

Insulation Tipsheet 50p



Centre for
Alternative
Technology
Publications

Insulation saves energy. This reduces pollution, saves you money and makes your home a more comfortable place to live in.

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Why insulate?

Around 30% of the energy used in the UK is for domestic heating, lighting and appliances. Of this the majority is used in space and water heating, so by making sure that as little of this is lost as possible, we can significantly reduce CO₂ emissions and so cut down our individual contributions to global warming. Figures 1 and 2 give a break down of how energy is used in the UK, while figure 3 compares the potential CO₂ savings from several energy efficiency measures to show thermal insulation as the best – and therefore first – option.

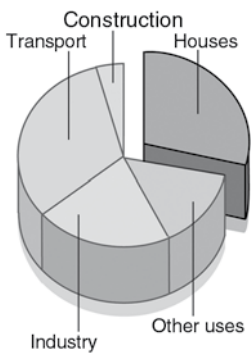


Fig. 1: Energy use in Britain

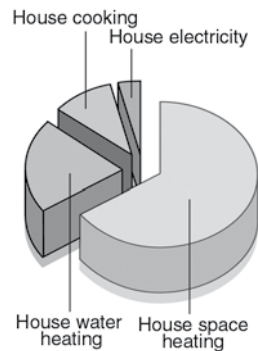


Fig. 2: Typical energy in a house in a temperate climate

A house with good insulation will not only use less fossil fuel for space and water heating – therefore causing fewer CO₂ emissions and saving you money on your fuel bills – but will also be more comfortable in the winter and cooler in the summer. Ideally, every building should be superinsulated – i.e. insulated to levels thought to be optimum for a cold climate. Table 1 below is a guide to minimum levels of superinsulation by depth of insulation material and corresponding U-value (this is the measure of the rate of flow of energy, in Watts, passing through one square metre of construction for every degree of temperature difference (in degrees Kelvin) between the interior and exterior). These are basic guidelines. A good rule of thumb is; where it's easy, put more in.

Table 1: How much to put in: recommended depths of insulation for different building elements

Element	Recommended levels of insulation	U-value – W/m ² K
Roof	300-450mm	300mm = 0.12
Timber wall	200-300mm	200mm = 0.16
Masonry wall	150-250mm	150mm = 0.16
Solid floor	150mm	150mm = 0.18
Suspended floor	200-250mm	225mm = 0.13

Insulation can be relatively easy to retrofit to old houses. Of course new ones should be built with maximum insulation to start with. The energy payback period for insulation (i.e. the time taken for the energy used in the manufacture of the insulating material to be matched by the energy saved during its use) is very short – usually the first winter.

Choosing insulation material

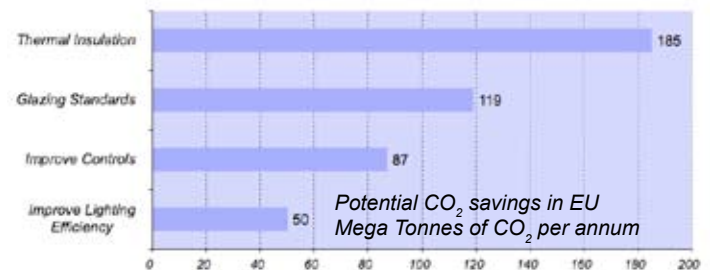
There are many different types of insulation so choosing the right one for your particular situation can seem complicated. The following guidelines should help. There are basically three different types of insulation material.

Organic – derived from natural vegetation and renewable resources. Reclaimable on demolition: cork (slabs, tile and granular fill), expanded rubber (pipe sections etc.), wood fibre (insulation board), hemp (loose fill), hemp/lime (rigid construction), sheep's wool (felted quilt), heraflex (felted quilt), woodwool (rigid slabs), cellulose (loose fill in shredded paper pellet form).

Inorganic – derived from naturally occurring minerals, non-renewable but from mostly plentiful sources. Reclaimable on demolition: mineral fibres (rockwool, slagwool and fibreglass, quilts), perlite and vermiculite (loose fill, aggregate for concrete), aerated concrete blocks, foamed glass (glass in cellular form).

