



Householder's



Guide to



Sustainable



Design and



Construction



Contents

1	WHAT IS SUSTAINABLE DESIGN AND CONSTRUCTION?	3
2	WHO IS THIS GUIDE INTENDED FOR?	3
3	HOW TO USE THIS GUIDE	4
4	THE BENEFITS OF SUSTAINABLE DESIGN AND CONSTRUCTION	7
5	BUYING YOUR HOME	11
	5.1 ENERGY PERFORMANCE CERTIFICATES	12
	5.2 RESOURCE EFFICIENCY	13
	5.3 WHAT TO LOOK OUT FOR	14
	5.4 BUYING NEW FROM A DEVELOPER	15
6	IMPROVING YOUR HOME	17
	6.1 BUILDING EXTENSIONS AND LOFT CONVERSIONS	18
	6.1.1 Location and positioning of buildings	18
	6.1.2 Positioning and glazing of windows	19
	6.1.3 Installation of sustainable energy measures	20
	6.1.4 Conservatories	21
	6.1.5 Installation of water conservation measures	22
	6.1.6 Green roofs	23
	6.1.7 Environmentally friendly construction materials	24
	6.1.8 Creating space for internal recycling facilities	26
	6.2 DECORATING YOUR HOME	27
	6.2.1 Choosing materials	27
	6.2.2 Paints and finishes	27
	6.2.3 Flooring	28
	6.2.4 Wood	28
	6.2.5 Plastics	29
	6.2.6 Asbestos	29
7	IMPROVING YOUR GARDEN	31
	7.1 FRONT GARDENS	32
	7.2 BICYCLE STORAGE	33
	7.3 WATER CONSERVATION IN THE GARDEN	33
8	CONSERVING RESOURCES IN YOUR HOME	35
	8.1 ENERGY EFFICIENCY	36
	8.1.1 Simple, low (or no) cost measures	36
	8.1.2 Insulation	37
	8.1.3 Energy efficient heating systems	40
	8.1.4 Lighting and appliances	42
	8.1.5 A summary of savings from sustainable energy measures	43
	8.2 RENEWABLE ENERGY	44
	8.2.1 Solar water heating systems	44
	8.2.2 Photovoltaic systems (solar electricity)	46
	8.2.3 Biomass and wood fuel heating	47
	8.2.4 Ground source heat pumps	48
	8.2.5 Small-scale wind	50
	8.3 SAVING WATER	51
	8.3.1 The importance of saving water	51
	8.3.2 Water conservation	51
	8.3.3 Simple low (or no) cost measures	52
	8.3.4 In the garden	52
	8.4 MINIMISING WASTE	53
	8.4.1 Reduce	53
	8.4.2 Re-use	53
	8.4.3 Recycle	54
	8.4.4 Composting	54

1

What is sustainable design and construction

One of the easiest ways to understand and appreciate the concept of sustainability is to consider the legacy that we leave to those who follow us: we need to understand the impacts that our actions today have on the opportunities for future generations to live healthy, happy and full lives. In London, each of the capital's three million households generates around 2.2 tonnes of rubbish, emits around 6 tonnes of carbon dioxide each year and uses 165 litres of water per day. By adapting our homes and behaviour to reduce these figures, we will be living in a more sustainable way.

There has never been a better time to incorporate sustainability into our homes. A proliferation of businesses dedicated to providing green products, services and advice means that finding alternatives and implementing changes has never been simpler. Incorporating principles of sustainability into our homes at all stages, from initial purchase through to making improvements and refurbishments, will not only make a significant contribution to sustainability but will also improve the quality, durability and cost effectiveness of our homes.

The Benefits of Sustainable Design and Construction

- Saves you money in the long term
- Is essential to minimising climate change
- Reduces pollutants and improves health
- Minimises waste of limited resources
- Provides more comfortable, healthy homes
- Will increase the value of your home

2

Who is this guide intended for?

This guide is intended for those buying a new home or planning to extend or redecorate their existing home. It provides essential information on what to consider when choosing construction materials and how to ensure that ongoing running costs and your home's environmental impact are kept to a minimum.

Whilst making your home more sustainable can be most cost effective if undertaken as part of renovation or extension works, it is recognised that there are a number of ways (some no or low cost) of reducing running costs (and your ecological footprint), which can be implemented at any time. This guide identifies these measures and as such will be of interest to all householders who are keen to save money and help the environment.

