3720E+15	345	2.24E+09	2.93E+26	2.24E+09		M	
I-131	3.28E+02	8.85E+03	7.00E-01	468.01	4.60E+03	7.12E-02	3.39E-03	3.00E+01	B	30.00	8.85E+03	3.2761E+14	345	1.59E+18	9.94E+14	3.28E+14	H		
In-111	4.27E+02	1.15E+04	3.00E+00	142.34	1.50E+04	2.85E-02	2.60E-03	3.00E+01	B	30.00	1.15E+04	4.2702E+14	345	5.18E+18	1.29E+28	4.27E+14	H		
Ir-192	1.81E+02	4.90E+03	6.00E-01	302.02	3.40E+02	5.33E-01	6.13E-03	3.00E+01	B	30.00	4.90E+03	1.8121E+14	345	1.17E+17	7.19E+14	1.81E+14	H		
Ir-194	1.47E+01	3.96E+02	3.00E-01	48.84	3.10E+04	4.73E-04	5.35E-03	2.12E+00	B	30.00	5.61E+03	2.0766E+14	345	1.07E+19	1.47E+13	1.47E+13			S
Lu-177	1.03E+03	2.78E+04	7.00E-01	1470.30	4.10E+03	2.51E-01	1.08E-03	3.00E+01	B	30.00	2.78E+04	1.0292E+15	345	1.41E+18	1.38E+24	1.03E+15	H		
Mo-99	1.91E+01	5.17E+02	6.00E-01	31.85	1.80E+04	1.06E-03	3.27E-03	1.69E+00	B	30.00	9.18E+03	3.3972E+14	345	6.21E+18	1.91E+13	1.91E+13			S
Na-24	1.28E-02	3.45E-01	2.00E-01	0.06	3.20E+05	3.99E-08	2.77E-02	9.55E-03	A	30.00	1.08E+03	4.0053E+13	345	1.10E+20	1.28E+10	1.28E+10			S
Np-237	8.97E-03	2.42E-01	2.00E-03	4.49	2.60E-05	3.45E+02	2.88E-02	6.98E-03	B	30.00	1.04E+03	3.8570E+13	345	8.97E+09	1.58E+12	8.97E+09		M	
P-32	2.49E+00	6.73E+01	5.00E-01	4.98	1.10E+04	2.26E-04	4.12E-03	2.77E-01	B	30.00	7.28E+03	2.6946E+14	345	3.80E+18	2.49E+12	2.49E+12			S
P-33	2.44E+03	6.61E+04	1.00E+00	2444.45	5.80E+03	4.21E-01	4.54E-04	3.00E+01	B	30.00	6.61E+04	2.4444E+15	345	2.00E+18	3.61E+37	2.44E+15	H		
Pb-203	5.20E+02	1.40E+04	3.00E+00	173.28	1.10E+04	4.73E-02	2.14E-03	3.00E+01	B	30.00	1.40E+04	5.1983E+14	345	3.80E+18	2.45E+16	5.20E+14	H		
Pb-210	3.31E+00	8.96E+01	5.00E-02	66.28	2.80E+00	1.18E+00	2.31E-04	2.07E-02	B	30.00	1.30E+05	4.8135E+15	345	9.66E+14	3.31E+12	3.31E+12			S
Pd-109	9.61E+01	2.60E+03	5.00E-01	192.26	7.90E+04	1.22E-03	2.14E-03	5.57E+00	B	30.00	1.40E+04	5.1809E+14	345	2.73E+19	9.61E+13	9.61E+13			S
Ra-223	4.14E+00	1.12E+02	7.00E-03	591.20	1.90E+03	2.18E-03	3.50E-02	3.91E+00	B	30.00	8.58E+02	3.1739E+13	345	6.56E+17	4.14E+12	4.14E+12			S
Ra-224	4.37E-02	1.18E+00	2.00E-02	2.18	5.90E+03	7.40E-06	3.37E-02	3.98E-02	B	30.00	8.90E+02	3.2924E+13	345	2.04E+18	4.37E+10	4.37E+10			S
Ra-226	4.80E-02	1.30E+00	3.00E-03	16.00	3.70E-02	1.30E+00	2.84E-02	3.68E-02	B	30.00	1.06E+03	3.9093E+13	345	1.28E+13	4.80E+10	4.80E+10			S
Re-186	5.31E+01	1.43E+03	6.00E-01	88.45	6.90E+03	7.69E-03	2.14E-03	3.07E+00	B	30.00	1.40E+04	5.1910E+14	345	2.38E+18	5.31E+13	5.31E+13			S
Re-188	5.67E-01	1.53E+01	4.00E-01	1.42	3.60E+04	1.57E-05	4.97E-03	7.60E-02	B	30.00	6.04E+03	2.2355E+14	345	1.24E+19	5.67E+11	5.67E+11			S
Rh-105	8.12E+02	2.19E+04	8.00E-01	1014.40	3.10E+04	2.62E-02	1.37E-03	3.00E+01	B	30.00	2.19E+04	8.1152E+14	345	1.07E+19	1.17E+29	8.12E+14	H		
Se-75	4.61E+02	1.25E+04	3.00E+00	153.81	5.40E+02	8.55E-01	2.41E-03	3.00E+01	B	30.00	1.25E+04	4.6144E+14	345	1.86E+17	7.87E+18	4.61E+14	H		
Sm-153	5.71E+02	1.54E+04	6.00E-01	952.23	1.60E+04	3.57E-02	1.94E-03	3.00E+01	B	30.00	1.54E+04	5.7134E+14	345	5.52E+18	1.91E+15	5.71E+14	H		
Sr-89	5.17E+00	1.40E+02	6.00E-01	8.62	1.10E+03	4.70E-03	3.46E-03	4.83E-01	B	30.00	8.68E+03	3.2113E+14	345	3.80E+17	5.17E+12	5.17E+12			S
Sr-90	8.30E-01	2.24E+01	3.00E-01	2.77	5.10E+00	1.63E-01	3.46E-03	7.75E-02	B	30.00	8.68E+03	3.2113E+14	345	1.76E+15	8.30E+11	8.30E+11			S
Tb-161	7.39E+00	2.00E+02	2.00E-02	369.26	4.35E+03	1.70E-03	1.16E-03	2.32E-01	B	30.00	2.59E+04	9.5690E+14	345	1.50E+18	7.39E+12	7.39E+12			S
Th-227	4.17E+00	1.13E+02	5.00E-03	834.00	1.10E+03	3.79E-03	3.59E-02	4.04E+00	B	30.00	8.36E+02	3.0947E+13	345	3.80E+17	4.17E+12	4.17E+12			S
Th-228	3.35E-02	9.07E-01	1.00E-03	33.54	3.00E+01	1.12E-03	3.21E-02	2.91E-02	B	30.00	9.33E+02	3.4537E+13	345	1.04E+16	3.35E+10	3.35E+10			S
Tl-201	1.45E+03	3.92E+04	4.00E+00	362.71	7.90E+03	1.84E-01	7.65E-04	3.00E+01	B	30.00	3.92E+04	1.4508E+15	345	2.73E+18	1.41E+22	1.45E+15	H		
W-187	8.56E+00	2.31E+02	6.00E-01	14.26	2.60E+04	3.29E-04	4.54E-03	1.05E+00	B	30.00	6.61E+03	2.4460E+14	345	8.97E+18	8.56E+12	8.56E+12			S
W-188	5.68E-01	1.53E+01	3.00E-01	1.89	3.70E+02	1.53E-03	5.98E-04	9.18E-03	B	30.00	5.02E+04	1.8558E+15	345	1.28E+17	5.68E+11	5.68E+11			S
Y-90	8.30E-01	2.24E+01	3.00E-01	2.77	2.00E+04	4.15E-05	5.54E-03	1.24E-01	B	30.00	5.41E+03	2.0032E+14	345	6.90E+18	8.30E+11	8.30E+11			S
Yb-169	4.42E+02	1.19E+04	1.00E+00	442.11	8.90E+02	4.97E-01	2.51E-03	3.00E+01	B	30.00	1.19E+04	4.4211E+14	345	3.07E+17	1.66E+19	4.42E+14	H		
Yb-175	1.11E+03	2.99E+04	9.00E-01	1228.91	6.60E+03	1.68E-01	1.00E-03	3.00E+01	B	30.00	2.99E+04	1.1060E+15	345	2.28E+18	6.09E+22	1.11E+15	H		



