**Section 330.APPENDIX A Exempt Concentrations**

|  |  |  |  |
| --- | --- | --- | --- |
| Element(atomic number) | Isotope | Column I Gas Concentration1 | Column IILiquid and Solid Concentration2 |
| Bg/ml | microCi/ml | Bg/ml | microCi/ml |
|  |  |  |  |  |  |
| Antimony (51) | Sb-122 |  |  | 1.11x101 | 3x10-4 |
|  | Sb-124 |  |  | 7.40x100 | 2x10-4 |
|  | Sb-125 |  |  | 3.70x101 | 1x10-3 |
|  |  |  |  |  |  |
| Argon (18) | Ar-37 | 3.70x101 | 1x10-3 |  |  |
|  | Ar-41 | 1.48x10-2 | 4x10-7 |  |  |
|  |  |  |  |  |  |
| Arsenic (33) | As-73 |  |  | 1.85x102 | 5x10-3 |
|  | As-74 |  |  | 1.85x101 | 5x10-4 |
|  | As-76 |  |  | 7.40x100 | 2x10-4 |
|  | As-77 |  |  | 2.96x101 | 8x10-4 |
|  |  |  |  |  |  |
| Barium (56) | Ba-131 |  |  | 7.40x101 | 2x10-3 |
|  | Ba-140 |  |  | 1.11x101 | 3x10-4 |
|  |  |  |  |  |  |
| Beryllium (4) | Be-7 |  |  | 7.40x102 | 2x10-2 |
|  |  |  |  |  |  |
| Bismuth (83) | Bi-206 |  |  | 1.48x101 | 4x10-4 |
|  |  |  |  |  |  |
| Bromine (35) | Br-82 | 1.48x10-2 | 4x10-7 | 1.11x102 | 3x10-3 |
|  |  |  |  |  |  |
| Cadmium (48) | Cd-109 |  |  | 7.40x101 | 2x10-3 |
|  | Cd-115m |  |  | 1.11x101 | 3x10-4 |
|  | Cd-115 |  |  | 1.11x101 | 3x10-4 |
|  |  |  |  |  |  |
| Calcium (20) | Ca-45 |  |  | 3.33x100 | 9x10-5 |
|  | Ca-47 |  |  | 1.85x101 | 5x10-4 |
|  |  |  |  |  |  |
| Carbon (6) | C-14 | 3.70x10-2 | 1x10-6 | 2.96x102 | 8x10-3 |
|  |  |  |  |  |  |
| Cerium (58) | Ce-141 |  |  | 3.33x101 | 9x10-4 |
|  | Ce-143 |  |  | 1.48x101 | 4x10-4 |
|  | Ce-144 |  |  | 3.70x100 | 1x10-4 |
|  |  |  |  |  |  |
| Cesium (55) | Cs-131 |  |  | 7.40x102 | 2x10-2 |
|  | Cs-134m |  |  | 2.22x103 | 6x10-2 |
|  | Cs-134 |  |  | 3.3x100 | 9x10-5 |
|  |  |  |  |  |  |
| Chlorine (17) | Cl-38 | 3.33x10-2 | 9x10-7 | 1.48x102 | 4x10-3 |
|  |  |  |  |  |  |
| Chromium (24) | Cr-51 |  |  | 7.40x102 | 2x10-2 |
|  |  |  |  |  |  |
| Cobalt (27) | Co-57 |  |  | 1.85x102 | 5x10-3 |
|  | Co-58 |  |  | 3.70x101 | 1x10-3 |
|  | Co-60 |  |  | 1.85x101 | 5x10-4 |
|  |  |  |  |  |  |
| Copper (29) | Cu-64 |  |  | 1.11x102 | 3x10-3 |

