

Embodied Energy Material List.

Below is a list of common building materials and the embodied energy of each material. **Embodied energy is the total energy required for the extraction, processing, manufacture and transportation of materials and products, in this case supplied for building and construction.** Embodied energy is measured as the quantity of non-renewable energy per unit of material, component or system. It is expressed below in megajoules (MJ) per unit weight (kg). For this list, we have considered that low embodied energy materials have an embodied energy of 10 mj/kg or less, in relation to the material density that would be used in an average build. These materials have been highlighted in green. Materials with an embodied energy of 50 mj/kg or more have been highlighted in orange.

What must be taken into consideration is the embodied energy in relation to the material's density. For example, in the list below, concrete shows a low embodied energy. Because of the material's density, for 1kg of concrete, the volume is very small. This means, the amount of concrete required for an average building is significant, upwards of 1000kg. Therefore, the low embodied energy figure when applied across the total cubic area of concrete actually represents a high embodied energy total.

















To note: Aluminium frame shows a *high embodied energy of 170 EE Mj/Kg*, but the volume of aluminium in a window frame is quite small. If thermally broken it performs well for thermal efficiency and has little to no ongoing maintenance. Aluminium can also be recycled.

As well as the embodied energy of each of these materials, other aspects need to be considered, such as cost, performance, repurpose, sourcing and longevity. We have used symbols to represent these areas of consideration where applicable, please refer to the adjacent key:









KEY.

- | | |
|---|------------------|
|  | CARBON STORE |
|  | LOW TRAVEL MILES |
|  | DURABILITY |
|  | REUSEABLE |
|  | LOW COST |
|  | MEDIUM COST |
|  | HIGH COST |

Embodied Energy Material List.


















Exterior Materials.		EE MJ/kg	
Concrete.	Pre-Cast	1.5	 \$\$
	In-situ (reinforced)	2	 \$
	Aerated Concrete	3.6	 \$\$
Wood.	Stores approx. 250kg/m ³		
	Softwood	7.4	   \$
	Hardwood	10.4	   \$\$
	Particleboard	8	  \$
	MDF	11	 \$
	Plywood	10.4	   \$\$
	GluLAM	12	 \$\$\$

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Exterior Materials.		EE MJ/kg	
Sheet Products.	Plasterboard	6.75	 \$
	Fibre-cement	10.4	\$\$
	Paint	21	\$
	Polycarbonate	112.9	\$
Windows & doors.	Glass	12.7	 \$\$
	Aluminium Frame	170	  \$\$
	Timber Frame	10	  \$\$\$
	Double-glazed window - aluminium frame.	88.5	  \$\$

*all costs of materials can vary.

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Exterior Materials.		EE MJ/kg	
Masonry	Concrete block hollow-core 200x400mm	1.5	 \$
	Concrete block 200x400mm core-filled reinforced.	1.5	 \$\$
	Brick	3	  \$
	Rammed earth	0.45	 \$\$
Steel / Metals	Mild steel	20	  \$
	Galvanised steel	38	  \$\$
	Aluminium	170	  \$\$
	Sheet metal cladding/roof	18.8/20 galv.	  \$\$
	Stainless	56.7	  \$\$\$
	SHS	21.5	  \$

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Exterior Materials.		EE MJ/kg	
Other	PVC (general)	80	 \$
	PVC (pipe)	67.5	 \$
Insulation	Glasswool: wall	28	\$\$
	Polystyrene (XPS)	88.6	\$

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Interior Materials.		EE MJ/kg	
Flooring	Carpet (Nylon)	148	 \$\$
	Carpet (Wool)	106	 \$\$\$
	Carpet (polypropylene)	95.4	 \$
	Linoleum	116	 \$\$
	Vinyl	79.1	\$
	Cork	4	  \$\$\$\$
Surfaces.	Stone (granite)	11	  \$\$
	Stone (marble)	2	  \$\$\$
	Stone (slate)	1	 \$\$
	Stone (ceramic)	6.5	 \$\$

*all costs of materials can vary.