										Contents heat limit			Contents mass limit		Shielding limit	Package limit			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Nuclide	Max Activity		A2	# A2s	Spec Ac	Mass	Heat gen	Heat output	Package Type	Heat output	Act		Mass	Act	Act	Act	Code		
	TBq	Ci	TBq		TBq/g	g	W/Ci	W	A or B	W	Ci	Bq	g	Bq	Bq	Bq	H	M	S
Max	6.71E+03	1.81E+05		3.62E+03		3.45E+02		3.00E+01											

Column		Colour codes	
1	Identifies nuclide		
2	Package activity limit for this Contents Type - from Col 17		Radionuclides
3	Calculated from Bq amount in Col 2		Package limit
4	A2 from 10CFR71		Physics data
5	# of A2's of nuclide at package activity limit		Contents limit based on heat, mass or shielding
6	Specific activity from 10CFR71		
7	Mass of nuclide at package activity limit		
8	Heat generation rate of nuclide - from Microshield.		
9	Heat output of nuclide at package activity limit		
10	Package Type [A or B] based on individual nuclide limit		
11	Mass limit of nuclide based on package heat limit		
12	Calculated from limit in Col 11		
13	Calculated from Bq amount in Col 12		
14	Mass limit of nuclide based on capacity of insert		
15	Calculated from Bq amount in Col 14		
16	Package shielding limit from CTR2011/01		
17	Package limit = least of heat, mass and shielding limits in Cols 13, 15 & 16		
18	H shown where package limit is Heat limit		
19	M shown where package limit is Mass limit		
20	S shown where package limit is Shielding limit		

Table 5 Activity Limits for Contents Type 3 - CT-3 - Solid in steel insert – Design No 3987