How to use this guide

I am...	This guide can help you to...	Relevant Section(s)	Further Information
Buying a new home	Identify whether your prospective new home is energy efficient and environmentally friendly	5	<p>Before you move it may be worth referring to the Energy Saving Trust's http://www.energysavingtrust.org.uk/home_improvements/moving_home to help you identify the most energy efficient homes. This booklet could help you save thousands of pounds over the coming years.</p> <p>If buying new from a developer, you may wish to ask whether the development has received an EcoHomes or Code for Sustainable Homes rating. For more information visit: http://www.breem.org/</p>
Building an extension/ conservatory or converting my loft	Find an environmentally-friendly builder, architect or engineer	N/A	<p>The following organisations and associations provide registers and advice:</p> <ol style="list-style-type: none"> 1. The Association for Environment Conscious Building (AECB) <ul style="list-style-type: none"> ● Phone: 01559 370908 ● Web: www.aecb.net 2. The Green Register of Construction Professionals <ul style="list-style-type: none"> ● Phone: 020 7582 9191 ● Web: www.greenregister.org 3. The Royal Institute of British Architects (RIBA) Client Services <ul style="list-style-type: none"> ● Phone: 020 7307 3700 4. SPONGE Network of professionals interested in sustainable design and construction <ul style="list-style-type: none"> ● Web: http://www.spongenet.org/
	Determine optimum location and positioning of buildings	6.1.1	<p>The EST has produced a guide aimed at designers and developers on passive solar design for housing estates. However, this guide can provide useful guidance to homeowners who are undertaking building projects: http://www.est.org.uk/bestpractice/uploads/publications/pdfs/GIR027.pdf</p> <p>In addition the PassivHaus standard is a set of design principles that can be followed to produce a building which requires little or no heating or cooling. Guidance on how this standard can be achieved can be found at: http://www.passivhaus.org.uk/</p>
	Determine positioning and glazing of Windows	6.1.2	<p>The EST has produced a number of Best Practice guides for the energy efficient refurbishment of existing housing, providing information to help landlords, private developers and others refurbish and repair their housing in an energy efficient way, including information on renewable energy sources for homes in urban environments: http://www.energysavingtrust.org.uk/housingbuildings/professionals/</p>
	Incorporate sustainable energy measures and technologies	6.1.3	<p>From 1 April 2005, the energy performance standard for new and replacement gas-fired hot-water central-heating boilers was raised. When you plan to install a new boiler or replace an existing one, you will need a condensing boiler to meet the higher standards for energy efficiency. For more information, read the Gas and Oil Central Heating Boilers: Advice to Householders guide that was produced by the Office of the Deputy Prime Minister (Now Communities and Local Government): http://www.energysavingtrust.org.uk/uploads/documents/housingtrade/HHIC%20Are%20you%20ready_%20%20(3).pdf</p> <p>For free, impartial advice on grants and discounts measures, contact your local Energy Efficiency Advice Centre on 0800 512012.</p> <p>EnergySmart can provide advice on discounted sustainable energy measures and appliances. Visit http://www.energy-smart.org.uk/ or call 0845 2303320.</p> <p>Contact CEN's Green Energy Centre on 020 8683 6805 for more information on renewable energy grants/ accredited installers or visit the Low Carbon Buildings Programme web sites: http://www.lowcarbonbuildings.org.uk/home/</p> <p>The British Wind Energy Association web site allows download of information about local wind speeds by entering northing and easting coordinates: http://www.bwea.com/noabl/index.html</p>

I am...	This guide can help you to...	Relevant Section(s)	Further Information
Building an extension/ conservatory or converting my loft	Incorporate water conservation measures	6.1.4	<p>The Environment Agency is the leading public body for protecting and improving the environment in England and Wales. It's web site provides detailed fact sheets on saving water in buildings: http://www.environment-agency.gov.uk/subjects/waterres/</p> <p>The Green Building Store is a web-based ecological building materials vender, which distributes materials and systems for sustainable building, including dual flush water saving WCs and rainwater storage tanks: http://www.greenbuildingstore.co.uk/01484 461705</p>
	Investigate the potential for a green roof	6.1.5	<p>livingroofs.org is the first independent UK website to specifically promote green roofs: http://www.livingroofs.org/</p>
	Select environmentally-friendly construction materials	6.1.6	<p>The Building Research Establishment (BRE) has produced the Green Guide to Housing Specification, providing a simple reference guide to the environmental impacts of the construction materials most commonly used in house building. The guide is available to purchase from BRE's bookshop: http://www.brebookshop.com/</p> <p>Organisations selling environmentally-friendly construction materials including insulation, timber and guttering:</p> <ul style="list-style-type: none"> ● The Green Building Store (01484 854898; www.greenbuildingstore.co.uk) ● The Green Shop (01452 770629; www.greenshop.co.uk) <p>Look for the Forest Stewardship Council's (FSC) 'tick tree' logo. This proves the timber or wood product comes from a well-managed forest. It is the only independently certified wood mark for sustainability: www.fsc-uk.info</p> <p>For other construction materials, EMS certification indicates that the material has come from a sustainable source</p> <p>Visit the Greenpeace web site for more information on alternatives to plastics: http://www.greenpeace.org/international/campaigns/toxics/polyvinyl-chloride/pvc-free-solutions</p> <p>Visit http://www.londonremade.com/ for information on buying recycled products</p> <p>Visit www.salvo.co.uk for reclaimed building materials and architectural salvage, such as doors, fireplaces, furniture, gardens, glass, ironwork, kitchens, lighting, radiators, stone, windows and woodwork.</p>
	Create space for internal recycling facilities	6.1.7	<p>Visit recycleforlondon.com to find your local recycling service: http://www.recycleforlondon.com/index.cfm</p> <p>Contact your local authority for information on local recycling services</p>
Redecorating my home	Choose low carbon lifecycle and toxicity materials for decorating the home, including paints, varnishes, and flooring	6.2	<p>Natural and eco-friendly paints are available from:</p> <ul style="list-style-type: none"> ● Auro (01799 543077; www.auro.co.uk) ● Nutshell Natural Paints (01392 823760; www.nutshellpaints.com) ● Livos natural paints are available from http://www.ecomerchant.co.uk/ <p>For information on soundproofing your home contact one of the following:</p> <ul style="list-style-type: none"> ● AB Sealants (01264 359 984; www.absealantsltd.com) ● Advanced Cladding (0800 068 3726; www.advancedcladding.com) ● Custom Audio Designs (0870 747 5432; http://www.customaudiodesigns.co.uk/) ● Floorscan Acoustics (0151 933 0939; www.floorscan.co.uk) ● Hush (0151 933 2026; www.hush.uk.com) ● Sound Reduction Systems (01204 380 074; www.soundreduction.co.uk) ● Sound Service (0845 363 7131; www.soundservice.co.uk) ● Trim Acoustics (020 8443 0099; www.trimacoustics.co.uk)

