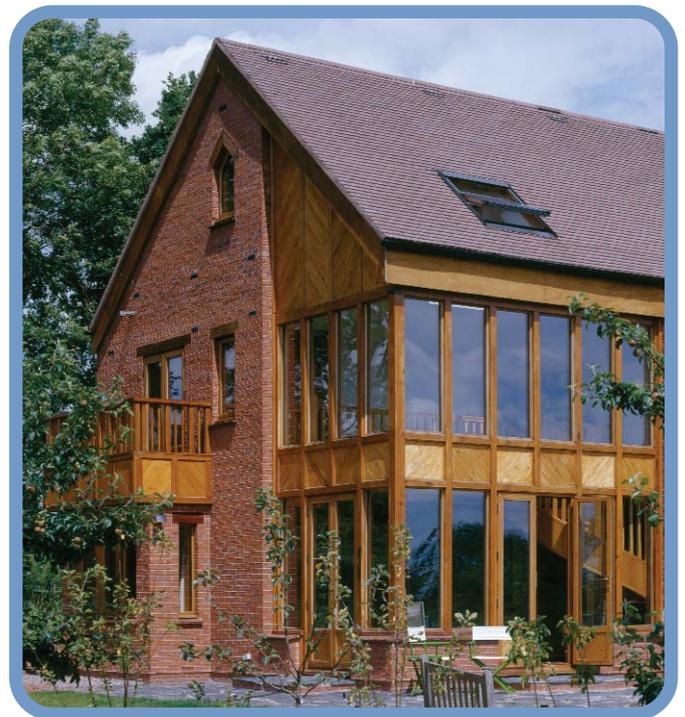




Energy Efficiency Best Practice in Housing

Energy efficiency – frequently asked questions



Home energy use is responsible for 28 per cent of UK carbon dioxide emissions which contribute to climate change. By following Best Practice standards, new build and refurbished housing will be more energy efficient and will reduce these emissions, saving energy, money and the environment.

Energy efficiency is an important issue for self-builders. Here are some of the questions that come up regularly:

Which is the best construction method for new houses?

Timber frame, brick-and-block, modern methods of construction (MMC) – all are perfectly acceptable and durable provided they are used correctly. If a building is not properly designed and well-built, there are likely to be problems whatever construction method is used.

Timber frame: as insulation is normally located between the studs, virtually any depth can be accommodated simply by increasing the stud size. This construction method is becoming increasingly popular in England and Wales and this type of house can be quicker to erect than those employing brick-and-block.

Brick-and-block (masonry): insulation is usually installed in the wall cavity although it can be fitted externally. Differing types and thickness of insulation can be accommodated in a variety of cavity depths. The insulation can either completely or partially fill the cavity. It is wise to avoid completely filled cavities in very exposed locations, as high winds can force rain through tiny cracks in the outer wall, across the cavity and into the inner wall, causing damp. Masonry construction is particularly well-suited to passive solar designs (where south-facing windows are used to contribute towards lighting and heating by using the sun, and main living spaces are located accordingly to benefit), providing thermal mass to first absorb solar heat on a sunny winter's day and then release the stored heat later. This type of construction also reduces the risk of overheating in summer.

MMC building elements are fabricated in state-of-the-art factories, which can save time on site and reduce wastage. Structural insulated panels (SIPs) and insulated concrete formwork are two examples. Selecting MMC options may require detailed research.

For more information on this subject, please see:

Modern methods of construction (MMC) case studies (CE139).

What are the best insulation materials?

Rigid foam, mineral wool, loose fill and sprayed insulation are all generally available and will perform well. Foam-based products generally have higher performance and so do not need to be as thick – but they tend to cost more.

Materials such as cork, wool, flax and cellulose (recycled paper) are renewable natural resources that can be used as insulation in homes. They may not all be as readily available as the more commonly used materials and they may need greater thicknesses to achieve the same thermal performance.

All the exposed elements of the home (roof, walls and floor) need a high level of insulation and an even distribution. Avoid gaps, particularly at junctions, as these create weak spots known as thermal bridges.