										Contents heat limit			Contents mass limit		Shielding limit	Package limit			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Nuclide	Max	Activity	A2	# A2s	Spec Ac	Mass	Heat gen	Heat output	Package Type	Heat output	Act	Act	Mass	Act	Act	Act	Code		
	TBq	Ci	TBq		TBq/g	g	W/Ci	W	A or B	W	Ci	Bq	g	Bq	Bq	Bq	H	M	S
Ac-225	7.65E-01	2.07E+01	6.00E-03	127.45	2.10E+03	3.64E-04	3.46E-02	7.15E-01	B	30.00	8.68E+02	3.2105E+13	905	1.90E+18	7.65E+11	7.65E+11			S
Ac-227	3.18E+01	8.59E+02	9.00E-05	353036.59	2.70E+00	1.18E+01	4.72E-04	4.05E-01	B	30.00	6.35E+04	2.3513E+15	905	2.44E+15	3.18E+13	3.18E+13			S
Ac-228	1.02E-01	2.75E+00	5.00E-01	0.20	8.40E+04	1.21E-06	8.04E-03	2.21E-02	A	30.00	3.73E+03	1.3807E+14	905	7.60E+19	1.02E+11	1.02E+11			S
Am-241	3.38E+01	9.14E+02	1.00E-03	33828.06	1.30E-01	2.60E+02	3.28E-02	3.00E+01	B	30.00	9.14E+02	3.3828E+13	905	1.18E+14	3.54E+22	3.38E+13	H		
As-77	7.90E+02	2.13E+04	7.00E-01	1128.38	3.90E+04	2.03E-02	1.41E-03	3.00E+01	B	30.00	2.13E+04	7.8987E+14	905	3.53E+19	2.50E+17	7.90E+14	H		
Au-198	3.64E+01	9.85E+02	6.00E-01	60.73	9.00E+03	4.05E-03	4.34E-03	4.27E+00	B	30.00	6.92E+03	2.5590E+14	905	8.15E+18	3.64E+13	3.64E+13			S
Ba-131	8.20E+00	2.22E+02	2.00E+00	4.10	3.10E+03	2.65E-03	3.06E-03	6.77E-01	B	30.00	9.82E+03	3.6334E+14	905	2.81E+18	8.20E+12	8.20E+12			S
C-14	1.45E+02	3.91E+03	3.00E+00	48.27	1.60E-01	9.05E+02	2.93E-04	1.15E+00	B	30.00	1.02E+05	3.7850E+15	905	1.45E+14	1.40E+28	1.45E+14		M	
Co-60	1.81E-02	4.90E-01	4.00E-01	0.05	4.20E+01	4.32E-04	1.54E-02	7.56E-03	A	30.00	1.95E+03	7.1970E+13	905	3.80E+16	1.81E+10	1.81E+10			S
Cs-131	6.71E+03	1.81E+05	3.00E+01	223.73	3.80E+03	1.77E+00	1.65E-04	3.00E+01	B	30.00	1.81E+05	6.7118E+15	905	3.44E+18	5.94E+35	6.71E+15	H		
Cs-134	4.20E-01	1.14E+01	7.00E-01	0.60	4.80E+01	8.75E-03	1.02E-02	1.16E-01	A	30.00	2.95E+03	1.0905E+14	905	4.34E+16	4.20E+11	4.20E+11			S
Cs-137	1.73E+01	4.68E+02	6.00E-01	28.88	3.20E+00	5.42E+00	1.01E-03	4.74E-01	B	30.00	2.96E+04	1.0966E+15	905	2.90E+15	1.73E+13	1.73E+13			S
Cu-67	6.91E+02	1.87E+04	7.00E-01	986.75	2.80E+04	2.47E-02	1.61E-03	3.00E+01	B	30.00	1.87E+04	6.9073E+14	905	2.53E+19	9.23E+21	6.91E+14	H		
Hg-203	5.58E+02	1.51E+04	1.00E+00	557.87	5.10E+02	1.09E+00	1.99E-03	3.00E+01	B	30.00	1.51E+04	5.5787E+14	905	4.62E+17	1.14E+30	5.58E+14	H		
Ho-166	1.54E+00	4.15E+01	4.00E-01	3.84	2.60E+04	5.91E-05	4.29E-03	1.78E-01	B	30.00	6.99E+03	2.5852E+14	905	2.35E+19	1.54E+12	1.54E+12			S
I-125	3.19E+03	8.61E+04	3.00E+00	1062.52	6.40E+02	4.98E+00	3.48E-04	3.00E+01	B	30.00	8.61E+04	3.1875E+15	905	5.79E+17	3.18E+35	3.19E+15	H		
I-129	5.88E-03	1.59E-01	< 1	< 1	6.50E-06	9.05E+02	4.68E-04	7.44E-05	B	30.00	6.41E+04	2.3720E+15	905	5.88E+09	6.65E+26	5.88E+09		M	
I-131	1.42E+02	3.83E+03	7.00E-01	202.60	4.60E+03	3.08E-02	3.39E-03	1.30E+01	B	30.00	8.85E+03	3.2761E+14	905	4.16E+18	1.42E+14	1.42E+14			S
In-111	4.27E+02	1.15E+04	3.00E+00	142.34	1.50E+04	2.85E-02	2.60E-03	3.00E+01	B	30.00	1.15E+04	4.2702E+14	905	1.36E+19	1.03E+28	4.27E+14	H		
Ir-192	1.76E+02	4.74E+03	6.00E-01	292.54	3.40E+02	5.16E-01	6.13E-03	2.91E+01	B	30.00	4.90E+03	1.8121E+14	905	3.08E+17	1.76E+14	1.76E+14			S
