

Pt. 20, App. C

10 CFR Ch. I (1-1-12 Edition)

APPENDIX C TO PART 20—QUANTITIES¹
OF LICENSED MATERIAL REQUIRING
LABELING

Radionuclide	Quantity (μ Ci)
Hydrogen-3	1,000
Beryllium-7	1,000
Beryllium-10	1
Carbon-11	1,000
Carbon-14	100
Fluorine-18	1,000
Sodium-22	10
Sodium-24	100
Magnesium-28	100
Aluminum-26	10
Silicon-31	1,000
Silicon-32	1
Phosphorus-32	10
Phosphorus-33	100
Sulfur-35	100
Chlorine-36	10
Chlorine-38	1,000
Chlorine-39	1,000
Argon-39	1,000
Argon-41	1,000
Potassium-40	100
Potassium-42	1,000
Potassium-43	1,000
Potassium-44	1,000
Potassium-45	1,000
Calcium-41	100
Calcium-45	100
Calcium-47	100
Scandium-43	1,000
Scandium-44m	100
Scandium-44	100
Scandium-46	10
Scandium-47	100
Scandium-48	100
Scandium-49	1,000
Titanium-44	1
Titanium-45	1,000
Vanadium-47	1,000
Vanadium-48	100
Vanadium-49	1,000
Chromium-48	1,000
Chromium-49	1,000
Chromium-51	1,000
Manganese-51	1,000
Manganese-52m	1,000
Manganese-52	100
Manganese-53	1,000
Manganese-54	100
Manganese-56	1,000
Iron-52	100
Iron-55	100
Iron-59	10
Iron-60	1
Cobalt-55	100
Cobalt-56	10
Cobalt-57	100
Cobalt-58m	1,000
Cobalt-58	100
Cobalt-60m	1,000
Cobalt-60	1
Cobalt-61	1,000
Cobalt-62m	1,000
Nickel-56	100
Nickel-57	100
Nickel-59	100
Nickel-63	100
Nickel-65	1,000
Nickel-66	10
Copper-60	1,000

Radionuclide	Quantity (μ Ci)
Copper-61	1,000
Copper-64	1,000
Copper-67	1,000
Zinc-62	100
Zinc-63	1,000
Zinc-65	10
Zinc-69m	100
Zinc-69	1,000
Zinc-71m	1,000
Zinc-72	100
Gallium-65	1,000
Gallium-66	100
Gallium-67	1,000
Gallium-68	1,000
Gallium-70	1,000
Gallium-72	100
Gallium-73	1,000
Germanium-66	1,000
Germanium-67	1,000
Germanium-68	10
Germanium-69	1,000
Germanium-71	1,000
Germanium-75	1,000
Germanium-77	1,000
Germanium-78	1,000
Arsenic-69	1,000
Arsenic-70	1,000
Arsenic-71	100
Arsenic-72	100
Arsenic-73	100
Arsenic-74	100
Arsenic-76	100
Arsenic-77	100
Arsenic-78	1,000
Selenium-70	1,000
Selenium-73m	1,000
Selenium-73	100
Selenium-75	100
Selenium-79	100
Selenium-81m	1,000
Selenium-81	1,000
Selenium-83	1,000
Bromine-74m	1,000
Bromine-74	1,000
Bromine-75	1,000
Bromine-76	100
Bromine-77	1,000
Bromine-80m	1,000
Bromine-80	1,000
Bromine-82	100
Bromine-83	1,000
Bromine-84	1,000
Krypton-74	1,000
Krypton-76	1,000
Krypton-77	1,000
Krypton-79	1,000
Krypton-81	1,000
Krypton-83m	1,000
Krypton-85m	1,000
Krypton-85	1,000
Krypton-87	1,000
Krypton-88	1,000
Rubidium-79	1,000
Rubidium-81m	1,000
Rubidium-81	1,000
Rubidium-82m	1,000
Rubidium-83	100
Rubidium-84	100
Rubidium-86	100
Rubidium-87	100
Rubidium-88	1,000
Rubidium-89	1,000
Strontium-80	100

