

GREENHOUSE INFORMATION SHEET

INSULATION



Formerly the Chief Surgeon's house (No. 42) for the Lunatic Asylum opposite (Bethel Hospital) – and a number of small shops (No's 44, 46 & 48) - used by the Ancient Order of Foresters (44-46) and as a bakers/ sweetshop (48) until just after the First World War. 42-46 was a printing works, 'Modern Press,' from 1911 – 1973 before being bought by the Greenhouse Trust.

Norwich's Environment Centre

PASSIVE SOLAR GAIN

The front of the building faces almost directly south. One of the first design decisions was to remove the interior wooden and lath & plaster partitions that separated warm sunny (front) rooms from cold dark (back) rooms. The new, more open plan building allows air to travel from the ground floor to the top floor creating a more even temperature, and the building as a whole benefits from the sun's light and warmth.

MATERIALS USED FOR INSULATION AT THE GREENHOUSE

Once the energy needed in the day-to-day life of a building has been minimised by insulation, then the energy used in the insulation process itself becomes a bigger proportion of the building's overall energy footprint. It makes sense when planning an energy efficient house to make careful choices about the materials used. The Trust decided to use materials that use as little energy in their production as possible (known as low embodied energy products). The 'embodied energy' of a product includes the energy used to extract, manufacture, and transport all the materials used.

Wool

Natural sheep's wool is ecologically sustainable, safe and pleasant to handle. The wool itself is not toxic or irritating in any way. As an insulation material it has a high insulation value. Its ability to absorb, store and re-emit over a third of its own weight in water vapour makes it a very practical and easy material to use in areas which are prone to damp and the structure is required to breathe.

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SUGGESTED DONATION 50p

The Greenhouse was a typical 19th century Norwich building built of varying thicknesses of brick, with a timber framed roof with lime and straw insulation, pine floors, wooden windows with single glazing and lath and plaster ceilings and stud partitioning throughout.

Energy use in houses accounts for 28% of all CO₂ emissions in the UK. Heating the home is the largest contributor with around 60% of total domestic energy use.



Wool used in the dormers on the top floor (top right hand-triangle). Cork used in all wall and partition areas.



Recycled paper used for all floor/ceilings to provide sound and heat insulation.

Recycled Paper

Recycled paper insulation (cellulose fibre) is manufactured to a British Standard from recycled newsprint. It is safe to handle and treated to provide protection against fire. Already installed in over a million homes, recycled paper is established as a workable material with high environmental benefits including: high-energy efficiency, low embodied energy and no CFCs (ozone depleting chemicals and greenhouse gas) or VOCs (volatile organic compounds, which are toxic).

On the ground floor timber joists were suspended above the concrete floor. 50% of the void was filled with recycled paper, allowing airflow to occur in the remaining space.



Crosshatch timbers added to the ceiling of the top floor/roof increased the available depth for recycled paper insulation.

Cork

Cork is both a good thermal and sound barrier and useful to dampen vibration. It is a natural and renewable product cut from the cork oak tree, which has been growing around the Mediterranean Sea (Portugal) for thousands of years and provides a valuable and rare habitat for a range of wildlife and sustainable local economy.

Crosshatch timbers added to the ceiling of the top floor / roof increased the available depth for recycled paper insulation. On the ground floor timber joists were suspended above the concrete floor. 50% of the void was filled with recycled paper, allowing airflow in the remaining space. A timber frame added throughout the building with cork (from 60mm to 300mm) was used to sound-proof and insulate the building.

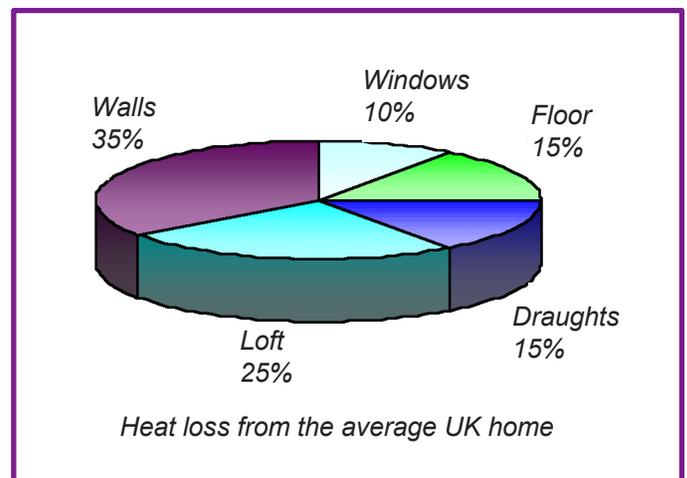
GLAZING

The Greenhouse has used double, triple and quadruple glazing throughout the building. 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 even just some clear plastic film stuck to the interior frame.

If you are replacing your windows, then Forest Stewardship Certificated wood (FSC) is definitely the option to go for. Wooden windows can last for more than 50 years, and beyond that they can be renovated rather than replaced.

There are lots of environmental problems associated with the manufacture of uPVC. High levels of dioxins and other toxins are found around uPVC plants. uPVC windows will use large amounts of energy in manufacture and will need replacing after a much shorter period.

Aluminium windows will have involved a lot of energy use and pollution during manufacture. The coatings used on some frames make their recycling difficult.



How It Works

There are a number of different techniques for achieving a more efficient building. The table below highlights different methods showing the annual savings and costs involved. It also shows estimates for the payback period (time taken to recoup the cost of your investment).