|  |  |  |  |
| --- | --- | --- | --- |
| Element(atomic number) | Isotope | Column I Gas Concentration1 | Column IILiquid and Solid Concentration2 |
| Bg/ml | microCi/ml | Bg/ml | microCi/ml |
|  |  |  |  |  |  |
| Dysprosium (66) | Dy-165 |  |  | 1.48x102 | 4x10-3 |
|  | Dy-166 |  |  | 1.48x101 | 4x10-4 |
|  |  |  |  |  |  |
| Erbium (68) | Er-169 |  |  | 3.33x101 | 9x10-4 |
|  | Er-171 |  |  | 3.70x101 | 1x10-3 |
|  |  |  |  |  |  |
| Europium (63) | Eu-152 |  |  | 2.22x101 | 6x10-4 |
|  | (9.2h) |  |  |  |  |
|  | Eu-155 |  |  | 7.40x101 | 2x10-3 |
|  |  |  |  |  |  |
| Fluorine (9) | F-18 | 7.40x10-2 | 2x10-6 | 2.96x102 | 8x10-3 |
|  |  |  |  |  |  |
| Gadolinium (64) | Gd-153 |  |  | 7.40x101 | 2x10-3 |
|  | Gd-159 |  |  | 2.96x101 | 8x10-4 |
|  |  |  |  |  |  |
| Gallium (31) | Ga-72 |  |  | 1.48x101 | 4x10-4 |
|  |  |  |  |  |  |
| Germanium (32) | Ge-71 |  |  | 7.40x102 | 2x10-2 |
|  |  |  |  |  |  |
| Gold (79) | Au-196 |  |  | 7.40x101 | 2x10-3 |
|  | Au-198 |  |  | 1.85x101 | 5x10-4 |
|  | Au-199 |  |  | 7.40x101 | 2x10-3 |
|  |  |  |  |  |  |
| Hafnium (72) | Hf-181 |  |  | 2.59x101 | 7x10-4 |
|  |  |  |  |  |  |
| Hydrogen (1) | H-3 | 1.85x10-1 | 5x10-6 | 1.11x103 | 3x10-2 |
|  |  |  |  |  |  |
| Indium (49) | In-113m |  |  | 3.70x102 | 1x10-2 |
|  | In-114m |  |  | 7.40x100 | 2x10-4 |
|  |  |  |  |  |  |
| Iodine (53) | I-126 | 1.11x10-4 | 3x10-9 | 7.40x10-1 | 2x10-5 |
|  | I-131 | 1.11x10-4 | 3x10-9 | 7.40x10-1 | 2x10-5 |
|  | I-132 | 2.96x10-3 | 8x10-8 | 2.22x101 | 6x10-4 |
|  | I-133 | 3.70x10-4 | 1x10-8 | 2.59x100 | 7x10-5 |
|  | I-134 | 7.40x10-3 | 2x10-7 | 3.70x101 | 1x10-3 |
|  |  |  |  |  |  |
| Iridium (77) | Ir-190 |  |  | 7.40x101 | 2x10-3 |
|  | Ir-192 |  |  | 1.48x101 | 4x10-4 |
|  | Ir-194 |  |  | 1.11x101 | 3x10-4 |
|  |  |  |  |  |  |
| Iron (26) | Fe-55 |  |  | 2.96x102 | 8x10-3 |
|  | Fe-59 |  |  | 2.22x101 | 6x10-4 |
|  |  |  |  |  |  |
| Krypton (36) | Kr-85m | 3.70x10-2 | 1x10-6 |  |  |
|  | Kr-85 | 1.11x10-1 | 3x10-6 |  |  |
|  |  |  |  |  |  |
| Lanthanum (57) | La-140 |  |  | 7.40x100 | 2x10-4 |
|  |  |  |  |  |  |
| Lead (82) | Pb-203 |  |  | 1.48x102 | 4x10-3 |