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Radionuclide	Quantity (μCi)	Radionuclide	Quantity (μCi)
Strontium-81	1,000	Palladium-101	1,000
Strontium-83	100	Palladium-103	100
Strontium-85m	1,000	Palladium-107	10
Strontium-85	100	Palladium-109	100
Strontium-87m	1,000	Silver-102	1,000
Strontium-89	10	Silver-103	1,000
Strontium-90	0.1	Silver-104m	1,000
Strontium-91	100	Silver-104	1,000
Strontium-92	100	Silver-105	100
Yttrium-86m	1,000	Silver-106m	100
Yttrium-86	100	Silver-106	1,000
Yttrium-87	100	Silver-108m	1
Yttrium-88	10	Silver-110m	10
Yttrium-90m	1,000	Silver-111	100
Yttrium-90	10	Silver-112	100
Yttrium-91m	1,000	Silver-115	1,000
Yttrium-91	10	Cadmium-104	1,000
Yttrium-92	100	Cadmium-107	1,000
Yttrium-93	100	Cadmium-109	1
Yttrium-94	1,000	Cadmium-113m	0.1
Yttrium-95	1,000	Cadmium-113	100
Zirconium-86	100	Cadmium-115m	10
Zirconium-88	10	Cadmium-115	100
Zirconium-89	100	Cadmium-117m	1,000
Zirconium-93	1	Cadmium-117	1,000
Zirconium-95	10	Indium-109	1,000
Zirconium-97	100	Indium-110 (69.1min.)	1,000
Niobium-88	1,000	Indium-110 (4.9h)	1,000
Niobium-89m (66 min)	1,000	Indium-111	100
Niobium-89 (122 min)	1,000	Indium-112	1,000
Niobium-90	100	Indium-113m	1,000
Niobium-93m	10	Indium-114m	10
Niobium-94	1	Indium-115m	1,000
Niobium-95m	100	Indium-115	100
Niobium-95	100	Indium-116m	1,000
Niobium-96	100	Indium-117m	1,000
Niobium-97	1,000	Indium-117	1,000
Niobium-98	1,000	Indium-119m	1,000
Molybdenum-90	100	Tin-110	100
Molybdenum-93m	100	Tin-111	1,000
Molybdenum-93	10	Tin-113	100
Molybdenum-99	100	Tin-117m	100
Molybdenum-101	1,000	Tin-119m	100
Technetium-93m	1,000	Tin-121m	100
Technetium-93	1,000	Tin-121	1,000
Technetium-94m	1,000	Tin-123m	1,000
Technetium-94	1,000	Tin-123	10
Technetium-96m	1,000	Tin-125	10
Technetium-96	100	Tin-126	10
Technetium-97m	100	Tin-127	1,000
Technetium-97	1,000	Tin-128	1,000
Technetium-98	10	Antimony-115	1,000
Technetium-99m	1,000	Antimony-116m	1,000
Technetium-99	100	Antimony-116	1,000
Technetium-101	1,000	Antimony-117	1,000
Technetium-104	1,000	Antimony-118m	1,000
Ruthenium-94	1,000	Antimony-119	1,000
Ruthenium-97	1,000	Antimony-120 (16min.)	1,000
Ruthenium-103	100	Antimony-120 (5.76d)	100
Ruthenium-105	1,000	Antimony-122	100
Ruthenium-106	1	Antimony-124m	1,000
Rhodium-99m	1,000	Antimony-124	10
Rhodium-99	100	Antimony-125	100
Rhodium-100	100	Antimony-126m	1,000
Rhodium-101m	1,000	Antimony-126	100
Rhodium-101	10	Antimony-127	100
Rhodium-102m	10	Antimony-128 (10.4min.)	1,000
Rhodium-102	10	Antimony-128 (9.01h)	100
Rhodium-103m	1,000	Antimony-129	100
Rhodium-105	100	Antimony-130	1,000
Rhodium-106m	1,000	Antimony-131	1,000
Rhodium-107	1,000	Tellurium-116	1,000
Palladium-100	100		