In all types of construction, installing the optimum amount of insulation at the right stage of the process is the easiest and cheapest way of achieving energy efficiency.

For more information on this subject, please see:

Insulation materials chart - thermal properties and environmental ratings (CE71).

What are U-values?

Insulation is usually specified by its U-value, a measure of the rate of heat transfer (or loss): the lower the figure, the better the insulation. While the science may be quite complex, the concept is easy to apply and widely used by designers.

Building elements should achieve Best Practice U-values: 0.13 W/m²K for roofs; 0.25 W/m²K for walls; and 0.20 W/m²K for floors. Any additional insulation costs will be recovered through lower heating bills and smaller sizes of heating equipment (boilers and radiators).

For more information on this subject, please see:

Energy efficiency in new housing (Summary of specifications for England, Wales and Scotland) (CE12)

Energy efficiency in new housing (Summary of specifications for Northern Ireland) (CE24).

How should I ventilate the house?

Ventilation provides fresh air and prevents condensation – it is also a requirement of the building regulations. The most basic choice is to use trickle vents in windows and extractor fans in kitchens, bathrooms, showers and utility rooms. Two alternatives are passive stack ventilation (PSV) and mechanical ventilation with heat recovery.

PSV employs the principle that warm air rises, allowing stale air to be removed without using electric fans. Trickle vents in rooms allow replacement air into the building. The ducting that removes the exhaust air should be as near to vertical as possible, with no more than two bends, so as to prevent flow restriction and loss of performance. PSV systems are silent, have no direct running costs and will last for the life of the building. However, it may be difficult to incorporate them into existing buildings because of the need to avoid bends and long ducting runs.

Mechanical ventilation with heat recovery provides filtered air and allows designers and operators to reduce the amount of intrusive, outdoor noise (windows can be kept shut). However, it is not a particularly energy efficient technology – the electricity driving the fans normally exceeds the energy saved through heat recovery. It requires a well-sealed house to work well (no open chimneys or flues); ensure the design specifies good airtightness.

Draught lobbies (an additional door and unheated space between the main entrance door and hallway) can reduce heat losses and their use is recommended.

Houses need to be made as airtight as possible. Close attention must be paid to design detailing and site workmanship – regardless of the ventilation system chosen.

For more information on this subject, please see:

Energy efficient ventilation in housing (GPG 268).

What about the windows?

New windows will normally have to be double-glazed with low emissivity (Low-E) glass in order to satisfy building regulations in most parts of the UK. By fitting windows that meet Best Practice standards, higher comfort levels and lower fuel bills can be achieved. Options like triple glazing and argon-fill should improve the performance even further, but they will cost more.

In specific circumstances, building control officers may agree to trade-offs in performance between different parts of the building fabric (including windows), for example in conservation areas.

For more information on this subject, please see:
Windows for new and existing housing (CE66).

Should I use underfloor heating or radiators?

Heating systems should ideally be matched to the characteristics of the building. A house with a lightweight construction such as timber-frame will respond to changes in temperature more quickly than one with greater thermal mass such as masonry. So for a timber-frame dwelling, the best form of heating would be one that was quick to supply heat where and when it was needed. Radiators with thermostatic radiator valves (TRVs) work well in this situation, especially where the house is mainly in use morning and evening.

Because they cannot respond so quickly, underfloor heating and other storage-based systems are better suited to less lightweight constructions. A tiled, solid-screed floor works best with underfloor heating and rugs rather than carpet.

It is perfectly acceptable to mix systems: for example by having underfloor heating downstairs and radiators upstairs.

Which is the best hot water system?

In the correct setting, any form of hot water system can work well.

In the case of oil or gas firing, an efficient boiler is the key – and it is Best Practice to fit a condensing boiler. From 1 April 2005, all gas boilers installed in England and Wales will be condensing boilers (aside from a small number of exceptions). From 1 April 2005, details of all boiler installations must be provided to the local authority building control (LABC). These changes will not include oil boilers until April 2007. Visit www.boilers.org.uk for more information. Also visit www.est.org.uk/bestpractice/boiler for the whole house boiler sizing wizard which provides a quick and simple method for boiler sizing.