For more information on the details of the measures outlined below, see the Energy Saving Trust website:

www.energysavingtrust.org.uk

✓ *Invest and Save Money for the Future: Insulation is widely recognised as the most effective energy efficiency measure you can undertake.*

✓ *Protect The Environment: A poorly insulated home allows heat to escape through the walls and roof, so fossil fuel is wasted and CO₂ produced.*

✓ *Home Improvement: Insulation adds value to your home, making it easier to sell your home, should you want to.*

✓ *Quality of Life: Insulation helps keep your home warmer during cold periods and cooler when it's hot and allows you to control the temperature of your building more efficiently*

✓ *Prevent Condensation: Installing Insulation can help to prevent condensation as the interior surface of walls and ceilings will be warmer.*

Planning

Planning permission is not normally required for fitting insulation (where there is no change in external appearance). However, if the building is listed or in a conservation area, you may need to consult your local planning authority.

Measure	Annual saving per year (£)	Installed cost (£)	Installed payback	CO ₂ saving per year
Cavity wall insulation	Around £120	Around £500	Around 4 years	Around 800kg
External wall insulation	Around £380	Around £4,500	Around 12 years	Around 2.6 tonnes
Internal wall insulation	Around £360	From £42/m ²	N/A	Around 2.4 tonnes
Loft insulation (0 - 270mm)	Around £155	Around £500 DIY £250	Around 3 years DIY 2 years	Around 1 tonne
Loft insulation (50 - 270mm)	Around £45	Around £500 DIY £180	Around 11 years DIY 4 years	Around 300kg
Floor insulation	Around £40	Around £90	From 2 years	Around 250kg
Draught Proofing	Around £25	Around £200 Around £90	Around 8 years Around 4 years	Around 150kg
Hot water tank jacket	Around £30	Around £12	Around 6 months	Around 195kg
Primary pipe insulation	Around £10	Around £10	Up to 1 year	Around 65kg
Double Glazing	Around £110	Variable	Variable	Around 720kg

TYPES OF INSULATION

The best environmental choices are insulation materials made from organic materials from renewable sources, and recycled materials (e.g. cellulose from recycled newspaper); second-best are non renewable but plentiful organic materials, and then those from fossil fuels.

The effectiveness of insulation is indicated by its U-value. This measures the heat flow or conductivity in Watts per m². The smaller the U-value the better.

There are many different types of insulation. They generally fall into three types:

😊 *Organic: derived from natural vegetation, renewable sources and reclaimed materials e.g. sheep's wool, cork and recycled paper.*

😐 *Inorganic: derived from naturally occurring non renewable but plentiful sources which are reclaimable after use, e.g. fibreglass.*

😞 *Fossil Organic: derived from the chemical industry, difficult to reclaim and polluting.*

Simple Energy Saving Measures

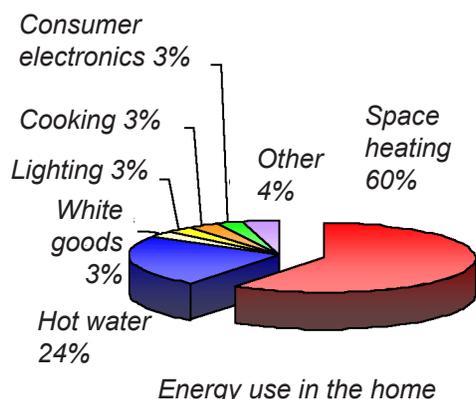
✓ Turning down your thermostat by 1°C can save up to £40 on your annual heating bill and save 300kg of CO₂

✓ Insulating your hot water cylinder is one of the simplest and cheapest ways to save energy and money. Fitting a British Standard 'jacket' around your cylinder will cut heat loss by over 75%.

✓ Use about 270 mm of insulation all round in the roof, walls and floor. Make sure the insulation material has a zero ozone depletion potential (ZODP).

✓ Double or triple glazing with low emissivity coatings and gas filling are best (see 'Glazing' below for further information).

✓ In a typical home 20% of all heat loss is through poor ventilation and draughts. (Air tightness must be balanced with ventilation). Remember ventilation is just as important – unless properly ventilated, an airtight home can seal in indoor air pollutants.



USEFUL CONTACTS AND FURTHER INFORMATION

Association of Energy Conscious Building
P.O. Box 32, Llandysul, Wales, SA44 5ZA
Tel: 0845 4569773 Web: www.aecb.net

Energy Saving Trust
Advice Centre - Anglia, Ecotech Centre, Turbine Way,
Swaffham PE37 7HT
Tel: 0800 512012
Web: www.energysavingtrust.org.uk

SUPPLIERS

Hendry & Sons Ltd., suppliers of conservation materials,
Station Road, Foulsham, Dereham, Norfolk, NR20 5RE
Tel: 01362 683249

WOOL

Second Nature UK Ltd., (Thermafleece - Wool)
Soulands Gate, Soulby, Dacre, Penrith, Cumbria, CA11
OJF
Tel: 01768 486285
Web: www.secondnatureuk.com

RECYCLED PAPER

Excel Industries Limited
Maerdy Industrial Estate, Rhymney,
Gwent NP22 5PY
Tel: 01685 845200
Web: www.excel fibre.com

CORK

The Cork Industry Federation,
13 Felton Lea, Sidcup, Kent, DA14 6BA
Tel: 02083 024801
Web: www.cork-products.co.uk

WESTCO

Penarth Road, Cardiff, CF11 8YN
Tel: 029 2037 6700
Web: www.westcofloors.co.uk



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