I am...	This guide can help you to...	Relevant Section(s)	Further Information
Improving my garden	Understand the importance of reducing surface water run off from front gardens	7.1	N/A
	Install a bicycle shed or storage frame	7.2	The London Cycling Campaign provides information on cycling parking equipment suppliers http://lcc.org.uk/documents/Cycle%20parking%20equipment%20suppliers(1).pdf Bikeaway “the answer to your cycle parking problems!” http://www.bikeaway.com/products.htm
	Conserve water in the garden	7.3	Visit your local DIY store for water butt and piping and design your own rainwater harvesting system for use on the garden. Or purchase a complete rain saver kit from Blackwall or Straight Recycling Systems: http://www.greatgardeningoffers.co.uk/mail/Blackwall/products/product-102559.stm http://www.straight.co.uk/
Looking to save money (and the environment) through making my home more sustainable	Conserve resources in the home, including energy, water and waste	8	<p>Energy: From 1 April 2005, the energy performance standard for new and replacement gas-fired hot-water central-heating boilers was raised. When you plan to install a new boiler or replace an existing one, you will need a condensing boiler to meet the higher standards for energy efficiency. For more information, read the Gas and Oil Central Heating Boilers: Advice to Householders guide that was produced by the Office of the Deputy Prime Minister (Now Communities and Local Government): http://www.energysavingtrust.org.uk/uploads/documents/housingtrade/HHIC%20Are%20you%20ready_%202%20(3).pdf</p> <p>Visit the EST website at www.est.com for energy saving information or contact your local Energy Efficiency Advice Centre on 0800 512012.</p> <p>EnergySmart can provide advice on discounted sustainable energy measures and appliances. Visit http://www.energy-smart.org.uk/ or call 0845 2303320.</p> <p>Contact CEN's Green Energy Centre on 020 8683 6683 for more information on renewable energy grants/ accredited installers or visit Low Carbon Buildings web site: http://www.lowcarbonbuildings.org.uk/home/</p> <p>The British Wind Energy Association web site allows download of information about local wind speeds by entering northing and easting coordinates: http://www.bwea.com/noabl/index.html</p> <p>To make an informed decision about green electricity for your home, visit the Etheco website: http://www.etheco.com/energy/ukpower/wepayyou.html</p> <p>Water: The Environment Agency is the leading public body for protecting and improving the environment in England and Wales. It's web site provides detailed fact sheets on saving water in the home and garden: http://www.environment-agency.gov.uk/subjects/waterres/286587/286911/548861/?version=1&lang=_e</p> <p>Waste: Visit recycleforlondon.com to find out more about recycling in London: http://www.recycleforlondon.com/index.cfm</p> <p>Contact your local authority for information on local recycling services:</p> <p>Register with the mailing preference service at www.mpsonline.org.uk to cut down the amount of junk mail you receive</p>

4

The benefits of

sustainable design

and construction

4

The benefits of sustainable design and construction

Saving you money

Making home improvements cheaply will save money in the short term, but may well cost you more over time. The essence of sustainability is a consideration of long-term costs and benefits.

Extra expenditure on energy efficiency, for example, may increase capital costs, but there is evidence that, in the long term, the savings in running costs will exceed the initial extra capital outlay. There is also evidence to suggest that building to high environmental specification leads to lower maintenance and management costs.

Planning for the long term (planning for sustainability) can increase the value of your home and save you money. In short, making your home more sustainable will not only help to preserve the environment, but will also help to preserve your wallet. This will become especially true with the introduction of Energy Performance Certificates for all homes that are being sold.

Warmer, healthier and more comfortable homes

Greater energy efficiency can make a significant difference to quality of life, health and material standard of living. A quarter of UK homes suffer from condensation or dampness, in part because of inadequate heating. This has well-established harmful effects on health and imposes an additional burden on deprived households. The improvement of domestic energy efficiency for lower income households can potentially enable them to heat their homes to a higher standard, reduce condensation and dampness, and release income for other purposes.

Minimising climate change

The most widespread and potentially damaging environmental problem at present is global climate change as a result of the emission of greenhouse gases, notably carbon dioxide (CO₂). Evidence shows that climate change is already happening and that it will lead to higher global temperatures, with very serious consequences; the message is clear – we must take action now. Over the past 100 years, average temperatures have increased by about 0.8°C, with the last decade being the warmest on record. Forecasts suggest that climate change will result in temperature rises of up to 6°C by 2100, bringing with it rising sea levels, increased droughts, floods, cold spells and severe storms.

The housing sector has an important role to play in reducing these CO₂ emissions. Our homes contribute up to 40% of all CO₂ emissions in the UK, with 10% being produced through the production of construction materials. Through reduced energy usage and adoption of low carbon (recycled) products, we can help to reduce the effects of climate change.



Did You Know?

- Around 25% of homes in London suffer from condensation or dampness.
- Government grants and discounts are available for making improvements to heating systems and insulation levels of homes.



Reducing pollutants and improving air quality and health

In addition to producing greenhouse gases, energy use in the home produces other gases, which have negative effects. These include sulphur dioxide (or SO₂ which causes acid rain), nitrogen oxides (NO_x) and carbon monoxide (CO) which are poisonous. Greater uptake of energy efficiency measures will reduce the output of these pollutants.

A combination of more airtight buildings and the increasing use of synthetic materials has resulted in a collection of ill health effects known as Sick Building Syndrome due to indoor air pollution. These include headaches, nausea, eye and skin irritations and breathing difficulties.

In addition to the by-product pollutants of energy use in the home, interior and exterior construction materials can contribute to this syndrome.

Carpets, insulation and structural timber are often treated with a range of chemicals and conventional paints which can emit an array of Volatile Organic Compounds (VOCs), with levels of solvents present in the air during application exceeding recommended levels by up to seven times.

There are a growing number of natural products on the market, including natural paints, natural flooring, wool- and cellulose-based insulation, and non-chemically treated structural timber, which can help to prevent these effects.

? Did You Know?

- The average home emits 6 tonnes of CO₂ each year (from heating and electricity).
- Our homes contribute up to 40% of all CO₂ emissions in the UK.

Reducing the need for resources

In the UK as a whole, the construction industry uses six tonnes of material per person per year and is responsible for around a third of all waste generated. Improvements in the way we design and build our dwellings offer opportunities to use materials more sparingly. At the end of a building's life, re-use and recycling of materials will reduce the need for quarrying and other resource-depleting activities.

