an increasingly important transport mechanism. The apparent vapour resistance therefore falls with increasing relative humidity. This effect is summarised by the dry cup values which apply when the mean relative humidity across a material is less than 70 % and the wet cup values that apply when the mean relative humidity is greater than or equal to 70 %. For heated buildings the dry cup values are generally applicable to materials on the inside of an insulation layer and wet cup values to those on the outside of an insulation layer. If a specific insulation layer is not present, e.g. monolithic masonry walls, dry cup values apply when the component is wetting from a dry state, and wet cup values apply when it is drying from a wet state.

Table 3 – Design thermal values for materials in general building applications

Material group or application	Density ρ kg/m^3	Design thermal conductivity λ W/(m·K)	Specific heat capacity c_p J/(kg·K)	Water vapour resistance factor μ	
				dry	wet
Asphalt	2 100	0,70	1 000	50 000	50 000
Bitumen					
Pure	1 050	0,17	1 000	50 000	50 000
Felt / sheet	1 100	0,23	1 000	50 000	50 000
Concrete [a]					
Medium density	1 800	1,15	1 000	100	60
	2 000	1,35	1 000	100	60
	2 200	1,65	1 000	120	70
High density	2 400	2,00	1 000	130	80
Reinforced (with 1 % of steel)	2 300	2,3	1 000	130	80
Reinforced (with 2 % of steel)	2 400	2,5	1 000	130	80
Floor coverings					
Rubber	1 200	0,17	1 400	10 000	10 000
Plastic	1 700	0,25	1 400	10 000	10 000
Underlay, cellular rubber or plastic	270	0,10	1 400	10 000	10 000
Underlay, felt	120	0,05	1 300	20	15
Underlay, wool	200	0,06	1 300	20	15
Underlay, cork	<200	0,05	1 500	20	10
Tiles, cork	>400	0,065	1 500	40	20
Carpet / textile flooring	200	0,06	1 300	5	5
Linoleum	1 200	0,17	1 400	1 000	800
Gases					
Air	1,23	0,025	1 008	1	1
Carbon dioxide	1,95	0,014	820	1	1
Argon	1,70	0,017	519	1	1
Sulphur hexafluoride	6,36	0,013	614	1	1
Krypton	3,56	0,009 0	245	1	1
Xenon	5,68	0,005 4	160	1	1
Glass					
Soda lime glass (including ”float glass”)	2 500	1,00	750	∞	∞
Quartz glass	2 200	1,40	750	∞	∞
Glass mosaic	2 000	1,20	750	∞	∞
Water					
Ice at -10 °C	920	2,30	2 000		
Ice at 0 °C	900	2,20	2 000		
Snow, freshly fallen (< 30 mm)	100	0,05	2 000		
Snow, soft (30 to 70 mm)	200	0,12	2 000		
Snow, slightly compacted (70 to 100 mm)	300	0,23	2 000		
Snow, compacted (< 200 mm)	500	0,60	2 000		
Water at 10 °C	1 000	0,60	4 190		
Water at 40 °C	990	0,63	4 190		
Water at 80 °C	970	0,67	4 190		

Material group or application	Density ρ kg/m^3	Design thermal conductivity λ W/(m·K)	Specific heat capacity c_p J/(kg·K)	Water vapour resistance factor μ	
				dry	wet
Metals					
Aluminium alloys	2 800	160	880	∞	∞
Bronze	8 700	65	380	∞	∞
Brass	8 400	120	380	∞	∞
Copper	8 900	380	380	∞	∞
Iron, cast	7 500	50	450	∞	∞
Lead	11 300	35	130	∞	∞
Steel	7 800	50	450	∞	∞
Stainless steel, [b] austenitic or austenitic-ferritic	7 900	17	500	∞	∞
Stainless steel, [b] ferritic or martensitic	7 900	30	460	∞	∞
Zinc	7 200	110	380	∞	∞
Plastics, solid					
Acrylic	1 050	0,20	1 500	10 000	10 000
Polycarbonates	1 200	0,20	1 200	5 000	5 000
Polytetrafluoroethylene (PTFE)	2 200	0,25	1 000	10 000	10 000
Polyvinylchloride (PVC)	1 390	0,17	900	50 000	50 000
Polymethylmethacrylate (PMMA)	1 180	0,18	1 500	50 000	50 000
Polyacetate	1 410	0,30	1 400	100 000	100 000
Polyamide (nylon)	1 150	0,25	1 600	50 000	50 00
Polyamide 6.6 with 25 % glass fibre	1 450	0,30	1 600	50 000	50 000
Polyethylene /polythene, high density	980	0,50	1 800	100 000	100 000
Polyethylene/polythene, low density	920	0,33	2 200	100 000	100 000
Polystyrene	1 050	0,16	1 300	100 000	100 000
Polypropylene	910	0,22	1 800	10 000	10 000
Polypropylene with 25 % glass fibre	1 200	0,25	1 800	10 000	10 000
Polyurethane (PU)	1 200	0,25	1 800	6 000	6 000
Epoxy resin	1 200	0,20	1 400	10 000	10 000
Phenolic resin	1 300	0,30	1 700	100 000	100 000
Polyester resin	1 400	0,19	1 200	10 000	10 000
Rubber					
Natural	910	0,13	1 100	10 000	10 000
Neoprene (polychloroprene)	1 240	0,23	2 140	10 000	10 000
Butyl, (isobutene), solid/hot melt	1200	0,24	1 400	200 000	200 000
Foam rubber	60 - 80	0,06	1 500	7 000	7 000
Hard rubber (ebonite), solid	1 200	0,17	1 400	∞	∞
Ethylene propylene diene monomer (EPDM)	1 150	0,25	1 000	6 000	6 000
Polyisobutylene	930	0,20	1 100	10 000	10 000
Polysulfide	1 700	0,40	1 000	10 000	10 000
Butadiene	980	0,25	1 000	100 000	100 000
Sealant materials, weather stripping and thermal breaks					
Silica gel (dessicant)	720	0,13	1 000	∞	∞
Silicone, pure	1 200	0,35	1 000	5 000	5 000
Silicone, filled	1 450	0,50	1 000	5 000	5 000
Silicone foam	750	0,12	1 000	10 000	10 000
Urethane/polyurethane (thermal break)	1 300	0,21	1 800	60	60
Polyvinylchloride (PVC) flexible, with 40 % softener	1 200	0,14	1 000	100 000	100 000
Elastomeric foam, flexible	60 - 80	0,05	1 500	10 000	10 000
Polyurethane (PU) foam	70	0,05	1 500	60	60
Polyethylene foam	70	0,05	2 300	100	100