Ir-194	2.55E+00	6.89E+01	3.00E-01	8.50	3.10E+04	8.23E-05	5.35E-03	3.68E-01	B	30.00	5.61E+03	2.0766E+14	905	2.81E+19	2.55E+12	2.55E+12			S
Lu-177	2.08E+02	5.61E+03	3.00E-01	692.20	3.10E+04	6.70E-03	5.35E-03	3.00E+01	B	30.00	5.61E+03	2.0766E+14	905	2.81E+19	1.10E+24	2.08E+14	H		
Mo-99	1.47E+01	3.96E+02	3.00E-01	48.88	3.10E+04	4.73E-04	5.35E-03	2.12E+00	B	30.00	5.61E+03	2.0766E+14	905	2.81E+19	1.47E+13	1.47E+13			S
Na-24	3.47E-03	9.39E-02	3.00E-01	0.01	3.10E+04	1.12E-07	5.35E-03	5.02E-04	A	30.00	5.61E+03	2.0766E+14	905	2.81E+19	3.47E+09	3.47E+09			S
Np-237	2.08E+02	5.61E+03	3.00E-01	692.20	3.10E+04	6.70E-03	5.35E-03	3.00E+01	B	30.00	5.61E+03	2.0766E+14	905	2.81E+19	3.67E+17	2.08E+14	H		
P-32	1.69E+00	4.58E+01	3.00E-01	5.64	3.10E+04	5.46E-05	5.35E-03	2.45E-01	B	30.00	5.61E+03	2.0766E+14	905	2.81E+19	1.69E+12	1.69E+12			S
P-33	2.08E+02	5.61E+03	3.00E-01	692.20	3.10E+04	6.70E-03	5.35E-03	3.00E+01	B	30.00	5.61E+03	2.0766E+14	905	2.81E+19	1.03E+38	2.08E+14	H		
Pb-203	2.08E+02	5.61E+03	3.00E-01	692.20	3.10E+04	6.70E-03	5.35E-03	3.00E+01	B	30.00	5.61E+03	2.0766E+14	905	2.81E+19	1.45E+15	2.08E+14	H		
Pb-210	2.08E+02	5.61E+03	3.00E-01	692.20	3.10E+04	6.70E-03	5.35E-03	3.00E+01	B	30.00	5.61E+03	2.0766E+14	905	2.81E+19	1.22E+17	2.08E+14	H		
Pd-109	2.08E+02	5.61E+03	3.00E-01	692.20	3.10E+04	6.70E-03	5.35E-03	3.00E+01	B	30.00	5.61E+03	2.0766E+14	905	2.81E+19	2.03E+18	2.08E+14	H		
Ra-223	3.18E+01	8.59E+02	3.00E-01	105.91	3.10E+04	1.02E-03	5.35E-03	4.59E+00	B	30.00	5.61E+03	2.0766E+14	905	2.81E+19	3.18E+13	3.18E+13			S
Ra-224	1.36E-02	3.68E-01	3.00E-01	0.05	3.10E+04	4.39E-07	5.35E-03	1.97E-03	A	30.00	5.61E+03	2.0766E+14	905	2.81E+19	1.36E+10	1.36E+10			S
Ra-226	1.96E-02	5.30E-01	3.00E-01	0.07	3.10E+04	6.33E-07	5.35E-03	2.83E-03	A	30.00	5.61E+03	2.0766E+14	905	2.81E+19	1.96E+10	1.96E+10			S
Re-186	2.08E+02	5.61E+03	3.00E-01	692.20	3.10E+04	6.70E-03	5.35E-03	3.00E+01	B	30.00	5.61E+03	2.0766E+14	905	2.81E+19	1.12E+16	2.08E+14	H		
Re-188	1.43E+00	3.86E+01	3.00E-01	4.76	3.10E+04	4.60E-05	5.35E-03	2.06E-01	B	30.00	5.61E+03	2.0766E+14	905	2.81E+19	7.46E+12	1.43E+12			
Rh-105	2.08E+02	5.61E+03	3.00E-01	692.20	3.10E+04	6.70E-03	5.35E-03	3.00E+01	B	30.00	5.61E+03	2.0766E+14	905	2.81E+19	2.93E+25	2.08E+14	H		
Se-75	2.08E+02	5.61E+03	3.00E-01	692.20	3.10E+04	6.70E-03	5.35E-03	3.00E+01	B	30.00	5.61E+03	2.0766E+14	905	2.81E+19	5.84E+18	2.08E+14	H		
Sm-153	5.71E+02	1.54E+04	6.00E-01	952.23	1.60E+04	3.57E-02	1.94E-03	3.00E+01	B	30.00	1.54E+04	5.7134E+14	905	1.45E+19	3.56E+20	5.71E+14	H		
Sr-89	3.21E+02	8.68E+03	6.00E-01	535.22	1.10E+03	2.92E-01	3.46E-03	3.00E+01	B	30.00	8.68E+03	3.2113E+14	905	9.96E+17	2.34E+15	3.21E+14	H		
Sr-90	6.38E-01	1.72E+01	3.00E-01	2.13	5.10E+00	1.25E-01	3.46E-03	5.96E-02	B	30.00	8.68E+03	3.2113E+14	905	4.62E+15	2.42E+17	6.38E+11			
Tb-161	9.57E+02	2.59E+04	2.00E-02	47844.83	4.35E+03	2.20E-01	1.16E-03	3.00E+01	B	30.00	2.59E+04	9.5690E+14	905	3.94E+18	1.92E+17	9.57E+14	H		
Th-227	3.09E+01	8.36E+02	5.00E-03	6189.36	1.10E+03	2.81E-02	3.59E-02	3.00E+01	B	30.00	8.36E+02	3.0947E+13	905	9.96E+17	6.80E+13	3.09E+13	H		
Th-228	1.02E-02	2.77E-01	1.00E-03	10.24	3.00E+01	3.41E-04	3.21E-02	8.89E-03											