Hot weather and overuse is placing great pressure on the UK's existing water supplies, and plans to build new homes in the South East may exacerbate the situation even further. Water saving measures, appliances and recycling systems can help to alleviate this issue.

? Did You Know?

- The greatest concentration of airborne pollutants are found indoors where on average adults spend 90% of their time.



5

Buying

your home

Buying a new home can be an exciting and emotional event. It is one of the biggest investments we make, so it is vital to have the right information to hand and to carefully inspect potential new homes. Giving consideration to the energy performance of a prospective purchase will ensure the home you buy is comfortable and will not cost you the earth in utility bills. Purchasing a home with sustainable features will also reduce the need for changes and modifications in the future.

5.1

Energy

Performance

Certificates

The Government's introduction of the Home Information Pack is intended to make home buying and selling faster, easier to understand and more consumer friendly. The pack must include an Energy Performance Certificate following from an energy assessment. Buying a home with a high standard of energy performance may therefore make the property more marketable should you choose to sell it in the future.

Home Information Packs are being phased in for all dwellings and are required before a house can be sold. Therefore the energy performance of a dwelling will become a critical factor in the desirability of a home.

The Home Information Pack (UK Government Directive)

The Home Information Pack is intended to make home-buying faster, easier and more consumer-friendly and includes:

- Sales statement (ownership)
- Energy Performance Certificate
- Standard searches (local authority enquiries, drainage and water search)
- Evidence of title
- Additional information for leasehold and commonhold sales, where appropriate
- Planning and Building regulations consents and approvals
- Any guarantees for work carried out on the property
- Replies to searches made of the local authority
- An energy efficiency assessment

The Energy Performance Certificate will show the following for each house:

Energy efficiency rating

This indicates the overall energy efficiency of a home. The higher the rating, the more energy efficient it is. It also indicates the potential for improvement. The rating is similar to an EU energy label and gives a rating of between A and G. This rating is awarded by an accredited Energy Assessor who visits the property to collect the relevant data and creates the certificate.

Environmental carbon dioxide (CO₂) impact rating

The certificate also includes an environmental CO₂ rating that indicates your home's impact on the environment in terms of carbon dioxide emissions as well as the potential for improvement. The higher the rating, the less impact it has on the environment.

The average property in the UK falls within bands D-E for both ratings. Each rating is based on the performance of the building itself and its services (such as heating and lighting), rather than the domestic appliances within it e.g. washing machines etc. This is known as an asset rating. The certificate also takes into account the age, location, size and condition of the building when providing a rating and suggesting improvements.

5.2

Resource

efficiency

A well insulated home with an efficient heating system provides high levels of comfort and lower fuel bills.

Design features such as house orientation, ventilation, insulation and adequate shading can improve energy efficiency. In many cases it is possible to keep the home cool in summer and warm in winter without resorting to artificial heating and cooling devices.

Research shows that £1.25 billion is wasted on unexpected repairs each year in the UK. 31% of homebuyers are paying an average of £2,500 in hidden costs because they are not aware of what to look for when buying a new home, with new boilers and insufficient insulation costing homebuyers £228 million and £75 million respectively (data from the energy saving trust).

Warmth and comfort is a key consideration when purchasing a new home, so look for energy saving features, such as cavity wall and loft insulation, as well as energy-efficient condensing boilers (A-rated) that will not only make for a cosy abode, but will also save you money on heating bills.



Did You Know?

- Whilst 80% of house buyers ask about council tax, fewer than half consider the cost of household bills.

With the increase in very warm summers it is also important to consider how your home will perform in the heat. Buildings with a high thermal mass will help keep you cool in the summer but warm in the winter. For example a house constructed with thick brick walls would have a high thermal mass; however a house with thin walls with lots of insulation would be very warm in the winter but also hot in the summer too!

The main problems experienced by new homeowners are old windows, old boilers, damaged plasterwork and rising damp, all of which would be mitigated by the consideration of the energy efficiency rating of your prospective home.

Choosing a home that already includes water saving showers, taps, toilets and rainwater tanks for watering the garden will increase water efficiency.

Further information

The Energy Saving Trust has developed an impartial guide to help homebuyers identify hidden and unexpected costs when viewing a property. <http://www.est.org.uk/myhome/moving/>

5.3

What to

look out for

You may wish to consider the following when buying a new home:

- What is the Energy Performance Certificate rating of the house?
- Quiz the vendor about their energy expenditure. Has the property been sufficiently insulated? Are energy efficient appliances included in the asking price? Opting for a well-insulated property which is fully equipped with energy efficient appliances means that your home will be cheaper to heat, light and power, saving you up to £200 each year on your energy bills.

What are SAP Ratings?

SAP (Standard Assessment Procedure) ratings allow comparison of the energy efficiency of properties based on the heating and hot water systems and the fabric of the building. Using energy ratings, homeowners can consider energy efficiency factors when buying new homes or refurbishing existing ones.

- SAP is the UK Government's standard method for energy rating in the home
- The SAP scale runs from 1 (least energy-efficient) to 120 (extremely energy-efficient)
- A score of 80 or more represents a very energy efficient home; all new-build homes should have a SAP rating of 80 or more.

- A reliable and robust central heating system is an important factor. Ask your vendor the age of the existing boiler. If it is older than 15 years it will most likely need to be replaced. Look out for high efficiency heating systems when you are viewing properties. They can save you up to 32% on your fuel bills.
- Is the property the right size for your needs and for the number of people who will be living there? A large house inhabited by only one person will be expensive to heat and power.
- What is the energy efficiency rating of your new home? Since 1995, new homes are required to have an energy rating by law. If an energy rating is not available, call your local Energy Efficiency Advice Centre on 0800 512 012 for details of Standard Assessment Procedure (SAP) assessors in your area.
- Is the property located near to public transport links? Does it have space for cycle storage or will you be dependent on the car?
- Has the property been fitted with water efficient appliances, such as low flush toilets and spray taps?
- Is there space in the property for recycling bins or boxes?

