



Centre for
Alternative
Technology

GLAZING OVER

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If a house has single-glazed windows, these can be responsible for one-fifth of the heat lost from the building. Double glazing should cut this loss in half. Replacement double glazing is fairly expensive, so if you're on a budget look first at insulating your home as much as possible (see our *Energy Efficiency in the Home* sheet) and draught-proofing existing windows. It is possible to upgrade existing windows with various types of secondary glazing.

Secondary glazing

There are a few ways to improve the performance of old windows without going to the expense of double glazing. A simpler, cheaper alternative is to fit secondary glazing, which can be an additional window fitted on the inside of the existing frame, or a magnetic or adhesive pane to fit to the frame, or just clear plastic film stuck to the interior frame.

Clear plastic film (polythene) should be available from DIY stores - supermarket cling film may even be suitable. You can attach it round the edge with double-sided sticky tape and then heat it to make it first stretch and then contract back as it cools - to clear the wrinkles. It won't last a huge length of time - probably one year - but is very cheap.

Rigid (or slightly flexible) plastic sheets are usually available from DIY outlets. These can be stuck on or held in place magnetically to enable easier cleaning. More advanced options could be a single pane in an aluminium frame, attached on hinges or sliding runners, or perhaps an old and suitably-sized window cleaned up and fitted to the inside frame. There are also many specialist window films available. Some of these improve the insulating properties of the glass by letting through certain wavelengths of light in only one direction.

The most advanced type of secondary glazing is to fit a second window inside the existing one. This will often be better and cheaper than replacing the windows altogether. You could hire a local joiner to make them, or there are certain proprietary systems available - for example from DIY stores.

Specifying new windows

When buying new or replacement windows, we recommend double-glazed, low-e coated, argon filled, timber framed units. The gap between the two panes of glass should be about 20mm. A smaller gap gives a slightly poorer performance,

but a bigger gap won't make much difference (except that it will give better sound insulation). Windows with lots of glazing bars (e.g. Georgian) are poorer, as the multiple bars conduct heat out.

A low-E ("low emissivity") coating improves the thermal performance of a window by reducing heat flow between the panes of glass, and is required by current building regulations. It's a very thin layer of metal, making a tiny difference to the amount of light coming in. The coating is protected as it is on the outer surface of the inner pane.

Using argon gas between the panes also improves the performance of the window, as the gas does not conduct heat as well as air. Krypton gas is also sometimes used, especially if a narrow gap between panes is needed - as it will give a better performance than argon (but is more costly).

'U-values' are a measure of thermal performance - the lower the value, the better a material or building element is as an insulator.

Specification	U-value
Single glazing	5.5
Standard double glazing	2.7
Double glazing, low-E coating	1.8
Double glazing, low-E coating and argon-filled	1.6 to 1.3
Triple glazing, multiple low-E coating and argon-filled	less than 1.0

Timber, uPVC or aluminium frames?

For replacement windows, the authors of CAT's 'Whole House Book' recommend timber frames, writing: *"the production of PVC is environmentally damaging, they have an unknown lifespan and wear badly, and they are expensive."* They also note that: *"Intermediate components of the PVC production process - ethylene dichloride that is then converted to vinyl chloride monomer (VCM) - are carcinogenic and mutagenic; there is a danger that significant amounts of these chemicals will be released during production and transportation."*

Timber frames require little energy to manufacture, can last for over 50 years and then be renovated rather than replaced. uPVC windows usually need replacing after a shorter period. Although uPVC window manufacturers claim they are maintenance free, Dulux recently brought out a uPVC frame paint, recommended for use every 6 years!

Aluminium manufacture involves a lot of energy use and pollution. The coatings on some frames make recycling difficult - not ideal for such a high-value material, so look for anodized frames if you do choose aluminium.

Choosing wood framed windows

Wood frames have had a poor image in the past, as UK-made softwood windows were often of low quality. However, we are learning from the Scandinavians and it is possible to get UK-made windows with high standards of airtightness, built from homegrown, durable, untreated wood.

FSC-certified temperate (not tropical) hardwood or durable softwood would be first choice. A durable temperate hardwood (e.g. oak, sweet chestnut or larch) won't need treating and should last 30 years. The preservatives used to protect softwood will cause some pollution when it eventually needs to be disposed of. If you choose a less durable wood, look for one pre-treated with a low-impact natural and renewable treatment. Any sustainable (FSC) timber is still preferable to uPVC. Avoid painting wood, as this increases the environmental impact.

Costs

A WWF report collated various estimates of the relative costs of timber and PVC windows. Overall, it found that high performance timber windows should not cost more than PVC. Case studies in the report show that timber-framed windows cost 15% to 25% less than uPVC units. Also, sustainable timber, e.g. with the FSC mark, should be no more expensive than standard timber.

The WWF 'Window of Opportunity' report is a free download (1.8MB). See the following link:
www.wwf.org.uk/filelibrary/pdf/windows_0305.pdf

Meeting building regulations

Just replacing glass units (e.g. broken windows or faulty double-glazed units), or replacing some rotten wood in the frame or sash, will not need approval from Building Control. If you are replacing the whole of a window frame and the opening parts of a window, or a door that is more than 50% glazed, you'll need approval from Building Control. By employing a FENSA registered (Fenestration Self Assessment Scheme) joiner or installer you will not need to have the work checked. Instead, the installer will issue you and the local council with a certificate to show that the windows or doors comply with Part L of the Building Regulations.

Conservation-grade windows

For more specialised properties, such as listed buildings, the requirements can be very strict. You should be able to find high-specification windows

(either replacement or secondary glazing) suitable for a listed building. 'Conservation glazing' uses different coloured strips in the gap between the glass panes, such as black, brown or white. Specialist replacement windows (such as sash windows) replicate the appearance of existing windows, but with much greater levels of insulation & draughtproofing. If you have difficulty finding a supplier of conservation glazing, try English Heritage, Historic Scotland, or Cadw (for Wales).

Further Information

The CAT book **The Energy Saving House** is a detailed guide to reducing energy use in the home. For much more advice on eco-building and renovating, including in-depth guidelines on materials choice and techniques, see **The Whole House Book**. These, and many more eco-building books, are available through **CAT Mail Order**.
Tel: 01654 705959; web: www.cat.org.uk/shopping

CAT's **residential course** programme includes several on energy efficiency & eco-design.
Tel: 01654 705981; web: www.cat.org.uk/courses

For one-to-one technical advice, many people planning a big project find it useful to come here and run through their plans with CAT experts. For further details see www.cat.org.uk/consultancy

You can also contact **CAT's Information Service** with any further questions about eco-building.
Tel: 01654 705989; email: info@cat.org.uk

Contacts

Find details of environmentally aware building contractors through the **Association for Environment Conscious Building (AECB)**.
Tel: 0845 456 9773; web: www.aecb.net

Forest Stewardship Council (FSC)

Tel: 01686 413916; Web: www.fsc-uk.org
Wood that is FSC certified is guaranteed to come from sustainable sources. Their site includes a database of products and suppliers.

FENSA

Tel: 020 7645 3700; Web: www.fensa.org.uk
Their web site includes a list of local installers.

For advice on conservation glazing:
English Heritage, *Tel: 0870 333 1181*
Web: www.english-heritage.org.uk
Historic Scotland, *Tel: 0131 668 8600*
Web: www.historic-scotland.gov.uk
Cadw (for Wales), *Tel: 01443 33 6000*
Web: www.cadw.wales.gov.uk

Good further reading on the useful **National Green Specification** web site: www.greenspec.co.uk/html/materials/windowframes.html