										Contents heat limit			Contents mass limit		Shielding limit	Package limit			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Nuclide	Max	Activity	A2	# A2s	Spec Ac	Mass	Heat gen	Heat output	Package Type	Heat output	Act	Act	Mass	Act	Act	Act	Code		
	TBq	Ci	TBq		TBq/g	g	W/Ci	W	A or B	W	Ci	Bq	g	Bq	Bq	Bq	H	M	S
Yb-175	1.11E+03	2.99E+04	9.00E-01	1228.91	6.60E+03	1.68E-01	1.00E-03	3.00E+01	B	30.00	2.99E+04	1.1060E+15	905	5.97E+18	2.26E+20	1.11E+15	H		

Notes

Column

- 1Identifies nuclide
- 2Package activity limit for this Contents Type - from Col 17
- 3Calculated from Bq amount in Col 2
- 4A2 from 10CFR71
- 5# of A2's of nuclide at package activity limit
- 6Specific activity from 10CFR71
- 7Mass of nuclide at package activity limit
- 8Heat generation rate of nuclide - from Microshield.
- 9Heat output of nuclide at package activity limit
- 10Package Type [A or B] based on individual nuclide limit
- 11Mass limit of nuclide based on package heat limit
- 12Calculated from limit in Col 11
- 13Calculated from Bq amount in Col 12
- 14Mass limit of nuclide based on capacity of insert
- 15Calculated from Bq amount in Col 14
- 16Package shielding limit from CTR2011/01
- 17Package limit = least of heat, mass and shielding limits in Cols 13, 15 & 16
- 18H shown where package limit is Heat limit
- 19M shown where package limit is Mass limit
- 20S shown where package limit is Shielding limit

Colour codes

- Radionuclides
- Package limit
- Physics data
- Contents limit based on heat, mass or shielding

Table 6 Activity Limits for Contents Type 4 - CT-4 - Liquid in light tungsten insert – Design No 3985