5.4

Buying new

from a

developer

If you are buying a new build property directly from a developer, you may wish to ask whether the property has received an EcoHomes or Code for Sustainable Homes rating. EcoHomes is an environmental assessment method developed by the Building Research Establishment (BRE), which has since been replaced by the Code for Sustainable Homes. For EcoHomes all house types on a site are considered and the award is given for the whole development. However for the Code for Sustainable Homes each dwelling is assessed separately. They both consider the broad environmental concerns of climate change, resource use and impacts on wildlife and they award the following overall ratings:

EcoHomes “Very Good” is roughly equivalent to a Code for Sustainable Homes Level 3.

Seven categories are considered for both of the rating systems:

- Energy
- Water
- Materials
- Surface Water Run-Off (Code for Sustainable Homes)/ Transport (EcoHomes)
- Pollution
- Health and Wellbeing
- Ecology and Land-Use

EcoHomes	Code for Sustainable Homes
Fair	Code Level 1
Good	Code Level 2
Very Good	Code Level 3
Excellent	Code Level 4
	Code Level 5
	Code Level 6

Further information

For more information about EcoHomes and the Code for Sustainable Homes visit:

http://www.breeam.org/page_1col.jsp?id=54



6

Improving

your home

6.1

Building

extensions and

loft conversions

The environmental impact of a building can be improved in many ways without carrying out a full refurbishment. Many opportunities arise as we gradually repair, extend and rebuild parts of our homes. Building an extension or converting a loft space prompts a number of important considerations with regard to sustainable design.

6.1.1 Location and positioning of buildings

'Passive Solar Energy' design involves designing buildings to optimize use of energy freely available from solar heat, daylight and wind, thereby minimising the need to provide heating, lighting, ventilation and cooling by artificial means:

- Position your extension so as to avoid cutting out natural sunlight to both the rest of your home and your neighbour's home.
- Wherever possible use skylights and windows on southerly facing elevations. This brings more light and free warmth into your extension. You may wish to consider the use of a SunPipe, where the light that hits a clear plastic dome installed on your roof is intensified by a highly reflective tube and diffused into the space below.
- Minimise windows on northerly elevations or make them smaller; this will help keep out the colder northerly winds and reduce heat loss.
- The smaller the external surface area of the building and its window area, the less heat loss will occur. You can reduce the exposure of the extension to the external environment by employing unheated intermediate spaces (thermal buffers), such as a conservatory, porch, garage or draught lobby between the heated area and the outdoors.

Further information

- Building regulations require replacement windows to be double glazed, with low emissive (low-E) glass.
- Low-E glass has the added advantage of screening out the Sun's ultraviolet rays, which helps reduce fading of carpets and curtains.



6.1.2 Positioning and glazing of windows

Windows are a vital design consideration when building extensions. With careful positioning you can ensure that natural daylight and heat energy from the Sun through 'solar gain' is maximised and heat loss is minimised. The main function of windows in housing is to provide as much daylight as possible, while controlling heat loss:

- Make sure that the building's main windows face south and use double or triple glazing in airtight frames to prevent draughts. Argon filling will further decrease heat losses from the windows.
- Where possible, ensure windows on the north-facing sides are smaller: these do not get the Sun and are prone to cold northerly winds.
- To help natural ventilation in warm weather, you should be able to open windows easily. There should be sufficient ventilation to ensure condensation is avoided.

If you are replacing your windows, building regulations require the installation of double glazed windows with Low-E (low emissivity) glass, which has a special coating that reflects heat back into a room, providing a similar performance to that of triple glazing. Low-E glass has the added advantage of screening out the Sun's ultraviolet rays, thereby reducing fading of carpets and curtains.

! Important Information

- You need approval under the building regulations to replace windows and doors.
- Planning Controls can restrict the use of UPVC / metal frames, for instance in conservation areas and listed buildings.

6.1.3 Installation of sustainable energy measures

Sustainable energy is of vital importance when building extensions. More information on sustainable energy is found in Section 8.1 and 8.2, but the following provides a list of key considerations:

- Gas central heating is by far preferable to electric heating. While electric heating systems may be less expensive to install, they are more expensive to run and the CO₂ emissions associated with electricity usage are double those associated with gas. As of 1st April 2005 all new boilers installed must be high efficiency condensing boilers.
- Internal or External wall insulation installed during construction can provide a cost effective means of reducing fuel bills. There are a range of natural insulation materials available including Thermafleecel and Warmacel 100. See Section 6.1.7: Environmentally Friendly Construction Materials for further information.
- Double or triple glazing whilst not always financially beneficial when replacement windows are not required provides cost savings when installed during construction.

- Cavity wall insulation provides significant cost savings and should be included in an extension wherever possible.
- Insulation of doors and floors will ensure that adequate draft proofing is achieved.
- Low energy lighting should be incorporated in any extension, both internal and external.
- Renewable energy technologies, such as solar thermal or photovoltaic systems, can be installed most cost effectively when incorporated into extensions or loft conversions. See Section 8.2 for further information.

Further information

- For free, impartial advice on grants and discounted measures, contact your local Energy Efficiency Advice Centre on **0800 512012**

Did You Know?