|  |  |  |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| Element(atomic number) | Isotope | Column I Gas Concentration1 | Column IILiquid and Solid Concentration2 |
| Bg/ml | microCi/ml | Bg/ml | microCi/ml |
|  |  |  |  |  |  |
| Lutetium (71) | Lu-177 |  |  | 3.70x101 | 1x10-3 |
|  |  |  |  |  |  |
| Manganese (25) | Mn-52 |  |  | 1.11x101 | 3x10-4 |
|  | Mn-54 |  |  | 3.70x101 | 1x10-3 |
|  | Mn-56 |  |  | 3.70x101 | 1x10-3 |
|  |  |  |  |  |  |
| Mercury (80) | Hg-197m |  |  | 7.40x101 | 2x10-3 |
|  | Hg-197 |  |  | 1.11x102 | 3x10-3 |
|  | Hg-203 |  |  | 7.40x100 | 2x10-4 |
|  |  |  |  |  |  |
| Molybdenum (42) | Mo-99 |  |  | 7.40x101 | 2x10-3 |
|  |  |  |  |  |  |
| Neodymium (60) | Nd-147 |  |  | 2.22x101 | 6x10-4 |
|  | Nd-149 |  |  | 1.11x102 | 3x10-3 |
|  |  |  |  |  |  |
| Nickel (28) | Ni-65 |  |  | 3.70x101 | 1x10-3 |
|  |  |  |  |  |  |
| Niobium |  |  |  | 3.70x101 | 1x10-3 |
| (Columbium) | Nb-95 |  |  |  |  |
| (41) | Nb-97 |  |  | 3.33x102 | 9x10-3 |
|  |  |  |  |  |  |
| Osmium (76) | Os-185 |  |  | 2.59x101 | 7x10-4 |
|  | Os-191m |  |  | 1.11x103 | 3x10-2 |
|  | Os-191 |  |  | 7.40x101 | 2x10-3 |
|  | Os-193 |  |  | 2.22x101 | 6x10-4 |
|  |  |  |  |  |  |
| Palladium (46) | Pd-103 |  |  | 1.11x102 | 3x10-3 |
|  | Pd-109 |  |  | 3.33x101 | 9x10-4 |
|  |  |  |  |  |  |
| Phosphorus (15) | P-32 |  |  | 7.40x100 | 2x10-4 |
|  |  |  |  |  |  |
| Platinum (78) | Pt-191 |  |  | 3.70x101 | 1x10-3 |
|  | Pt-193m |  |  | 3.70x102 | 1x10-2 |
|  | Pt-197m |  |  | 3.70x102 | 1x10-2 |
|  | Pt-197 |  |  | 3.70x101 | 1x10-3 |
|  |  |  |  |  |  |
| Potassium (19) | K-42 |  |  | 1.11x102 | 3x10-3 |
|  |  |  |  |  |  |
| Praseodymium (59) | Pr-142 |  |  | 1.11x101 | 3x10-4 |
|  | Pr-143 |  |  | 1.85x101 | 5x10-4 |
|  |  |  |  |  |  |
| Promethium (61) | Pm-147 |  |  | 7.40x101 | 2x10-3 |
|  | Pm-149 |  |  | 1.48x101 | 4x10-4 |
|  |  |  |  |  |  |
| Rhenium (75) | Re-183 |  |  | 2.22x102 | 6x10-3 |
|  | Re-186 |  |  | 3.33x101 | 9x10-4 |
|  | Re-188 |  |  | 2.22x101 | 1x10-4 |
|  |  |  |  |  |  |
| Rhodium (45) | Rh-103m |  |  | 3.70x103 | 1x10-1 |
|  | Rh-105 |  |  | 3.70x101 | 1x10-3 |