										Contents heat limit			Contents mass limit		Shielding limit		Package limit		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Nuclide	Max	Activity	A2	# A2s	Spec Ac	Mass	Heat gen	Heat output	Package Type	Heat output	Activity		Mass	Act	Act	Act	Code		
	TBq	Ci	TBq		TBq/g	g	W/Ci	W	A or B	W	Ci	Bq	g	Bq	Bq	Bq	H	M	S
Ho-166	9.20E-01	2.49E+01	4.00E-01	2.30	2.60E+04	3.54E-05	4.29E-03	1.07E-01	B	5.00	1.16E+03	4.3087E+13	345	8.97E+18	9.20E+11	9.20E+11			S
Lu-177	1.71E+02	4.63E+03	7.00E-01	244.71	4.10E+03	4.18E-02	1.08E-03	5.00E+00	B	5.00	4.63E+03	1.7130E+14	345	1.41E+18	1.38E+24	1.71E+14	H		
Mo-99	1.91E+01	5.17E+02	6.00E-01	31.85	1.80E+04	1.06E-03	3.27E-03	1.69E+00	B	5.00	1.53E+03	5.6575E+13	345	6.21E+18	1.91E+13	1.91E+13			S
Se-75	7.68E+01	2.07E+03	3.00E+00	25.59	5.40E+02	1.42E-01	2.41E-03	5.00E+00	B	5.00	2.07E+03	7.6763E+13	345	1.86E+17	7.87E+18	7.68E+13	H		
Tl-201	2.42E+02	6.54E+03	4.00E+00	60.45	7.90E+03	3.06E-02	7.65E-04	5.00E+00	B	5.00	6.54E+03	2.4181E+14	345	2.73E+18	1.41E+22	2.42E+14	H		
Max	6.71E+03	1.81E+05				3.45E+02		3.00E+01											

Notes

Column	
1	Identifies nuclide
2	Package activity limit for this Contents Type - from Col 17
3	Calculated from Bq amount in Col 2
4	A2 from 10CFR71
5	# of A2's of nuclide at package activity limit
6	Specific activity from 10CFR71
7	Mass of nuclide at package activity limit
8	Heat generation rate of nuclide - from Microshield.
9	Heat output of nuclide at package activity limit
10	Package Type [A or B] based on individual nuclide limit
11	Mass limit of nuclide based on package heat limit
12	Calculated from limit in Col 11
13	Calculated from Bq amount in Col 12
14	Mass limit of nuclide based on capacity of insert
15	Calculated from Bq amount in Col 14
16	Package shielding limit from CTR2011/01
17	Package limit = least of heat, mass and shielding limits in Cols 13, 15 & 16
18	H shown where package limit is Heat limit
19	M shown where package limit is Mass limit
20	S shown where package limit is Shielding limit

Colour codes

	Radionuclides
	Package limit
	Physics data
	Contents limit based on heat, mass or shielding

Table 7 Activity Limits for Contents Type 5 - CT-5 - Liquid in steel insert – Design No 3987

										Contents heat limit			Contents mass limit		Shielding limit	Package limit			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Nuclide	Max	Activity	A2	# A2s	Spec Ac	Mass	Heat gen	Heat output	PackageType	Heat output	Act	Act	Mass	Act	Act	Act	Code		
	TBq	Ci	TBq		TBq/g	g	W/Ci	W	A or B	W	Ci	Bq	g	Bq	Bq	Bq	H	M	S
Ho-166	1.54E+00	4.15E+01	4.00E-01	3.84	2.60E+04	5.91E-05	4.29E-03	1.78E-01	B	5.00	1.16E+03	4.3087E+13	905	2.35E+19	1.54E+12	1.54E+12			S
Lu-177	3.46E+01	9.35E+02	3.00E-01	115.37	3.10E+04	1.12E-03	5.35E-03	5.00E+00	B	5.00	9.35E+02	3.4610E+13	905	2.81E+19	1.10E+24	3.46E+13	H		
Mo-99	1.47E+01	3.96E+02	3.00E-01	48.88	3.10E+04	4.73E-04	5.35E-03	2.12E+00	B	5.00	9.35E+02	3.4610E+13	905	2.81E+19	1.47E+13	1.47E+13			S
Se-75	3.46E+01	9.35E+02	3.00E-01	115.37	3.10E+04	1.12E-03	5.35E-03	5.00E+00	B	5.00	9.35E+02	3.4610E+13	905	2.81E+19	5.84E+18	3.46E+13	H		
Tl-201	2.42E+02	6.54E+03	4.00E+00	60.45	7.90E+03	3.06E-02	7.65E-04	5.00E+00	B	5.00	6.54E+03	2.4181E+14	905	7.15E+18	1.13E+22	2.42E+14	H		