With electric systems, the addition of solar water heating is very effective at reducing carbon emissions and running costs. It uses the sun's energy, rather than electricity or gas, to heat water via a collector. There are two types available: 'flat plate' collectors are larger (but less efficient) than 'evacuated tubes' for the same hot water provision, but they are cheaper.

Is oil or liquid petroleum gas (LPG) best for a condensing boiler?

While LPG is generally more expensive than oil, it has lower carbon emissions. Fuel storage and local availability should be carefully considered before choosing between them.

Are heat pumps a sensible option?

A ground source heat pump (GSHP) extracts heat from the earth and transfers it into a building, even though the building may already be warmer than the ground. The technology works like a domestic refrigerator in reverse and similarly needs electricity to run it. An off-peak electricity tariff or special heat pump tariff is necessary to make it as economical as gas central heating. Installation costs are high compared with conventional gas central heating, due to drilling and equipment needs. Although savings in running and maintenance costs will eventually repay the higher investment, this will take some years. By installing high levels of insulation in the property prior to investing in a heat pump project, heating requirements (and therefore total system costs) can be reduced substantially.

The advantage of GSHP is that, although it requires electricity to run it, the system as a whole has relatively low carbon emissions, since the heat pump extracts 'free' heat from the ground. Heat pumps have similar running costs to condensing boilers. They offer a particularly attractive option in rural locations away from the gas network.

For more information on this subject, please see:
Domestic Ground Source Heat Pumps: Design and installation of closed-loop systems (GPG339).

What should I look for when buying products for my home?

The Energy Saving Trust (EST) manages a labelling scheme for products of proven energy efficiency. The scheme currently covers appliances (washing machines, fridges, freezers, dishwashers and tumble dryers), light bulbs and fittings, gas and oil boilers, heating controls, loft insulation, cavity wall insulation, draught-stripping, external wall and dry linings, high performance hot water cylinders and windows. These products carry the Energy Efficiency Recommended label. Currently endorsed products can be found at www.est.org.uk/myhome.



Energy Efficiency Recommended logo



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How can I build an Eco-House?

This is potentially very complex, so a trip to the local library would be a good starting place. Other useful sources of information are:

- Construction Resources
16 Guildford Street, London SE1 0HS
Tel: 020 7450 2211 Web: www.constructionresources.com
- The Centre for Alternative Technology
Machynlleth, Powys SY20 9AZ
Tel: 01654 705 950 Web: www.cat.org.uk
- The Building Centre
Store Street, London WC1E 7BT
Tel: 020 7692 4000 Web: www.buildingcentrebookshop.co.uk
- The Royal Institute of British Architects (RIBA)
66 Portland Place, London W1B 1AD
Tel: 020 7496 8390 Web: www.ribabookshop.com.

For more information on this subject, please see:
Building your own energy efficient house (GPG194).

Are there any grants available?

The latest information on energy efficiency grants and their availability can be found at www.est.org.uk/myhome/gid, or contact your local **Energy Efficiency Advice Centre (EEAC)** on **0800 512 012**.

Advice on grants for renewables can be found at www.clear-skies.org and www.est.org.uk/solar. The Scottish Community and Householder Renewables Initiative (SCHRI) administers grants for renewables in Scotland and can be found at www.est.org.uk/schri.

Where can I find out more about Energy Efficiency Best Practice in Housing?

Useful publications include:

Renewable energy in housing – case studies (CE28)

What is Energy Efficiency Best Practice in Housing? (CE107)

Building your own energy efficient house (GPG194).

To obtain these or any other Energy Efficiency Best Practice in Housing publications free of charge, call the Helpline on **0845 120 7799** or visit www.est.org.uk/bestpractice.

Cover image of Dragon House courtesy of Constructive Individuals.
Photo: Philip Bier.

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