Table A.1 Thresholds for Radionuclides

Isotope	Category 2 [1] Curies	Threshold Grams	Category 3 [2] Curies	Threshold Grams
H-3	3.0E+05	3.0E+01	1.6E+04*	1.6E+00*
C-14	1.4E+06	3.1E+05	4.2E+02	9.4E+01
Na-22	6.3E+03	1.0E+00	2.4E+02	3.8E-02
P-32	4.4E+03	1.5E-04	1.2E+01	4.2E-05
P-33	3.0E+04	1.9E-01	9.4E+01	6.0E-04
P-32, acid**	2.2E+06	7.7E-02	1.2E+01	4.2E-05
P-33, acid**	1.5E+07	9.6E+01	9.4E+01	6.0E-04
S-35	2.5E+04	5.8E-01	7.8E+01	1.8E-03
Cl-36	1.4E+03	4.3E+04	3.4E+02	1.0E+04
K-40	4.7E+03	6.8E+08	1.7E+02	2.4E+07
Ca-45	4.7E+06	2.6E+02	1.1E+03	6.2E-02
Ca-47	4.8E+06	7.8E+00	7.0E+02	1.1E-03
Sc-46	1.4E+06	4.0E+01	3.6E+02	1.1E-02
Ti-44	3.2E+04	1.9E+02	6.2E+01	3.6E-01
V-48	3.0E+06	1.8E+01	6.4E+02	3.8E-03
Cr-51	1.0E+08	1.1E+03	2.2E+04	2.4E-01
Mn-52	4.0E+06	8.8E+00	3.4E+02	7.6E-04
Fe-55	1.1E+07	4.6E+03	5.4E+03	2.2E+00
Fe-59	1.8E+06	3.7E+01	6.0E+02	1.2E+02
Co-60	1.9E+05	1.7E+02	2.8E+02	2.5E-01
Ni-63	4.5E+06	8.0E+04	5.4E+03	9.5E+01
Zn-65	1.6E+06	1.9E+02	2.4E+02	2.9E-02
Ge-68	5.8E+05	8.8E+01	1.0E+03	1.5E-01
Se-75	3.4E+05	2.4E+01	3.2E+02	2.2E-02
Kr-85	2.8E+07	7.2E+04	2.0E+04	5.1E+01
Sr-89	7.7E+05	2.7E+01	3.4E+02	1.2E-02
Sr-90	2.2E+04	1.6E+02	1.6E+01	1.2E-01
Y-91	6.5E+05	2.7E+01	3.6E+02	1.5E-02
Zr-93	8.9E+04	3.6E+07	6.2E+01	2.5E+04
Zr-95	1.5E+06	6.9E+01	7.0E+02	3.3E-02
Nb-94	8.6E+04	4.6E+05	2.0E+02	1.1E+03
Mo-99	7.8E+06	1.6E+01	3.4E+03	7.1E-03
Tc-99	3.8E+06	2.3E+08	1.7E+03	1.0E+05
Ru-106	6.5E+03	1.9E+00	1.0E+02	3.0E-02
Ag-110m	5.3E+05	1.1E+02	2.6E+02	5.5E-02
Cd-109	2.9E+05	1.1E+02	1.8E+02	7.0E-02
Cd-113	1.8E+04	5.3E+16	1.1E+01	3.2E+13
In-114m	3.7E+05	1.6E+01	2.2E+02	9.5E-03
Sn-113	3.2E+06	3.2E+02	1.3E+03	1.3E-01