Column

1	Identifies nuclide
2	Package activity limit for this Contents Type - from Col 17
3	Calculated from Bq amount in Col 2
4	A2 from 10CFR71
5	# of A2's of nuclide at package activity limit
6	Specific activity from 10CFR71
7	Mass of nuclide at package activity limit
8	Heat generation rate of nuclide - from Microshield.
9	Heat output of nuclide at package activity limit
10	Package Type [A or B] based on individual nuclide limit
11	Mass limit of nuclide based on package heat limit
12	Calculated from limit in Col 11
13	Calculated from Bq amount in Col 12
14	Mass limit of nuclide based on capacity of insert
15	Calculated from Bq amount in Col 14
16	Package shielding limit from CTR2011/01
17	Package limit = least of heat, mass and shielding limits in Cols 13, 15 & 16
18	H shown where package limit is Heat limit
19	M shown where package limit is Mass limit
20	S shown where package limit is Shielding limit

Colour codes

	Radionuclides
	Package limit
	Physics data
	Contents limit based on heat, mass or shielding

Table 8 Activity Limits for Contents Type 6 - CT-6 - Gas in light tungsten insert – Design No 3985

										Contents heat limit			Contents mass limit		Shielding limit	Gas limit	Package limit					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	15a	17	18	19	19a	20	
Nuclide	Max	Activity	A2	# A2s	Spec Ac	Mass	Heat gen	Heat output	Package Type	Heat output	Act	Act	Mass	Act	Act	Act	Act	Code				
	TBq	Ci	TBq		TBq/g	g	W/Ci	W	A or B	W	Ci	Bq	g	Bq	Bq	Bq	Bq	H	M	L	S	
Kr-79	2.30E+01	6.21E+02	2.00E+00	11.49	9.24E+04	2.49E-04	1.67E-03	1.04E+00	B	30.00	1.80E+04	6.6467E+14	345	3.19E+19	2.30E+13	3.07E+14	2.30E+13				S	
Xe-133	1.04E+03	2.80E+04	1.00E+01	103.74	6.90E+03	1.50E-01	1.07E-03	3.00E+01	B	30.00	2.80E+04	1.0374E+15	345	2.38E+18	1.99E+33	6.97E+15	1.04E+15	H				

Notes

Column

1	Identifies nuclide
2	Package activity limit for this Contents Type - from Col 17
3	Calculated from Bq amount in Col 2
4	A2 from 10CFR71
5	
6	# of A2's of nuclide at package activity limit
7	Specific activity from 10CFR71
8	Mass of nuclide at package activity limit
9	Heat generation rate of nuclide - from Microshield.
10	Heat output of nuclide at package activity limit
11	Package Type [A or B] based on individual nuclide limit
12	Mass limit of nuclide based on package heat limit
13	Calculated from limit in Col 11
14	Calculated from Bq amount in Col 12
15	Mass limit of nuclide based on capacity of insert
16	Calculated from Bq amount in Col 14
17	Package shielding limit from CTR2011/01
18	Package limit = least of heat, mass and shielding limits in Cols 13, 15 & 16
19	H shown where package limit is Heat limit
20	M shown where package limit is Mass limit
19a	L Shown where package limit is gas leakage rate
20	S shown where package limit is Shielding limit

Colour codes

	Radionuclides
	Package limit
	Physics data
	Contents limit based on heat, mass or shielding

Table 9 Activity Limits for Contents Type 7 - CT-7 - Fissile solid in Normal Form in steel insert – Design No 3987

										Contents heat limit			Contents mass limit		Shielding limit	Package limit			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Nuclide	Max	Activity	A2	# A2s	Spec Ac	Mass	Heat gen	Heat output	PackageType	Heat output	Act	Act	Mass	Act	Act	Act	Code		
	TBq	Ci	TBq		TBq/g	g	W/Ci	W	A or B	W	Ci	Bq	g	Bq	Bq	Bq	H	M	S
Pu-238	34.06	920.6125142	1.00E-03	34062.66	6.30E-01	5.41E+01	3.26E-02	3.00E+01	B	30.00	9.21E+02	3.4063E+13	905	5.70E+14	4.85E+14	3.41E+13	H		
Pu-240	7.6	205.4594595	1.00E-03	7602.00	8.40E-03	9.05E+02	3.06E-02	6.29E+00	B	30.00	9.80E+02	3.6258E+13	905	7.60E+12	1.87E+13	7.60E+12		M	
Pu-241	Contents shall meet the requirements of 10 CFR 71.15 or 3439 TBq whichever value is lower	Contents shall meet one of the requirements of 10 CFR 71.15 or 92945 Ci whichever value is lower	6.00E-02	57316.67	3.80E+00	9.05E+02	3.10E-05	2.88E+00	B	30.00	9.68E+05	3.5803E+16	905	3.44E+15	1.72E+19	3.44E+15		M	
U-235	Contents shall meet the requirements of 10 CFR 71.15 or 0.0000724 TBq whichever value is lower	Contents shall meet one of the requirements of 10 CFR 71.15 or 0.002 Ci whichever value is lower	< 1	< 1	8.00E-08	9.05E+02	2.71E-02	5.31E-05	B	30.00	1.11E+03	4.0937E+13	905	7.24E+07	2.12E+16	7.24E+07		M	