- From 1 April 2005, the energy performance standard for new and replacement gas-fired hot-water central-heating boilers was raised. When you plan to install a new boiler or replace an existing one, you will need a condensing boiler to meet the higher standards for energy efficiency. For more information, read the Gas and Oil Central Heating Boilers: Advice to Householders guide that was produced by the Office of the Deputy Prime Minister (Now Communities and Local Government):
[http://www.energysavingtrust.org.uk/uploads/documents/housingtrade/HHIC%20Are%20you%20ready_%202%20\(3\).pdf](http://www.energysavingtrust.org.uk/uploads/documents/housingtrade/HHIC%20Are%20you%20ready_%202%20(3).pdf)



6.1.4 Conservatories

Conservatories can help reduce heat loss from existing walls and windows that they cover. However, they can also be a major source of energy loss, particularly if they are used as extended living accommodation in the winter or if mechanical cooling is required to counteract overheating during the summer months. To avoid this happening, always insulate the conservatory and separate it from the main dwelling with doors. The following key principles should be followed when constructing a conservatory:

- Construct your conservatory with at least double-glazing, insulated walls/ floors and insulated roof sheeting. This will lengthen the time in the day and year, which it is comfortable to use.
- If heating is provided, it has been proved in certain circumstances to double heating bills of a well-insulated new dwelling. If running off the house heating system, ensure you have isolators on your conservatory heating system to allow the heat supply to be shut off or reduced in the winter.
- Ideally, conservatories should face south and be free from overshadowing in order to provide acceptable lighting conditions throughout the year.
- You will need to provide high and low opening vents and blinds to help reduce overheating in the summer afternoons.
- Walls, windows and doors facing into the conservatory should be insulated to a high standard (see Section 8.1.2 Insulation).
- Always consider environmentally friendly materials when building and decorating the conservatory (see Section 6.1.7 and Section 6.2 for more information).

? Did You Know?

- Research has shown that if a conservatory is heated to the same extent as a normal room, this can double the heating bill of a well-insulated new home.

6.1.5 Installation of water conservation measures

Everyone uses water and lots of it. Hot weather and over-use can place pressure on existing water supplies in vulnerable parts of the country. Due to high population density in parts of the South and East of England there is less water available per person per year than in parts of Africa.

Plans for building new homes in the South East will put further pressure on the region's water resources. There will also be an additional environmental impact from the treatment and transportation of water all over the country.

Water saving measures

If the extension or renovation works to your home require new taps or toilets to be fitted, you are presented with the perfect opportunity to install water efficient appliances, such as spray taps or ultra-low flush toilets. Spray taps can save up to 80% of the water and energy used in standard pillar taps. By fitting a low flush or eco-flush, a device with high and low settings, you could reduce (drinking quality) water used to flush the toilet by up to 75%.

Grey water recycling

By using recycled grey water - wastewater from washroom basins, baths and showers (but not toilets) – for flushing toilets, we could save up to a third of water used in the home. While simple domestic systems are not yet readily available, the increase in the number of systems on the market is likely to gradually reduce the cost of installing a grey water recycling system. The running costs are small, being limited to costs for pumping and occasionally replacing disinfectant treatments.

Rainwater harvesting

Rainwater harvesting is the collection of rainwater that would otherwise have entered the drainage system, the ground or been lost to the atmosphere through evaporation. Large surfaces such as roofs are ideal for rainwater harvesting and the water captured can be used to flush toilets, water gardens/ landscapes and supply washing machines.

Since harvested rainwater is not suitable for drinking, it supplies toilets and outside taps through a separate pipe network. A control unit monitors the water level in the storage tank and can display this information to the user. If levels drop too low, the system switches to mains water supply; where levels become too high, an overflow trap allows floating material to be skimmed off to a storm drain.

? Did You Know?

- The average London Household consumes 150 litres (l) of water per person per day, or 54,800 l per annum. BedZED, an environmentally sound, energy efficient mix of housing and work space in Sutton has developed schemes to reduce household water consumption. Through its water saving schemes, such as the installation of rainwater collection tanks, water efficient washing machines and dual flush toilets, water consumption has been reduced to 33,200 l per person per annum.

6.1.6 Green roofs

Green Roofs are, in short, vegetated roofs, or roofs with vegetated spaces. They are also referred to as eco-roofs and roof gardens. Green roofs have been with us for centuries ranging from the hanging gardens of Babylon to the turf roofed dwellings of Ireland and Scandinavia. However, modern green roofs have largely developed in the last 50 years, with increasing sophistication to meet a growing range of needs.

The benefits of a green roof are numerous:

- Improves air quality
- Encourages biodiversity
- Helps to insulate your home
- Minimises surface water run off, reducing the pressure on urban drainage systems
- Helps to reduce the heat island effect (the warming effect in Cities like London due to high levels of hard-surfacing and air pollution)

6.1.7 Environmentally friendly construction materials

Choosing construction materials with low lifecycle environmental and toxicity impacts will improve air quality and health both inside and outside of your home:

- Timber is perhaps the most environmentally acceptable material used in modern construction. However, this only applies if it is from sustainably managed forests, for example carrying Forestry Stewardship Council (FSC) certification
- Lime Mortars are a viable alternative to cement and have been used for centuries. Lime mortars never set hard and can be easily cleaned off bricks for reuse
- Brick production is energy intensive. Therefore consider using old bricks wherever possible. Existing bricks removed during alteration works should be dressed and cleaned for re-use.
- Stone paving can often be sourced in recycled form from salvage yards. Avoid large areas of paving which will increase surface water run off into drainage systems. Consider the use of porous materials with holes for drainage. Lay surfaces at a gradient to allow drainage into soft landscaping areas.
- Aluminium products should be avoided if a material that uses less energy in production will perform the same task acceptably. For example, wooden windows should be chosen over aluminium.
- Glass requires a relatively large amount of energy to manufacture. Therefore, recycled products should be used wherever possible, e.g. glass gravel, glass tiles.

- Decking should make use of sustainable sources, such as timber certified by the FSC.
- Cement, as with brick, has an energy intensive production process and should be used sparingly.
- Stone aggregates should be used sparingly, as their extraction can have harmful environmental effects on landscape and biodiversity. Recycled/recovered aggregates can be easily sourced.