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Radionuclide	Quantity (μCi)	Radionuclide	Quantity (μCi)
Tellurium-121m	10	Lanthanum-140	100
Tellurium-121	100	Lanthanum-141	100
Tellurium-123m	10	Lanthanum-142	1,000
Tellurium-123	100	Lanthanum-143	1,000
Tellurium-125m	10	Cerium-134	100
Tellurium-127m	10	Cerium-135	100
Tellurium-127	1,000	Cerium-137m	100
Tellurium-129m	10	Cerium-137	1,000
Tellurium-129	1,000	Cerium-139	100
Tellurium-131m	10	Cerium-141	100
Tellurium-131	100	Cerium-143	100
Tellurium-132	10	Cerium-144	1
Tellurium-133m	100	Praseodymium-136	1,000
Tellurium-133	1,000	Praseodymium-137	1,000
Tellurium-134	1,000	Praseodymium-138m	1,000
Iodine-120m	1,000	Praseodymium-139	1,000
Iodine-120	100	Praseodymium-142m	1,000
Iodine-121	1,000	Praseodymium-142	100
Iodine-123	100	Praseodymium-143	100
Iodine-124	10	Praseodymium-144	1,000
Iodine-125	1	Praseodymium-145	100
Iodine-126	1	Praseodymium-147	1,000
Iodine-128	1,000	Neodymium-136	1,000
Iodine-129	1	Neodymium-138	100
Iodine-130	10	Neodymium-139m	1,000
Iodine-131	1	Neodymium-139	1,000
Iodine-132m	100	Neodymium-141	1,000
Iodine-132	100	Neodymium-147	100
Iodine-133	10	Neodymium-149	1,000
Iodine-134	1,000	Neodymium-151	1,000
Iodine-135	100	Promethium-141	1,000
Xenon-120	1,000	Promethium-143	100
Xenon-121	1,000	Promethium-144	10
Xenon-122	1,000	Promethium-145	10
Xenon-123	1,000	Promethium-146	1
Xenon-125	1,000	Promethium-147	10
Xenon-127	1,000	Promethium-148m	10
Xenon-129m	1,000	Promethium-148	10
Xenon-131m	1,000	Promethium-149	100
Xenon-133m	1,000	Promethium-150	1,000
Xenon-133	1,000	Promethium-151	100
Xenon-135m	1,000	Samarium-141m	1,000
Xenon-135	1,000	Samarium-141	1,000
Xenon-138	1,000	Samarium-142	1,000
Cesium-125	1,000	Samarium-145	100
Cesium-127	1,000	Samarium-146	1
Cesium-129	1,000	Samarium-147	100
Cesium-130	1,000	Samarium-151	10
Cesium-131	1,000	Samarium-153	100
Cesium-132	100	Samarium-155	1,000
Cesium-134m	1,000	Samarium-156	1,000
Cesium-134	10	Europium-145	100
Cesium-135m	1,000	Europium-146	100
Cesium-135	100	Europium-147	100
Cesium-136	10	Europium-148	10
Cesium-137	10	Europium-149	100
Cesium-138	1,000	Europium-150 (12.62h)	100
Barium-126	1,000	Europium-150 (34.2y)	1
Barium-128	100	Europium-152m	100
Barium-131m	1,000	Europium-152	1
Barium-131	100	Europium-154	1
Barium-133m	100	Europium-155	10
Barium-133	100	Europium-156	100
Barium-135m	100	Europium-157	100
Barium-139	1,000	Europium-158	1,000
Barium-140	100	Gadolinium-145	1,000
Barium-141	1,000	Gadolinium-146	10
Barium-142	1,000	Gadolinium-147	100
Lanthanum-131	1,000	Gadolinium-148	0.001
Lanthanum-132	100	Gadolinium-149	100
Lanthanum-135	1,000	Gadolinium-151	10
Lanthanum-137	10	Gadolinium-152	100
Lanthanum-138	100	Gadolinium-153	10

