

N. Table: Properties of shielding materials¹⁹

γ -ray linear attenuation coefficient μ for various materials.

Material	Density ρ (g/cm ³)	Linear attenuation coefficient (cm ⁻¹)			Material	Density ρ (g/cm ³)	Linear attenuation coefficient (cm ⁻¹)		
		1 MeV	3 MeV	6 MeV			1 MeV	3 MeV	6 MeV
Air	0.001 294	0.000 076 6	0.000 043 0	0.000 030 4	Flesh ^b	1	0.0699	0.0393	0.0274
Aluminum	2.7	0.166	0.095 3	0.071 8	Fuel oil				
Ammonia (liquid)	0.771	0.061 2	0.032 2	0.022 1	(medium weight)	0.89	0.0716	0.0350	0.0239
Beryllium	1.85	0.104	0.057 9	0.039 2	Gasoline	0.739	0.0537	0.0299	0.0203
Beryllium carbide	1.9	0.112	0.062 7	0.042 9	Glass				
Beryllium oxide					Borosilicate	2.23	0.141	0.0805	0.0591
(hot-pressed blocks)	2.3	0.140	0.078 9	0.055 2	Lead (Hi-D)	6.4	0.439	0.257	0.257
Bismuth	9.80	0.700	0.409	0.440	Plate (avg)	2.4	0.152	0.0862	0.0629
Boral	2.53	0.153	0.086 5	0.067 8	Iron	7.86	0.470	0.282	0.240
Boron (amorphous)	2.45	0.144	0.079 1	0.067 9	Lead	11.34	0.797	0.468	0.505
Boron carbide					Lithium hydride				
(hot pressed)	2.5	0.150	0.082 5	0.067 5	(pressed powder)	0.70	0.0444	0.0239	0.0172
Bricks					Lucite (polymethyl				
Fire clay	2.05	0.129	0.073 8	0.054 3	methacrylate)	1.19	0.0816	0.0457	0.0317
Kaolin	2.1	0.132	0.075 0	0.055 2	Paraffin	0.89	0.0646	0.0360	0.0246
Silica	1.78	0.113	0.064 6	0.047 3	Rocks				
Carbon	2.25	0.143	0.080 1	0.055 4	Granite	2.45	0.155	0.0887	0.0654
Clay	2.2	0.130	0.080 1	0.059 0	Limestone	2.91	0.187	0.109	0.0824
Cements					Sandstone	2.40	0.152	0.0871	0.0641
Colemanite borated	1.95	0.128	0.072 5	0.052 8	Rubber				
Plain (1 Portland					Copolymer	0.915	0.0662	0.0370	0.0254
cement: 3 sand					Natural	0.92	0.0652	0.0364	0.0248
mixture)	2.07	0.133	0.076 0	0.055 9	Neoprene	1.23	0.0813	0.0462	0.0333
Concretes					Sand	2.2	0.140	0.0825	0.0587
Barytes	3.5	0.213	0.127	0.110	Type 347				
Barytes-boron frits	3.25	0.199	0.119	0.101	stainless steel	7.8	0.462	0.279	0.236
Barytes-limonite	3.25	0.200	0.119	0.099 1	Steel (1% carbon)	7.83	0.460	0.276	0.234
Barytes-limonite-					Uranium	18.7	1.46	0.813	0.881
colemanite	3.1	0.189	0.112	0.093 9	Uranium hydride	11.5	0.903	0.504	0.542
Iron-Portland ^a	6.0	0.364	0.215	0.181	Water	1.0	0.0706	0.0396	0.0277
MO (ORNL mixture)	5.8	0.374	0.222	0.184	Wood				
Portland (1 cement:					Ash	0.51	0.0345	0.0193	0.0134
2 sand: 4 gravel					Oak	0.77	0.0521	0.0293	0.0203
mixture)	2.2	0.141	0.080 5	0.059 2	White pine	0.67	0.0452	0.0253	0.0175
	2.4	0.154	0.087 8	0.064 6					

^aElemental composition (wt. %): hydrogen, 1.0; oxygen, 52.9; silicon, 33.7; aluminum, 3.4; iron, 1.4; calcium, 4.4; magnesium, 0.2; carbon 0.1; sodium, 1.6; potassium, 1.3.

^bComposition (wt. %): oxygen, 65.99; carbon, 18.27; hydrogen, 10.15; nitrogen, 3.05; calcium, 1.52; phosphorus, 1.02.

O. Table: Radiation damage doses for typical electrical insulating materials¹⁹

Material	Threshold damage dose (Mrads)	25% damage dose (Mrads)	Material	Threshold damage dose (Mrads)	25% damage dose (Mrads)
Teflon	0.017	0.037	Mica	2000	~ 15 000
Formvar	16	82	Epoxy, mineral		
Mylar	30	120	filled with glass		
Typical epoxies,			fiber reinforcing	8000	50 000
unfilled	200	3200			