Fossil organic – derived by the chemical industry from fossilised vegetation, difficult to reclaim upon demolition. Polluting in production: expanded polystyrene ('bead board' – usually white), extruded expanded polystyrene (semi-rigid, smooth-skinned closed cell boards, usually tinted), polyurethane foam (closed cell semi-rigid boards and foam fill), urea- and phenol- formaldehyde foam, polyisocyanurate foam.

Fig. 3: Potential CO₂ savings by energy efficiency measure



In order of preference, the best choices are insulation made from organic materials from renewable sources and recycled materials (i.e. cellulose fibre insulation made from recycled newspaper), followed by non-renewable but plentiful inorganic materials, and then those from fossil fuel sources. In all cases it is important to arrange the construction layers so that water vapour from the warm, more humid interior can gently escape to the cold exterior without causing damage on the way through (in other words, ensure that the building is allowed to 'breathe' properly). Also, remember to look for the U-value when buying insulation material as an indication of the potential energy loss from the interior to the exterior when installed – a smaller U-value is better (see Table 1). In Table 2 overleaf the embodied energy (energy required for manufacture) of various insulating materials – organic, inorganic and fossil organic – are compared.

An important issue related to choosing fossil organic insulation is the environmental impact of any blowing agents used during installation. In the past, chlorofluorocarbons (CFCs) were commonly used but have been replaced now by hydrochlorofluorocarbons (HCFCs), which are only marginally better. From 2010 the sale of HCFCs will be banned in the EU, and hydrofluorocarbons (HFCs) used instead. While HFCs are not ozone depleting like the others, they do still act as a greenhouse gas when released into the atmosphere. A preferable alternative in terms

of environmental impact if you are using fossil organic insulation are pentane-blown materials.

Table 2: Primary embodied energy of common products and raw materials (approximates)

Type of insulation	Embodied energy – kWh/m ³
Plastic insulation	1,125
Foamed glass insulation	751
Mineral fibre insulation	230
Cellulose insulation	133
Sheep's wool insulation	30

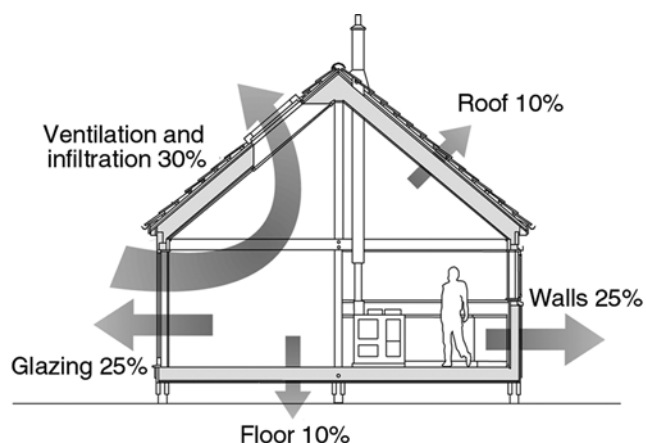
Sources: CAT; Green Building Bible; Environmental Science Handbook; Pittsburgh Corning; Timber Trade Federation; CIRIA; GreenPro.

While there is an order of preference, it is better to insulate with any material than not insulate at all. And also preferable to use a thicker layer of less polluting material, rather than a thinner layer of one that is more energy intensive to produce. The costs of insulating are dominated by the costs of materials required to contain the insulation or keep it dry. Bulk insulation materials are cheap and have very good energy and financial paybacks. So, for example, if an unused loft space is being insulated with loose blown cellulose, the cost of an extra 150mm is almost marginal compared to the cost of getting the installer set-up on site.

Of course, as well as insulating your building you mustn't forget to insulate your hot water tank and pipework! Heating controls such as thermostats and timers are also really helpful in cutting your energy use, saving you money and reducing CO₂ emissions. Draughtproofing is also vital: 30% of your home's heat is lost through air movement (see figure 4). Draughts also make you feel cold even if the air is relatively warm. Thick curtains and/or secondary glazing also help insulate older windows.

There may be grants available to help with the costs of making your house more energy efficient. Contact your electricity and gas suppliers to see if they are running any schemes, and also your local Energy Efficiency Advice Centre, the Energy Action Grants Agency and your Local Authority. Some grants are not nationally available and may only apply to people in particular need.