Once you have decided on your construction materials, try to adhere to the following principles when sourcing and disposing of them:

- Reduce quantities of materials you actually use. Be careful with your estimating to avoid waste.
- Avoid using materials that have been transported long distances.
- Minimise the amount of concrete used as it has a poor environmental record.
- Try to use recycled materials generated from deconstruction methods. For example, use bricks removed from existing walls, either for new internal walls or broken down as hardcore for floors or paving. Re-use sound timbers for studding.
- Use recycled materials from local suppliers wherever possible.
- Avoid burning of materials removed as part of the construction works.
- Find ways of recycling materials that you do not need. Find out where you can take recyclable materials or dispose of materials in appropriate recycling outlets.



Did You Know?

- 10 per cent of UK CO₂ emissions are generated through the production of construction materials

Environmentally friendly insulation materials

There are a range of natural insulation materials available from companies like the Green Building Store including:

- Warmcel 100 puts to good use paper, which would otherwise go to landfill. When, eventually, it is removed from a building, it can be recycled again or disposed of safely, without creating toxic waste or biodegradability problems.
- Thermafleece uses blended sheepswool from British hill sheep. This wool is often of low economic value, so the production of Thermafleece is renewable, recyclable and is promoting the economies of some of the poorest rural areas in the UK.
- CR Flax can be used in walls, roofs, floors and ceilings for both domestic and commercial buildings. It has good thermal properties, and includes no synthetic material.
- Isofloc is an environmentally-friendly thermal insulation material made from recycled newspapers which is used for filling roof, wall, floor and ceiling cavities.

Selecting window frame materials

Picking the right window frame is important as it contributes to the overall insulating effectiveness of your windows and prevents condensation arising from thermal (cold) bridging .

- Timber frames from a certifiable timber source are the best all round solution. Timber has better insulating properties and is a sustainable resource if taken from properly managed forests.
- Solid metal frames such as aluminium conduct heat quickly and should be avoided unless they contain a thermal break (insulation between the window frame and the outside wall).

The benefits of wood as a sustainable material in construction

- Natural, organic and non-toxic.
- Recyclable, biodegradable and waste efficient.
- Renewable – for instance, European softwood plantations are currently in surplus production with standing stocks of timber increasing annually by 252 million m³
- Wood is effectively a carbon-neutral material (even allowing for transport). Growing trees absorb carbon dioxide (CO₂) and produce oxygen; the carbon is stored for the life of the tree and the building. At the end of its serviceable life the wood can be recycled into new products or burned for energy as a substitute for fossil fuels.
- Sustainable, providing recognised harvesting principles and crop rotation techniques are used.
- Low embodied energy - converting timber into a usable building material takes far less energy and generates far fewer greenhouse gases than any other mainstream alternatives, such as aluminium, steel and concrete. Strength for strength, concrete uses 5 times, and steel 6 times more energy to produce than timber.
- Once installed, wood has excellent insulating properties and is extremely energy efficient, thereby greatly reducing the 'energy footprint' of a building, a gain which lasts for decades.
- Timber-framed houses are widely recognised as being top performers in acoustic efficiency.

- Plastic or Polyvinyl Chloride (PVC) frames can be low maintenance but are difficult to repair and dispose of.

PVC also has a number of negative environmental characteristics. As a chlorinated plastic, production and waste processes can lead to the formation of deadly toxic emissions. As well as generating significant quantities of low-grade waste in its manufacture, PVC also contains a range of toxic additives, including heavy metals, plasticizers, and hazardous oils that can further lead to contamination and health impacts.

Further information

- Look for the Forest Stewardship Council's (FSC) 'tick tree' logo. This proves the timber or wood product comes from a well-managed forest. It is the only independently certified wood mark for sustainability. www.fsc-uk.info

6.1.8 Creating space for internal recycling facilities

Around 23 million tonnes of our UK waste ends up in landfill sites every year. Huge amounts of materials like plastic and glass do not biodegrade, or at least not for hundreds of years. Those substances, which do break down, such as organic waste, degrade to form leachates, which are potent pollutants; alongside other chemicals and bacteria from rubbish, they can seep into the soil. Materials that degrade in landfill sites also produce methane – a so-called ‘greenhouse gas’, which contributes to global warming. The build-up of methane at landfill sites has also been known to cause additional risks, including subsidence and even explosions.

If you are extending your home, you may be able to incorporate a specific internal space for the storage of bins or boxes for the various packaging types.

A simple way to understand a green waste policy for the home is to remember the trinity of eco-rubbish: reduce, reuse (including repair), recycle – in that order. Top tips include cutting down on the levels of waste that you bring into your home by adopting a zero-tolerance approach to over-the-top packaging, using car boot sales and charity shops to keep the recycling wheel turning, and making use of kerbside recycling schemes operating in your area. Items that can be recycled either through kerbside collection schemes or recycling centres include:

- Aluminium – derived from bauxite; drink cans fetch the highest price of any recyclable packaging. Recycling cans saves 90% of the energy used in manufacturing new ones (and you are reducing the need for more bauxite mining, which is very damaging to Amazonian rainforests).



- Paper – paper to be recycled should be kept clean and dry. Paper, including junk mail, telephone directories that use white pages, Birthday and Christmas cards and wrapping paper, can be recycled either by taking it to paper banks or through collection services.
- Cardboard – all plastic must be removed from the cardboard before it can be recycled. Flattening cardboard boxes before putting them in collection boxes is a great way to save more space in the collection process.
- Glass – most glass containers can be recycled including jam jars, beer and wine bottles, and coffee jars. Glass can be taken to local bottle banks or collected in kerbside collection schemes, or save jars for a local community group (to make and sell jams and pickles).
- Plastic – plastic drink bottles are those most commonly recycled and can be turned into numerous products, including brand-name fleece jackets.

6.2

Decorating
your home

6.2.1 Choosing materials

There are so many 'sustainable' products now available that it is not difficult to find alternatives to decorating your home from top to bottom. From specialist companies with good product ranges to nationwide DIY giants, eco-friendly interiors have now become big business. A holistic, healthy, inspiring and nurturing living space should be well within your grasp.

Raw materials that can help improve our indoor environment include natural rubber, bamboo, hemp, wool, rattan and willow.