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Radionuclide	Quantity (μCi)	Radionuclide	Quantity (μCi)
Gadolinium-159	100	Hafnium-181	10
Terbium-147	1,000	Hafnium-182m	1,000
Terbium-149	100	Hafnium-182	0.1
Terbium-150	1,000	Hafnium-183	1,000
Terbium-151	100	Hafnium-184	100
Terbium-153	1,000	Tantalum-172	1,000
Terbium-154	100	Tantalum-173	1,000
Terbium-155	1,000	Tantalum-174	1,000
Terbium-156m (5.0h)	1,000	Tantalum-175	1,000
Terbium-156m (24.4h)	1,000	Tantalum-176	100
Terbium-156	100	Tantalum-177	1,000
Terbium-157	10	Tantalum-178	1,000
Terbium-158	1	Tantalum-179	100
Terbium-160	10	Tantalum-180m	1,000
Terbium-161	100	Tantalum-180	100
Dysprosium-155	1,000	Tantalum-182m	1,000
Dysprosium-157	1,000	Tantalum-182	10
Dysprosium-159	100	Tantalum-183	100
Dysprosium-165	1,000	Tantalum-184	100
Dysprosium-166	100	Tantalum-185	1,000
Holmium-155	1,000	Tantalum-186	1,000
Holmium-157	1,000	Tungsten-176	1,000
Holmium-159	1,000	Tungsten-177	1,000
Holmium-161	1,000	Tungsten-178	1,000
Holmium-162m	1,000	Tungsten-179	1,000
Holmium-162	1,000	Tungsten-181	1,000
Holmium-164m	1,000	Tungsten-185	100
Holmium-164	1,000	Tungsten-187	100
Holmium-166m	1	Tungsten-188	10
Holmium-166	100	Rhenium-177	1,000
Holmium-167	1,000	Rhenium-178	1,000
Erbium-161	1,000	Rhenium-181	1,000
Erbium-165	1,000	Rhenium-182 (12.7h)	1,000
Erbium-169	100	Rhenium-182 (64.0h)	100
Erbium-171	100	Rhenium-184m	10
Erbium-172	100	Rhenium-184	100
Thulium-162	1,000	Rhenium-186m	10
Thulium-166	100	Rhenium-186	100
Thulium-167	100	Rhenium-187	1,000
Thulium-170	10	Rhenium-188m	1,000
Thulium-171	10	Rhenium-188	100
Thulium-172	100	Rhenium-189	100
Thulium-173	100	Osmium-180	1,000
Thulium-175	1,000	Osmium-181	1,000
Ytterbium-162	1,000	Osmium-182	100
Ytterbium-166	100	Osmium-185	100
Ytterbium-167	1,000	Osmium-189m	1,000
Ytterbium-169	100	Osmium-191m	1,000
Ytterbium-175	100	Osmium-191	100
Ytterbium-177	1,000	Osmium-193	100
Ytterbium-178	1,000	Osmium-194	1
Lutetium-169	100	Iridium-182	1,000
Lutetium-170	100	Iridium-184	1,000
Lutetium-171	100	Iridium-185	1,000
Lutetium-172	100	Iridium-186	100
Lutetium-173	10	Iridium-187	1,000
Lutetium-174m	10	Iridium-188	100
Lutetium-174	10	Iridium-189	100
Lutetium-176m	1,000	Iridium-190m	1,000
Lutetium-176	100	Iridium-190	100
Lutetium-177m	10	Iridium-192 (73.8d)	1
Lutetium-177	100	Iridium-192m (1.4min.)	10
Lutetium-178m	1,000	Iridium-194m	10
Lutetium-178	1,000	Iridium-194	100
Lutetium-179	1,000	Iridium-195m	1,000
Hafnium-170	100	Iridium-195	1,000
Hafnium-172	1	Platinum-186	1,000
Hafnium-173	1,000	Platinum-188	100
Hafnium-175	100	Platinum-189	1,000
Hafnium-177m	1,000	Platinum-191	100
Hafnium-178m	0.1	Platinum-193m	100
Hafnium-179m	10	Platinum-193	1,000
Hafnium-180m	1,000	Platinum-195m	100