|  |  |  |  |
| --- | --- | --- | --- |
| Element(atomic number) | Isotope | Column I Gas Concentration1 | Column IILiquid and Solid Concentration2 |
| Bg/ml | microCi/ml | Bg/ml | microCi/ml |
|  |  |  |  |  |  |
| Rubidium (37) | Rb-86 |  |  | 2.59x101 | 7x10-4 |
|  |  |  |  |  |  |
| Ruthenium (44) | Ru-97 |  |  | 1.48x102 | 4x10-3 |
|  | Ru-103 |  |  | 2.96x101 | 8x10-4 |
|  | Ru-105 |  |  | 3.70x101 | 1x10-3 |
|  | Ru-106 |  |  | 3.70x100 | 1x10-4 |
|  |  |  |  |  |  |
| Samarium (62) | Sm-153 |  |  | 2.96x101 | 8x10-4 |
|  |  |  |  |  |  |
| Scandium (21) | Sc-46 |  |  | 1.48x101 | 4x10-4 |
|  | Sc-47 |  |  | 3.33x101 | 9x10-4 |
|  | Sc-48 |  |  | 1.11x101 | 3x10-4 |
|  |  |  |  |  |  |
| Selenium (34) | Se-75 |  |  | 1.11x102 | 3x10-3 |
|  |  |  |  |  |  |
| Silicon (14) | Si-31 |  |  | 3.33x102 | 9x10-3 |
|  |  |  |  |  |  |
| Silver (47) | Ag-105 |  |  | 3.70x101 | 1x10-3 |
|  | Ag-110m |  |  | 1.11x101 | 3x10-4 |
|  | Ag-111 |  |  | 1.48x101 | 4x10-4 |
|  |  |  |  |  |  |
| Sodium (11) | Na-24 |  |  | 7.40x101 | 2x10-3 |
|  |  |  |  |  |  |
| Strontium (38) | Sr-85 |  |  | 3.70x101 | 1x10-3 |
|  | Sr-89 |  |  | 3.70x100 | 1x10-4 |
|  | Sr-91 |  |  | 2.59x101 | 7x10-4 |
|  | Sr-92 |  |  | 2.59x101 | 7x10-4 |
|  |  |  |  |  |  |
| Sulfur (16) | S-35 |  |  | 2.22x101 | 6x10-4 |
|  |  |  |  |  |  |
| Tantalum (73) | Ta-182 |  |  | 1.48x101 | 4x10-4 |
|  |  |  |  |  |  |
| Technetium (43) | Tc-96m |  |  | 3.70x103 | 1x10-1 |
|  | Tc-96 |  |  | 3.70x101 | 1x10-3 |
|  |  |  |  |  |  |
| Tellurium (52) | Te-125m |  |  | 7.40x101 | 2x10-3 |
|  | Te-127m |  |  | 2.22x101 | 6x10-4 |
|  | Te-127 |  |  | 1.11x102 | 3x10-3 |
|  | Te-129m |  |  | 1.11x101 | 3x10-4 |
|  | Te-131m |  |  | 2.22x101 | 6x10-4 |
|  | Te-132 |  |  | 1.11x101 | 3x10-4 |
|  |  |  |  |  |  |
| Terbium (65) | Tb-160 |  |  | 1.48x101 | 4x10-4 |
|  |  |  |  |  |  |
| Thallium (81) | Tl-200 |  |  | 1.48x101 | 4x10-3 |
|  | Tl-201 |  |  | 1.11x102 | 3x10-3 |
|  | Tl-202 |  |  | 3.70x101 | 1x10-3 |
|  | Tl-204 |  |  | 3.70x101 | 1x10-3 |
|  |  |  |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| Element(atomic number) | Isotope | Column I Gas Concentration1 | Column IILiquid and Solid Concentration2 |
| Bg/ml | microCi/ml | Bg/ml | microCi/ml |
|  |  |  |  |  |  |
| Thulium (69) | Tm-170 |  |  | 1.85x101 | 5x10-4 |
|  | Tm-171 |  |  | 1.85x102 | 5x10-3 |
|  |  |  |  |  |  |
| Tin (50) | Sn-113 |  |  | 3.33x101 | 9x10-4 |
|  | Sn-125 |  |  | 7.40x100 | 2x10-4 |
|  |  |  |  |  |  |
| Tungsten | W-181 |  |  | 1.48x102 | 4x10-3 |
| (Wolfram) (74) | W-187 |  |  | 2.59x101 | 7x10-4 |
|  |  |  |  |  |  |
| Vanadium (23) | V-48 |  |  | 1.11x101 | 3x10-4 |
|  |  |  |  |  |  |
| Xenon (54) | Xe-131m | 1.48x10-1 | 4x10-6 |  |  |
|  | Xe-133 | 1.11x10-1 | 3x10-6 |  |  |
|  | X3-135 | 3.70x10-2 | 1x10-6 |  |  |
|  |  |  |  |  |  |
| Ytterbium (70) | Yb-175 |  |  | 3.70x101 | 1x10-3 |
|  |  |  |  |  |  |
| Yttrium (39) | Y-90 |  |  | 7.40x100 | 2x10-4 |
|  | Y-91m |  |  | 1.11x103 | 3x10-2 |
|  | Y-91 |  |  | 1.11x101 | 3x10-4 |
|  | Y-92 |  |  | 2.22x101 | 6x10-4 |
|  | Y-93 |  |  | 1.11x101 | 3x10-4 |
|  |  |  |  |  |  |
| Zinc (30) | Zn-65 |  |  | 3.70x101 | 1x10-3 |
|  | Zn-69m |  |  | 2.59x101 | 7x10-4 |
|  | Zn-69 |  |  | 7.40x102 | 2x10-2 |
|  |  |  |  |  |  |
| Zirconium (40) | Zr-95 |  |  | 2.22x101 | 6x10-4 |
|  | Zr-97 |  |  | 7.40x100 | 2x10-4 |
|  |  |  |  |  |  |
| Beta-and/or gamma-emitting radioactive material not listed above with half-life of less than 3 years. |  | 3.70x10-6 | 1x10-10 | 3.70x102 | 1x10~~-6~~ |

1 Values are given in Column I only for those materials normally used as gases.

2 Bq or microCi/g for solids.

NOTE 1: Many radionuclides transform into nuclides that are also radioactive. In expressing the concentrations in this Appendix, the activity stated is that of the parent radionuclide and takes into account the daughters.

NOTE 2: For purposes of Section 330.40 where there is involved a combination of radionuclides, the limit for the combination should be derived as follows: Determine for each radionuclide in the product the ratio between the radioactivity concentration present in the product and the exempt radioactivity concentration established in this Appendix for the radionuclide when not in combination. The sum of such ratios may not exceed "1".

EXAMPLE:

|  |  |  |  |
| --- | --- | --- | --- |
| Concentration of Nuclide A in Product | + | Concentration of Nuclide B in Product | ≤ 1 |
| Exempt Concentration of Nuclide A | Exempt Concentration of Nuclide B |

(Source: Amended at 35 Ill. Reg. 2931, effective February 7, 2011)