Fig. 4 The proportions of heat loss from a typical house



Superinsulation for new CAT building

The new education centre at CAT – the WISE (Wales Institute for Sustainable Education) building – will incorporate various insulation materials for specific areas of the structure: hemp/lime for the walls, 450mm Warmcell insulation in the theatre roof and 200-300mm of perlite in the ground floor and ceilings. Monitoring of the building and materials will take place throughout construction and during use.

Visit www.cat.org.uk for more information and publications, including CAT's 'Environmental Building' Factsheet and the complete guide to eco-building, 'The Whole House Book', by Pat Borer and Cindy Harris.

Grants and further information:

- Energy Saving Trust, Tel: 0845 727 7200 / 0800 512 012
Website: www.est.org.uk/myhome

Advice on energy saving in the home and the grants available in your area. Either contact your local office on the 0800 number, or ring the national 0845 helpline.

- Energy Action Grants Agency (EAGA), England, Tel: 0800 316 2808; Northern Ireland, Tel: 0800 181 667; Scotland, Tel: 0800 072 0150; Wales, Tel: 0800 316 2815.
Website: www.eaga.co.uk
Allocates government grants to those over sixty years old or on state benefits for home energy efficiency improvements, including insulation, draughtproofing, and heating.
- Heat Project, Tel: 0800 093 4050, Website: www.heatproject.co.uk
Grants towards loft and cavity wall insulation, on behalf of local councils. Available to all homes across mainland UK (not Northern Ireland). A grant can cover sheep's wool or flax insulation.

Suppliers

Actually finding environmentally friendly insulation materials can be hard, particularly if your builder and architect aren't familiar with them. The following contacts should point you in the right direction. Please note: mention of a company does not necessarily constitute a recommendation. We always advise that you contact several companies to compare products, services and prices.

- CAT Mail Order Tel. 01654 705959
Website: www.cat.org.uk email: mail.order@cat.org.uk
Warmcel (newspaper) loft insulation and Thermafleece sheep's wool insulation are available from the Centre for Alternative Technology by mail order. Get in touch for more details.
- Construction Resources (London), Tel: 020 7450 2211
Website: www.constructionresources.com
Builder's merchants specialising in ecological materials, including cellulose, flax and Austrian sheep's wool insulation.
- Cork Industry Federation, Tel. 020 8302 4801,
Website: www.cork-products.co.uk
Trade association for the cork industry. List of members available, including insulation manufacturers.
- Ecomerchant Ltd (Kent), Tel: 01795 530 130,
Website: www.ecomerchant.co.uk email: sales@ecomerchant.co.uk
Supplies sustainable building materials to trade and the general public, including cellulose, wool and cork insulation materials.
- Excel Industries Ltd, Tel: 01685 845 200,
Website: www.excellfibre.com email: info@excellfibre.com
Manufactures Warmcel insulation, made from recycled newspaper. Also makes pre-insulated (with Warmcel) structural wall panels and the Soundcel (thermal and acoustic) Floor System.
- Kingspan Insulation Ltd, Tel : 0870 733 8333
Website: www.insulation.kingspan.com
'Zero Ozone Depletion Potential Products', including insulation.
- Limetec, Tel: 0845 603 1143
Website: www.limetechnology.co.uk
Makes hemp/lime mortars and products.
- Second Nature UK Ltd, Tel: 01768 486285,
Website: www.secondnatureuk.com
email: info@secondnatureuk.com
Manufactures Thermafleece insulation, made from British sheep's wool and available from CAT by mail order.
- Thermica Heraklith Ltd (Skanda (UK) Ltd), Tel: 01978 664255
Website: www.heraklith.co.uk
Supplies 'Heraklith' (wood wool/magnesite) board for sheathing and infill and acoustic ceiling and wall panels, plus 'Heraflax' quilt insulation made from 99% flax.
- Natural Building Technologies, Tel: 01844 338 338
Website: www.natural-building.co.uk
email: info@natural-building.co.uk
Supplies green building products, including sheep's wool, cellulose, hemp/recycled cotton and woodfibre board insulation.
- Rockwool Ltd, Tel: 01656 862621, Website: www.rockwool.co.uk
Manufactures rockwool (mineral wool) insulation, including rockfibre cavity wall insulation – an alternative to foam.