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Radionuclide	Quantity (μCi)	Radionuclide	Quantity (μCi)
Platinum-197m	1,000	Radium-227	1,000
Platinum-197	100	Radium-228	0.1
Platinum-199	1,000	Actinium-224	1
Platinum-200	100	Actinium-225	0.01
Gold-193	1,000	Actinium-226	0.1
Gold-194	100	Actinium-227	0.001
Gold-195	10	Actinium-228	1
Gold-198m	100	Thorium-226	10
Gold-198	100	Thorium-227	0.01
Gold-199	100	Thorium-228	0.001
Gold-200m	100	Thorium-229	0.001
Gold-200	1,000	Thorium-230	0.001
Gold-201	1,000	Thorium-231	100
Mercury-193m	100	Thorium-232	100
Mercury-193	1,000	Thorium-234	10
Mercury-194	1	Thorium-natural	100
Mercury-195m	100	Protactinium-227	10
Mercury-195	1,000	Protactinium-228	1
Mercury-197m	100	Protactinium-230	0.1
Mercury-197	1,000	Protactinium-231	0.001
Mercury-199m	1,000	Protactinium-232	1
Mercury-203	100	Protactinium-233	100
Thallium-194m	1,000	Protactinium-234	100
Thallium-194	1,000	Uranium-230	0.01
Thallium-195	1,000	Uranium-231	100
Thallium-197	1,000	Uranium-232	0.001
Thallium-198m	1,000	Uranium-233	0.001
Thallium-198	1,000	Uranium-234	0.001
Thallium-199	1,000	Uranium-235	0.001
Thallium-200	1,000	Uranium-236	0.001
Thallium-201	1,000	Uranium-237	100
Thallium-202	100	Uranium-238	100
Thallium-204	100	Uranium-239	1,000
Lead-195m	1,000	Uranium-240	100
Lead-198	1,000	Uranium-natural	100
Lead-199	1,000	Neptunium-232	100
Lead-200	100	Neptunium-233	1,000
Lead-201	1,000	Neptunium-234	100
Lead-202m	1,000	Neptunium-235	100
Lead-202	10	Neptunium-236 (1.15×10 ⁵ y)	0.001
Lead-203	1,000	Neptunium-236 (22.5h)	1
Lead-205	100	Neptunium-237	0.001
Lead-209	1,000	Neptunium-238	10
Lead-210	0.01	Neptunium-239	100
Lead-211	100	Neptunium-240	1,000
Lead-212	1	Plutonium-234	10
Lead-214	100	Plutonium-235	1,000
Bismuth-200	1,000	Plutonium-236	0.001
Bismuth-201	1,000	Plutonium-237	100
Bismuth-202	1,000	Plutonium-238	0.001
Bismuth-203	100	Plutonium-239	0.001
Bismuth-205	100	Plutonium-240	0.001
Bismuth-206	100	Plutonium-241	0.01
Bismuth-207	10	Plutonium-242	0.001
Bismuth-210m	0.1	Plutonium-243	1,000
Bismuth-210	1	Plutonium-244	0.001
Bismuth-212	10	Plutonium-245	100
Bismuth-213	10	Americium-237	1,000
Bismuth-214	100	Americium-238	100
Polonium-203	1,000	Americium-239	1,000
Polonium-205	1,000	Americium-240	100
Polonium-207	1,000	Americium-241	0.001
Polonium-210	0.1	Americium-242m	0.001
Astatine-207	100	Americium-242	10
Astatine-211	10	Americium-243	0.001
Radon-220	1	Americium-244m	100
Radon-222	1	Americium-244	10
Francium-222	100	Americium-245	1,000
Francium-223	100	Americium-246m	1,000
Radium-223	0.1	Americium-246	1,000
Radium-224	0.1	Curium-238	100
Radium-225	0.1	Curium-240	0.1
Radium-226	0.1	Curium-241	1

