

Thermal conductivities of materials

(taken from EN ISO 10077-2: 2003)

Group	Material	Density kg/m ³	Thermal conductivity W/(m·K)
Frame	Copper	8900	380.0
	Aluminium (Si Alloys)	2800	160.0
	Brass	8400	120.0
	Steel	7800	50.0
	Stainless steel	7900	17.0
	PVC (polyvinylchloride), rigid	1390	0.17
	Hardwood	700	0.18
	Softwood (typical construction timber)	500	0.13
	Fibreglass (UP-resin)	1900	0.40
Glass	Soda lime glass	2500	1.0
	PMMA (polymethylmethacrylate)	1180	0.18
	Polycarbonates	1200	0.20
Thermal break	Polyamid (nylon)	1150	0.25
	Polyamid 6.6 with 25% glass fibre	1450	0.30
	Polyethylene HD, high density	980	0.50
	Polyethylene LD, low density	920	0.33
	Polypropylene, solid	910	0.22
	Polypropylene with 25% glass fibre	1200	0.25
	PU (polyurethane), rigid	1200	0.25
	PVC (polyvinylchloride), rigid	1390	0.17
Weather Stripping	PCP (polychloroprene), eg Neoprene	1240	0.23
	EPDM (ethylene propylene diene monomer)	1150	0.25
	Silicone, pure	1200	0.35
	PVC, flexible (PVC-P) 40% softener	1200	0.14
	Mohair (polyester) sweep		0.14
	Elastomeric foam, flexible	60 to 80	0.05
Sealant and glass edge material	PU (polyurethane), resin	1200	0.25
	Butyl (isobutene), solid/hot melt	1200	0.24
	Polysulfide	1700	0.40
	Silicone, pure	1200	0.35
	Polyisobutylene	930	0.20
	Polyester resin	1400	0.19
	Silica gel (desiccant)	720	0.13
	Molecular sieve (desiccant)	650 to 750	0.10
	Silicone foam, low density	750	0.12
	Silicone foam, medium density	820	0.17

Design thermal values for materials in general building applications

(taken from BS EN ISO 10456: 2007)

Material group or application		Density kg/m ³	Thermal conductivity W/(m·K)	
Asphalt		2100	0.70	
Bitumen	Pure	1050	0.17	
	Felt/sheet	1100	0.23	
Concrete ^a	Medium density	1800	1.15	
		2000	1.35	
		2200	1.65	
	High density	2400	2.00	
		Reinforced (with 1% of steel)	2300	2.30
		Reinforced (with 2% of steel)	2400	2.50
Floor coverings	Rubber	1200	0.17	
	Plastic	1700	0.25	
	Underlay, cellular rubber or plastic	270	0.10	
	Underlay, felt	120	0.05	
	Underlay, wool	200	0.06	
	Underlay, cork	<200	0.05	
	Tiles, cork	>400	0.065	
	Carpet / textile flooring	200	0.06	
	Linoleum	1200	0.17	
Gases	Air	1.23	0.025	
	Carbon dioxide	1.95	0.014	
	Argon	1.70	0.017	
	Sulphur hexafluoride	6.36	0.013	
	Krypton	3.56	0.009	
	Xenon	5.68	0.0054	
Glass	Soda lime glass (including "float glass")	2500	1.00	
	Quartz glass	2200	1.40	
	Glass mosaic	2000	1.20	
Water	Ice at -10°C	920	2.30	
	Ice at 0°C	900	2.20	
	Snow, freshly fallen (<30mm)	100	0.05	
	Snow, soft (30 to 70mm)	200	0.12	
	Snow, slightly compacted (70 to 100mm)	300	0.23	
	Snow, compacted (<200mm)	500	0.60	
	Water at 10°C	1000	0.60	
	Water at 40°C	990	0.63	
	Water at 80°C	970	0.67	
Metals	Aluminium alloys	2800	160.0	
	Bronze	8700	65.0	
	Brass	8400	120.0	
	Copper	8900	380.0	
	Iron, cast	7500	50.0	
	Lead	11300	35.0	
	Steel	7800	50.0	
	Stainless steel ^b , austenitic or austenitic-ferritic	7900	17.0	
	Stainless steel ^b , ferritic or martensitic	7900	30.0	
	Zinc	7200	110.0	