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Notes

Column

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
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- 14
- 15
- 16
- 17
- 18
- 19
- 20
- Identifies nuclide
- Package activity limit for this Contents Type - from Col 17
- Calculated from Bq amount in Col 2
- A2 from 10CFR71
- # of A2's of nuclide at package activity limit
- Specific activity from 10CFR71
- Mass of nuclide at package activity limit
- Heat generation rate of nuclide - from Microshield.
- Heat output of nuclide at package activity limit
- Package Type [A or B] based on individual nuclide limit
- Mass limit of nuclide based on package heat limit
- Calculated from limit in Col 11
- Calculated from Bq amount in Col 12
- Mass limit of nuclide based on capacity of insert
- Calculated from Bq amount in Col 14
- Package shielding limit from CTR2011/01
- Package limit = least of heat, mass and shielding limits in Cols 13, 15 & 16
- H shown where package limit is Heat limit
- M shown where package limit is Mass limit
- S shown where package limit is Shielding limit

Colour codes

- 
- 
- 
- 
- Radionuclides
- Package limit
- Physics data
- Contents limit based on heat, mass or shielding



Table 10 Activity Limits for Contents Type 8 - CT-8 - Fissile solid in Special Form in steel insert – Design No 3987

										Contents heat limit			Contents mass limit		Shielding limit	Package limit			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Nuclide	Max	Activity	A2	# A2s	Spec Ac	Mass	Heat gen	Heat output	Package Type	Heat output	Act	Act	Mass	Act	Act	Act	Code		
	TBq	Ci	TBq		TBq/g	g	W/Ci	W	A or B	W	Ci	Bq	g	Bq	Bq	Bq	H	M	S
Pu-238	34.06	920.6125142	1.00E-03	34062.66	6.30E-01	5.41E+01	3.26E-02	3.00E+01	B	30.00	9.21E+02	3.4063E+13	905	5.70E+14	4.85E+14	3.41E+13	H	M	
Pu-240	7.6	205.4594595	1.00E-03	7602.00	8.40E-03	9.05E+02	3.06E-02	6.29E+00	B	30.00	9.80E+02	3.6258E+13	905	7.60E+12	1.87E+13	7.60E+12		M	
Pu-241	Contents shall meet the requirements of 10 CFR 71.15 or 3439 TBq whichever value is lower	Contents shall meet one of the requirements of 10 CFR 71.15 or 92945 Ci whichever value is lower	6.00E-02	57316.67	3.80E+00	9.05E+02	3.10E-05	2.88E+00	B	30.00	9.68E+05	3.5803E+16	905	3.44E+15	1.72E+19	3.44E+15		M	
U-235	Contents shall meet the requirements of 10 CFR 71.15 or 0.0000724 TBq whichever value is lower	Contents shall meet one of the requirements of 10 CFR 71.15 or 0.002 Ci whichever value is lower	< 1	< 1	8.00E-08	9.05E+02	2.71E-02	5.31E-05	B	30.00	1.11E+03	4.0937E+13	905	7.24E+07	2.12E+16	7.24E+07		M	

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Notes

Column

- 1Identifies nuclide
- 2Package activity limit for this Contents Type - from Col 17
- 3Calculated from Bq amount in Col 2
- 4A2 from 10CFR71
- 5# of A2's of nuclide at package activity limit
- 6Specific activity from 10CFR71
- 7Mass of nuclide at package activity limit
- 8Heat generation rate of nuclide - from Microshield.
- 9
- 10Heat output of nuclide at package activity limit
- 11Package Type [A or B] based on individual nuclide limit
- 12Mass limit of nuclide based on package heat limit
- 13Calculated from limit in Col 11
- 14Calculated from Bq amount in Col 12
- 15Mass limit of nuclide based on capacity of insert
- 16Calculated from Bq amount in Col 14
- 17Package shielding limit from CTR2011/01
- 18Package limit = least of heat, mass and shielding limits in Cols 13, 15 & 16
- 19H shown where package limit is Heat limit
- 20M shown where package limit is Mass limit
- 21S shown where package limit is Shielding limit

Colour codes

- 
- Radionuclides
- 
- Package limit
- 
- Physics data
- 
- Contents limit based on heat, mass or shielding