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Radionuclide	Quantity (μCi)	Radionuclide	Quantity (μCi)
Curium-242	0.01	Fermium-252	1
Curium-243	0.001	Fermium-253	1
Curium-244	0.001	Fermium-254	10
Curium-245	0.001	Fermium-255	1
Curium-246	0.001	Fermium-257	0.01
Curium-247	0.001	Mendelevium-257	10
Curium-248	0.001	Mendelevium-258	0.01
Curium-249	1,000	Any radionuclide other than alpha emitting radionuclides not listed above, or mixtures of beta emitters of unknown composition	0.01
Berkelium-245	100		
Berkelium-246	100		
Berkelium-247	0.001		
Berkelium-249	0.1		
Berkelium-250	10		
Californium-244	100		
Californium-246	1		
Californium-248	0.01		
Californium-249	0.001		
Californium-250	0.001		
Californium-251	0.001		
Californium-252	0.001		
Californium-253	0.1		
Californium-254	0.001		
Any alpha emitting radionuclide not listed above or mixtures of alpha emitters of unknown composition	0.001		
Einsteinium-250	100		
Einsteinium-251	100		
Einsteinium-253	0.1		
Einsteinium-254m	1		
Einsteinium-254	0.01		

¹The quantities listed above were derived by taking 1/10th of the most restrictive ALI listed in table 1, columns 1 and 2, of appendix B to §§20.1001–20.2401 of this part, rounding to the nearest factor of 10, and arbitrarily constraining the values listed between 0.001 and 1,000 μCi. Values of 100 μCi have been assigned for radionuclides having a radioactive half-life in excess of 10⁹ years (except rhenium, 1000 μCi) to take into account their low specific activity.

NOTE: For purposes of §§20.1902(e), 20.1905(a), and 20.2201(a) where there is involved a combination of radionuclides in known amounts, the limit for the combination should be derived as follows: determine, for each radionuclide in the combination, the ratio between the quantity present in the combination and the limit otherwise established for the specific radionuclide when not in combination. The sum of such ratios for all radionuclides in the combination may not exceed "1" (i.e., "unity").

[56 FR 23465, May 21, 1991; 56 FR 61352, Dec. 3, 1991. Redesignated and amended at 58 FR 67659, Dec. 22, 1993; 60 FR 20186, Apr. 25, 1995]

APPENDIX D TO PART 20—UNITED STATES NUCLEAR REGULATORY COMMISSION REGIONAL OFFICES

	Address	Telephone (24 hour)	E-Mail
NRC Headquarters Operations Center	USNRC, Division of Incident Response Operations, Washington, DC 20555–0001.	(301) 816–5100 (301) 951–0550 (301) 816–5151 (fax)	H001@nrc.gov
Region I: Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont.	USNRC, Region I, 475 Allendale Road, King of Prussia, PA 19406–1415.	(610) 337–5000 (800) 432–1156 TDD: (301) 415–5575	RidsRgn1MailCenter@nrc.gov
Region II: Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, Puerto Rico, South Carolina, Tennessee, Virginia, Virgin Islands, and West Virginia.	USNRC, Region II, 245 Peachtree Center Avenue, NE., Suite 1200, Atlanta, GA 30303–1257..	(404) 997–4000 (800) 877–8510 TDD: (301) 415–5575	RidsRgn2MailCenter@nrc.gov
Region III: Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio and Wisconsin.	USNRC, Region III, 2443 Warrenville Road, Suite 210, Lisle, IL 60532–4352.	(630) 829–9500 (800) 522–3025 TDD: (301) 415–5575	RidsRgn3MailCenter@nrc.gov
Region IV: Alaska, Arizona, Arkansas, California, Colorado, Hawaii, Idaho, Kansas, Louisiana, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Texas, Utah, Washington, Wyoming, and the U.S. territories and possessions in the Pacific.	US NRC, Region IV, 1600 E. Lamar Blvd., Arlington, TX 76011–4511..	(817) 860–8100 (800) 952–9677 TDD: (301) 415–5575	RidsRgn4MailCenter@nrc.gov

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