Plastics, solid	Acrylic	1050	0.20
	Polycarbonates	1200	0.20
	Polytetrafluoroethylene (PTFE)	2200	0.25
	Polyvinylchloride (PVC)	1390	0.17
	Polymethylmethacrylate (PMMA)	1180	0.18
	Polyacetate	1410	0.30
	Polyamide (nylon)	1150	0.25
	Polyamide 6.6 with 25% glass fibre	1450	0.30
	Polyethylene/polythene, high density	980	0.50
	Polyethylene/polythene, low density	920	0.33
	Polystyrene	1050	0.16
	Polypropylene	910	0.22
	Polypropylene with 25% glass fibre	1200	0.25
	Polyurethane (PU)	1200	0.25
	Epoxy resin	1200	0.20
	Phenolic resin	1300	0.30
Polyester resin	1400	0.19	
Rubber	Natural	910	0.13
	Neoprene (polychloroprene)	1240	0.23
	Butyl (isobutene), solid/hot melt	1200	0.24
	Foam rubber	60 - 80	0.06
	Hard rubber (ebonite), solid	1200	0.17
	Ethylene propylene diene monomer (EPDM)	1150	0.25
	Polyisobutylene	930	0.20
	Polysulfide	1700	0.40
	Butadiene	980	0.25
Sealant materials, weather stripping and thermal breaks	Silica gel (desiccant)	720	0.13
	Silicone, pure	1200	0.35
	Silicone, filled	1450	0.50
	Silicone foam	750	0.12
	Urethane/polyurethane (thermal break)	1300	0.21
	Polyvinylchloride (PVC), flexible with 40% softener	1200	0.14
	Elastomeric foam, flexible	60 – 80	0.05
	Polyurethane (PU) foam	70	0.05
Polyethylene foam	70	0.05	
Gypsum	Gypsum	600	0.18
	“	900	0.30
	“	1200	0.43
	“	1500	0.56
	Gypsum plasterboard ^c	700	0.21
	“	900	0.25
Plasters and renders	Gypsum insulating plaster	600	0.18
	Gypsum plastering	1000	0.40
	“	1300	0.57
	Gypsum, sand	1600	0.80
	Lime, sand	1600	0.80
	Cement, sand	1800	1.00
Soils	Clay or silt	1200 – 1800	1.50
	Sand and gravel	1700 – 2200	2.00

Stone	Natural, crystalline rock	2800	3.50
	Natural, sedimentary rock	2600	2.30
	Natural, sedimentary rock, light	1500	0.85
	Natural, porous, eg lava	1600	0.55
	Basalt	2700 – 3000	3.50
	Gneiss	2400 – 2700	3.50
	Graphite	2500 – 2700	2.80
	Marble	2800	3.50
	Slate	2000 – 2800	2.20
	Limestone, extra soft	1600	0.85
	Limestone, soft	1800	1.10
	Limestone, semi hard	2000	1.40
	Limestone, hard	2200	1.70
	Limestone, extra hard	2600	2.30
	Sandstone (silica)	2600	2.30
	Natural pumice	400	0.12
Artificial stone	1750	1.30	
Tiles (roofing)	Clay	2000	1.00
	Concrete	2100	1.50
Tiles (other)	Ceramic/porcelain	2300	1.30
	Plastic	1000	0.20
Timber ^d		450	0.12
		500	0.13
		700	0.18
Wood based panels ^d	Plywood ^e	300	0.09
	“	500	0.13
	“	700	0.17
	“	1000	0.24
	Cement-bonded particleboard	1200	0.23
	Particleboard	300	0.10
	“	600	0.14
	“	900	0.18
	Oriented strand board (OSB)	650	0.13
	Fibreboard, including MDF ^f	250	0.07
	“	400	0.10
“	600	0.14	
“	800	0.18	

^a The density for concrete is the dry density.

^b EN 10088-1 contains extensive lists of properties of stainless steels which may be used when the precise composition of the stainless steel is known.

^c The thermal conductivity includes the effect of the paper liners.

^d The density for timber and wood-based products is the density in equilibrium with 20°C and 65% relative humidity, including the mass of hygroscopic water.

^e As an interim measure and until sufficient significant data for solid wood panels (SWP) and laminated veneer lumber (LVL) are available, the values given for plywood may be used.

^f MDF: Medium density fibreboard, dry process.