Isotope	Category 2 Curies	Threshold Grams	Category 3 Curies	Threshold Grams
Sn-123	9.5E+05	1.2E+02	3.2E+02	3.9E-02
Sn-126	3.3E+05	1.2E+07	1.7E+02	6.0E+03
Sb-124	1.3E+06	7.5E+01	3.6E+02	2.1E-02
Sb-126	2.5E+06	3.0E+01	2.8E+02	3.4E-03
Te-127m	1.5E+05	1.6E+01	4.0E+02	4.2E-02
Te-129m	1.4E+05	4.7E+00	4.0E+02	1.3E-02
I-125	2.4E+03	1.4E-01	5.6E-01	3.2E-05
I-131	1.8E+03	1.4E-02	9.2E-01	7.4E-06
Xe-133	1.8E+06	9.6E+00	2.0E+04	1.1E-01
Cs-134	6.0E+04	4.6E+01	4.2E+01	3.3E-02
Cs-137	8.9E+04	1.0E+03	6.0E+01	6.9E-01
Ba-133	4.0E+06	1.6E+04	1.1E+03	4.3E+00
Ba-140	7.8E+06	1.1E+02	6.0E+02	8.2E-03
Ce-141	3.3E+06	1.2E+02	1.0E+03	3.5E-02
Ce-144	8.2E+04	2.6E+01	1.0E+02	3.1E-02
Pm-145	1.1E+06	7.6E+03	2.0E+03	1.4E+01
Pm-147	8.4E+05	9.0E+02	1.0E+03	9.5E-01
Sm-151	9.9E+05	3.7E+04	1.0E+03	3.8E+01
Eu-152	1.3E+05	7.5E+02	2.0E+02	1.2E+00
Eu-154	1.1E+05	4.2E+02	2.0E+02	7.6E-01
Eu-155	7.3E+05	1.6E+03	9.4E+02	2.0E+00
Gd-153	1.4E+06	3.9E+02	1.0E+03	2.8E-01
Tb-160	1.3E+06	1.1E+02	5.6E+02	5.0E-02
Ho-166m	4.0E+04	2.2E+04	7.2E+01	4.0E+01
Tm-170	1.2E+06	2.1E+02	5.2E+02	8.7E-02
Hf-181	2.2E+06	1.3E+02	7.6E+02	4.5E-02
Ir-192	1.2E+06	1.3E+02	9.4E+02	1.0E-01
Au-198	9.3E+06	3.8E+01	2.0E+03	8.2E-03
Hg-203	4.3E+05	3.1E+01	3.6E+02	2.6E-02
Pb-210	2.2E+03	2.9E+01	3.6E-01	4.7E-03
Bi-207	2.2E+06	4.3E+04	5.0E+02	1.1E+01
Bi-210	1.5E+05	1.2E+00	3.2E+02	2.6E-03
Po-210	3.5E+02	7.8E-02	1.9E+00	4.2E-04
Rn-222	1.6E+08	1.1E+03	1.0E+01	6.5E-05
Ra-223	3.8E+03	7.4E-02	6.2E+01	1.2E-03
Ra-224	9.9E+03	6.1E-02	2.0E+02	1.2E-03
Ra-225	3.8E+03	9.6E-02	7.2E+01	1.8E-03
Ac-225	2.9E+03	4.9E-02	3.2E+01	5.5E-04
Ac-227	4.3E+00	5.9E-02	4.2E-02	5.8E-04
Th-228	9.2E+01	1.1E-01	1.0E+00	1.2E-03
Th-230	8.9E+01	4.4E+03	6.2E-01	3.1E+01
Th-232	1.8E+01	1.6E+08	1.0E-01	9.1E+05

Isotope	Category 2 Curies	Threshold Grams	Category 3 Curies	Threshold Grams
U-233	2.2E+02***	2.3E+04***	4.2E+00	4.4E+02
U-234	2.2E+02	3.5E+04	4.2E+00	6.7E+02
U-235	2.4E+02***	1.1E+08***	4.2E+00	1.9E+06
U-238	2.4E+02	7.1E+08	4.2E+00	1.3E+07
Np-237	5.8E+01	8.3E+04	4.2E-01	6.0E+02
Np-238	9.1E+05	3.5E+00	1.3E+03	5.0E-03
Pu-238	6.2E+01	3.6E+00	6.2E-01	3.6E-02
Pu-239	5.6E+01***	9.0E+02***	5.2E-01	8.4E+00
Pu-241	2.9E+03	2.8E+01	3.2E+01	3.1E-01
Am-241	5.5E+01	1.6E+01	5.2E-01	1.5E-01
Am-242m	5.6E+01	5.8E+00	5.2E-01	5.3E-02
Am-243	5.5E+01	2.8E+02	5.2E-01	2.6E+00
Cm-242	1.7E+03	5.1E-01	3.2E+01	9.7E-03
Cm-245	5.3E+01	3.1E+02	5.2E-01	3.0E+00
Cf-252	2.2E+02	4.1E-01	3.2E+00	5.9E-03

[1] For isotopes not listed below, users may refer to LA-12846-MS, Specific Activities and DOE-STD-1027-92 Hazard Category 2 Thresholds, LANL Fact Sheet or to 10 CFR 30.72, Schedule C and adjust the values consistent with the X/Q value described in Attachment 1 of this Standard. (Note that although LA-12846-MS misstates the Category 2 threshold criterion, its use of the proper X/Q negates any effect of the misstatement. See "Radiological Criteria, p A-3 and Meteorological Conditions, p A-7 for clarification)

Any other beta-gamma emitter - 4.3E+05 Ci
Mixed fission products - 1.0E+03 Ci
Any other alpha emitter - 5.5E+01 Ci

[2] For isotopes not listed below, users may refer to LA-12981-MS, Table of DOE-STD-1027-92 Hazard Category 3 Threshold Quantities for the ICRP-30 List of 757 Radionuclides, LANL Fact Sheet for threshold quantities of any isotopes of interest.

* At the recommendation of the Tritium Focus Group, the Category 3 tritium threshold value has been increased from 1.0E+03 Ci and 1.0E-01 grams to 1.6E+04 Ci and 1.6E+00 grams, consistent with the methodology of EPA used for the other nuclides.

** Provided as an example to indicate that when a substance such as P_{32} is used in a solution (i.e., phosphoric acid) for experimentation, medical treatment, etc., it should no longer be considered as highly volatile/combustible.

*** To be used only if segmentation or nature of process precludes potential for criticality. Otherwise, use the criticality lists for U_{233}, U_{235} and Pu_{239} of 500, 700, and 450 grams, respectively.