Material group or application	Density ρ kg/m^3	Design thermal conductivity λ W/(m·K)	Specific heat capacity c_p J/(kg·K)	Water vapour resistance factor μ	
				dry	wet
Gypsum					
Gypsum	600	0,18	1 000	10	4
”	900	0,30	1 000	10	4
”	1 200	0,43	1 000	10	4
”	1 500	0,56	1 000	10	4
Gypsum plasterboard [c]	700	0,21	1 000	10	4
" "	900	0,25	1 000	10	4
Plasters and renders					
Gypsum insulating plaster	600	0,18	1 000	10	6
Gypsum plastering	1 000	0,40	1 000	10	6
” ”	1 300	0,57	1 000	10	6
Gypsum, sand	1 600	0,80	1 000	10	6
Lime, sand	1 600	0,80	1 000	10	6
Cement, sand	1 800	1,00	1 000	10	6
Soils					
Clay or silt	1 200 – 1 800	1,5	1 670 – 2 500	50	50
Sand and gravel	1 700 – 2 200	2,0	910 – 1 180	50	50
Stone					
Natural, crystalline rock	2 800	3,5	1 000	10 000	10 000
Natural, sedimentary rock	2 600	2,3	1 000	250	200
Natural, sedimentary rock, light	1 500	0,85	1 000	30	20
Natural, porous, e.g. lava	1 600	0,55	1 000	20	15
Basalt	2 700 – 3 000	3,5	1 000	10 000	10 000
Gneiss	2 400 – 2 700	3,5	1 000	10 000	10 000
Granite	2 500 – 2 700	2,8	1 000	10 000	10 000
Marble	2 800	3,5	1 000	10 000	10 000
Slate	2 000 – 2 800	2,2	1 000	1000	800
Limestone, extra soft	1 600	0,85	1 000	30	20
Limestone, soft	1 800	1,1	1 000	40	25
Limestone, semi-hard	2 000	1,4	1 000	50	40
Limestone, hard	2 200	1,7	1 000	200	150
Limestone, extra hard	2 600	2,3	1 000	250	200
Sandstone (silica)	2 600	2,3	1 000	40	30
Natural pumice	400	0,12	1 000	8	6
Artificial stone	1 750	1,3	1 000	50	40
Tiles (roofing)					
Clay	2 000	1,0	800	40	30
Concrete	2 100	1,5	1 000	100	60
Tiles (other)					
Ceramic/porcelain	2 300	1,3	840		∞
Plastic	1 000	0,20	1 000	10 000	10 000
Timber [d]					
	450	0,12	1 600	50	20
	500	0,13	1 600	50	20
	700	0,18	1 600	200	50

Material group or application	Density ρ kg/m^3	Design thermal conductivity λ W/(m·K)	Specific heat capacity c_p J/(kg·K)	Water vapour resistance factor μ	
				dry	wet
Wood-based panels [d]					
Plywood [e]	300	0,09	1 600	150	50
	500	0,13	1 600	200	70
	700	0,17	1 600	220	90
	1 000	0,24	1 600	250	110
Cement-bonded particleboard	1 200	0,23	1 500	50	30
Particleboard	300	0,10	1 700	50	10
	600	0,14	1 700	50	15
	900	0,18	1 700	50	20
Oriented strand board (OSB)	650	0,13	1 700	50	30
Fibreboard, including MDF [f]	250	0,07	1 700	5	3
"	400	0,10	1 700	10	5
"	600	0,14	1 700	20	12
"	800	0,18	1 700	30	20

NOTE 1 For computational purposes the ∞ value may have to be replaced with an arbitrarily large value, e.g. 106.

NOTE 2 Water vapour resistance factors are given as dry cup and wet cup values, see 8.3.

[a] The density for concrete is the dry density

[b] EN 10088-1, *Stainless steels – Part 1: List of stainless steels*, 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.