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Safety Regulation  
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सत्यमेव जयते

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GOVERNMENT OF INDIA

Atomic  
Energy  
Regulatory  
Board



अध्यक्ष  
CHAIRMAN

No.CH/AERB/OPSD/25125/2010/953

November 26, 2010

**AERB Directive No.01/2010**

[Under Rule 3, 5 and 6 of the Atomic Energy (Radiation Protection) Rules 2004]

**Sub: Exclusion, Exemption and Clearance of Radionuclides in Solid Materials**

Radioactive practices in India are governed by the Atomic Energy (Radiation Protection) Rules 2004. As per sections 5 and 6 of the rules and the current IAEA strategy, some of the radioactive practices and sources within practices need not be subjected to regulatory control based on the principle of exclusion, exemption and clearance.

The terms exclusion, exemption and clearance are defined as;

- Exclusion means the deliberate exclusion of a particular category of exposure from the scope of an instrument of regulatory control on the grounds that it is not considered amenable to control through the regulatory instrument in question.
- Exemption is the determination by the regulatory body that a source or practice need not be subject to some or all aspects of regulatory control on the basis that the exposure (including potential exposure) due to the source or practice is too small to warrant the application of those aspects.
- Clearance is the removal of radioactive materials or radioactive objects within authorized practices from any further regulatory control by the regulatory body.

The criteria for exclusion, exemption and clearance of radionuclides in solid materials within radioactive practices have been examined by AERB from the consideration of regulatory control. Accordingly, the following directives are hereby issued:

1. Solid materials containing unmodified concentrations of naturally occurring radionuclides in raw materials, except the radioactive materials / waste generated from operation of Uranium and Thorium mining and milling facilities,

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ISO 9001:2000  
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are excluded from the regulatory requirements.  $^{40}\text{K}$  in the human body and cosmic radiation on the surface of the earth also come under exclusion.

2. Exemption of artificial radionuclides in moderate amount of solid materials (upto one tonne) shall be based on the radionuclide levels prescribed in Table-1. For radionuclides of natural origin Table-1 applies if these radionuclides are incorporated into consumer products, or used either as a radioactive source (e.g.  $^{226}\text{Ra}$ ,  $^{210}\text{Po}$ ) or for their elemental properties (e.g. thorium, uranium).
3. Exemption / clearance of artificial radionuclides in bulk amount of solid materials shall be based on the radionuclide levels prescribed in Table-2.
4. Clearance of naturally occurring radionuclides in bulk amount of solid materials from any authorized practice shall be based on the radionuclide levels prescribed in Table-3.
5. For exemption / clearance of a mixture of radionuclides in solid materials, the sum of the ratios of the concentration of individual radionuclides present in the solid material to the levels prescribed for the corresponding radionuclide in the respective table shall be less than unity.
6. Exemption / clearance of radionuclides in solid materials in excess of the levels prescribed in the respective tables or those not prescribed shall be subject to the specific approval of AERB.



(S.S. Bajaj)  
Chairman

Atomic Energy Regulatory Board

TABLE-1: EXEMPT CONCENTRATION AND ACTIVITIES FOR NATURAL AND ARTIFICIAL RADIONUCLIDES IN MODERATE AMOUNTS (1 TONNE) OF MATERIAL

Radionuclide	Activity concentration (Bq/g)	Activity (Bq)	Radionuclide	Activity concentration (Bq/g)	Activity (Bq)
H-3	1x10 <sup>6</sup>	1x10 <sup>9</sup>	Ag-110m	1x10 <sup>1</sup>	1x10 <sup>6</sup>
Be-7	1x10 <sup>3</sup>	1x10 <sup>7</sup>	In-115m	1x10 <sup>2</sup>	1x10 <sup>6</sup>
C-14	1x10 <sup>4</sup>	1x10 <sup>7</sup>	Sb-122	1x10 <sup>2</sup>	1x10 <sup>4</sup>
Na-22	1x10 <sup>1</sup>	1x10 <sup>6</sup>	Sb-124	1x10 <sup>1</sup>	1x10 <sup>6</sup>
Na-24	1x10 <sup>1</sup>	1x10 <sup>5</sup>	Te-129	1x10 <sup>2</sup>	1x10 <sup>6</sup>
P-32	1x10 <sup>3</sup>	1x10 <sup>5</sup>	Te-131	1x10 <sup>2</sup>	1x10 <sup>5</sup>
S-35	1x10 <sup>5</sup>	1x10 <sup>8</sup>	I-129	1x10 <sup>2</sup>	1x10 <sup>5</sup>
Cl-36	1x10 <sup>4</sup>	1x10 <sup>6</sup>	I-131	1x10 <sup>2</sup>	1x10 <sup>6</sup>
Ar-41	1x10 <sup>2</sup>	1x10 <sup>9</sup>	Cs-134	1x10 <sup>1</sup>	1x10 <sup>4</sup>
K-40*	1x10 <sup>2</sup>	1x10 <sup>6</sup>	Cs-137	1x10 <sup>1</sup>	1x10 <sup>4</sup>
V-48	1x10 <sup>1</sup>	1x10 <sup>5</sup>	Ba-140	1x10 <sup>1</sup>	1x10 <sup>5</sup>
Cr-51	1x10 <sup>3</sup>	1x10 <sup>7</sup>	La-140	1x10 <sup>1</sup>	1x10 <sup>5</sup>
Mn-51	1x10 <sup>1</sup>	1x10 <sup>5</sup>	Ce-141	1x10 <sup>2</sup>	1x10 <sup>7</sup>
Mn-52	1x10 <sup>1</sup>	1x10 <sup>5</sup>	Ce-144	1x10 <sup>2</sup>	1x10 <sup>5</sup>
Mn-54	1x10 <sup>1</sup>	1x10 <sup>6</sup>	Pm-147	1x10 <sup>4</sup>	1x10 <sup>7</sup>
Fe-59	1x10 <sup>1</sup>	1x10 <sup>6</sup>	Eu-154	1x10 <sup>1</sup>	1x10 <sup>6</sup>
Co-57	1x10 <sup>2</sup>	1x10 <sup>6</sup>	Ir-192	1x10 <sup>1</sup>	1x10 <sup>4</sup>
Co-58	1x10 <sup>1</sup>	1x10 <sup>6</sup>	Hg-203	1x10 <sup>2</sup>	1x10 <sup>5</sup>
Co-60	1x10 <sup>1</sup>	1x10 <sup>5</sup>	Po-210*	1x10 <sup>1</sup>	1x10 <sup>4</sup>
Ni-63	1x10 <sup>5</sup>	1x10 <sup>8</sup>	Ra-226*	1x10 <sup>1</sup>	1x10 <sup>4</sup>
Cu-64	1x10 <sup>2</sup>	1x10 <sup>6</sup>	Th-230*	1x10 <sup>0</sup>	1x10 <sup>4</sup>
Zn-65	1x10 <sup>1</sup>	1x10 <sup>6</sup>	Th-nat* (incl.Th-232)	1x10 <sup>0</sup>	1x10 <sup>3</sup>
Ga-72	1x10 <sup>1</sup>	1x10 <sup>5</sup>	U-233	1x10 <sup>1</sup>	1x10 <sup>4</sup>
Br-82	1x10 <sup>1</sup>	1x10 <sup>6</sup>	U-234*	1x10 <sup>1</sup>	1x10 <sup>4</sup>
Kr-87	1x10 <sup>2</sup>	1x10 <sup>9</sup>	U-235*	1x10 <sup>1</sup>	1x10 <sup>4</sup>
Kr-88	1x10 <sup>2</sup>	1x10 <sup>9</sup>	U-238*	1x10 <sup>1</sup>	1x10 <sup>4</sup>
Sr-89	1x10 <sup>3</sup>	1x10 <sup>6</sup>	U-nat*	1x10 <sup>0</sup>	1x10 <sup>3</sup>
Sr-90	1x10 <sup>2</sup>	1x10 <sup>4</sup>	Np-239	1x10 <sup>2</sup>	1x10 <sup>7</sup>
Y-90	1x10 <sup>3</sup>	1x10 <sup>5</sup>	Pu-239	1x10 <sup>0</sup>	1x10 <sup>4</sup>
Zr-95	1x10 <sup>1</sup>	1x10 <sup>6</sup>	Am-241	1x10 <sup>0</sup>	1x10 <sup>4</sup>
Nb-94	1x10 <sup>1</sup>	1x10 <sup>6</sup>	Cm-242	1x10 <sup>2</sup>	1x10 <sup>5</sup>
Nb-95	1x10 <sup>1</sup>	1x10 <sup>6</sup>	Cf-252	1x10 <sup>1</sup>	1x10 <sup>4</sup>
Mo-99	1x10 <sup>2</sup>	1x10 <sup>6</sup>			
Tc-99	1x10 <sup>4</sup>	1x10 <sup>7</sup>			
Ru-103	1x10 <sup>2</sup>	1x10 <sup>6</sup>			
Ru-106	1x10 <sup>2</sup>	1x10 <sup>5</sup>			
Rh-105	1x10 <sup>2</sup>	1x10 <sup>7</sup>			

\* Naturally Occurring Radionuclides

Note: For radionuclides of natural origin the Table-1 applies only to their incorporation into consumer products or for their use either as a radioactive source (e.g. <sup>226</sup>Ra, <sup>210</sup>Po) or for their properties as chemical elements (e.g. thorium, uranium).

TABLE-2: EXEMPTION /CLEARANCE LEVEL FOR RADIONUCLIDES OF ARTIFICIAL ORIGIN IN BULK QUANTITIES

Radionuclide	Activity concentration (Bq/g)	Radionuclide	Activity concentration (Bq/g)
H-3	100	Ag-110m	0.1
Be-7	10	In-115m	100
C-14	1	Sb-122	10
Na-22	0.1	Sb-124	1
Na-24	1	Te-129	100
P-32	1000	Te-131	100
S-35	100	I-129	0.01
Cl-36	1	I-131	10
V-48	1	Cs-134	0.1
Cr-51	100	Cs-137	0.1
Mn-51	10	Ba-140	1
Mn-52	1	La-140	1
Mn-54	0.1	Ce-141	100
Fe-59	1	Ce-144	10
Co-57	1	Pm-147	1000
Co-58	1	Eu-154	0.1
Co-60	0.1	Ir-192	1
Ni-63	100	Hg-203	10
Cu-64	100	U-233	1
Zn-65	0.1	U-236	10
Ga-72	10	U-237	100
Br-82	1	U-239	100
Sr-89	1000	Np-239	100
Sr-90	1	Pu-239	0.1
Y-90	1000	Am-241	0.1
Zr-95	1	Cm-242	10
Nb-94	0.1	Cf-252	1
Nb-95	1		
Mo-99	10		
Tc-99	1		
Ru-103	1		
Ru-106	0.1		
Rh-105	100		

TABLE-3. CLEARANCE LEVEL FOR RADIONUCLIDES OF NATURAL ORIGIN IN BULK QUANTITIES

Radionuclide	Activity concentration(Bq/g)
<sup>40</sup> K	10
*All other radionuclides of natural origin	1

\*This is valid for natural decay chains headed by <sup>238</sup>U, <sup>235</sup>U and <sup>232</sup>Th