Choose your materials carefully, so that they do not harm your health and the health of the planet. Ensure that materials are:

- Clean or non-polluting
- Healthy (to humans and domestic animals)
- Sourced from renewable or abundant materials
- Natural
- Durable and recyclable
- Energy efficient
- Locally-sourced
- Design efficient

? Did You Know?

- Studies show that the indoor environment can be up to 10 times more polluted than outside, yet we spend 90% of our adult lives indoors.
- 90% of the internal surface area of buildings is typically covered with a synthetic (petrochemical) covering.

6.2.2 Paints and finishes

Some 350 million litres of paint are sold in the UK every year, and while we spend hours choosing colour schemes, we do not always think about the actual paint itself: is it environmentally friendly and is it safe?

Conventional paints and varnishes can include a host of allergy-inducing chemicals from solvents to synthetic resins. In particular, oil-based paints contain solvents, which contribute to air pollution.

There is a growing number of natural products on the market, which can help to prevent these effects, including natural paints, formulated to traditional recipes using ingredients such as linseed and orange oils, plant resins and mineral pigments.

Further information

- Choose paints and varnishes with the European 'flower eco-label'. To find out more visit www.eco-label.com



6.2.3 Flooring

If you are replacing your existing flooring, consider using timber products, such as linoleum (from linseed), cork, rubber with cellulose insulation, or other natural products such as grasses, straw, bamboo, and coir (coconut husks). Be aware that most woollen and synthetic carpets are dyed with synthetic dyes, made from a variety of chemicals and often have vinyl backing and/or underlay

Check to see if you can sand existing wooden floors – this can often be cheaper and of course minimises the need for waste. If you have to replace floorboards, try to find old or reclaimed floorboards from salvage yards. If you are replacing floorboards with new wood, ensure that the wood is from a sustainable source approved by the FSC.

The trend for wooden floors and open-plan living can often have a detrimental effect on living standards for our neighbours. There are two main aspects to sound when it comes to construction:

- Impact noise (footsteps, furniture scraping overhead)
- Airborne sound (such as loud stereos)

If you plan to lay wooden flooring or preparing existing floorboards, you should consider the future impact on your neighbours or those who live below you. There are various sound solution products available, such as barrier mats, which can be used on or under timber floors and cut with scissors as a DIY solution.

6.2.4 Wood

If your redecorating regime requires the use of wood, avoid tropical hardwoods (including plywood) unless they are from a sustainable source (FSC-certified). Use European softwoods, such as pine and birch plywood from sustainably managed forests. Providing any noise impacts on your neighbours or those who live below you are mitigated, you can also consider re-use of your existing wooden floorboards, which can be treated using natural oil and wax finishes, allowing the wood to breathe and helping to stabilise building relative humidity.

Further information

- Look for the Forest Stewardship Council's (FSC) 'tick tree' logo. This proves the timber or wood product comes from a well-managed forest. It is the only independently certified wood mark for sustainability www.fsc-uk.info



6.2.5 Plastics

Materials such as doors, windows and cabling contain plastic. Plastic is environmentally damaging from its production to disposal. It requires hazardous chemicals and releases harmful additives in production and creates toxic waste when disposed of. Seek to avoid using plastic items when paper or wood products can serve the same purpose.

Further information

- Visit the Greenpeace web site for more information on plastic alternatives:
<http://www.greenpeace.org/international/campaigns/toxics/polyvinyl-chloride/pvc-free-solutions>

6.2.6 Asbestos

Asbestos dust can cause asbestosis, mesothelioma and certain types of cancer for which there is no cure. All asbestos must therefore be considered potentially dangerous.

Asbestos materials have been put to many uses over the past century and have been used in a variety of locations within the home (as recently as 1999) including:

- Eaves gutters and rainwater fall pipes
- Garage and shed roofs
- Linings for walls, ceilings and doors
- Insulation panels in some storage heaters
- Bath panels
- Central heating flues
- Floor tiles

Further information

- You should not handle asbestos yourself, but should employ a licensed asbestos contractor. You can check whether a contractor is licensed by visiting the Health and Safety Executive website <http://www.hse.gov.uk/>



20

7

Improving

your garden

7.1

Front gardens

Photo: Courtesy of Royal Horticultural Society



A large number of householders in London have covered their front gardens with stone or asphalt in order to provide parking spaces for cars. This growing trend has given rise to a number of problems:

- Process is visually harmful and can make the street look bleak and unfriendly
- Can result in the loss of planting/ soft landscaping, including street trees if crossovers are proposed
- Can result in a loss of habitat, deterring birds, insects and other wildlife
- Can result in an increase in rainwater run-off, leading to an increase in the risk of flooding
- Can allow petrol, oil and other chemicals to wash directly into drains and pollute local watercourses
- Artificial surfaces can absorb more solar heat, increasing the heat island effect and exacerbating predicted effects of global warming
- Artificial and hard surfaces absorb less noise and dust
- The increased numbers of crossovers on the pavement can make it difficult for pedestrian movement
- Encourages more cars and more traffic

If it is essential that a car parking space be provided in the front garden area, you should ensure that the surface is made of permeable materials or incorporates infiltration techniques (Sustainable Urban Drainage Systems). When choosing materials for the driveway, consider porous or permeable materials that allow rain to seep through the car-parking surface. Suitable materials include:

- Gravel, crushed stone, grills, or bricks and paving that allow grass and plants to grow through. The choice of materials should be in keeping with those used for the building itself.

- Ensure that the layer below also allows water to drain through.
- Asphalt may be made acceptable by rolling a covering of suitable gravel, chipping or sand onto it.
- Concrete slabs, separated by a 0.8 metre grass strip are an alternative

Hard surface or paving should be laid only where it is needed for the vehicle tracks and pathways and at a gradient, so as to allow surface water to flow onto soft landscape areas rather than into storm drains. A cut-off drainage channel should also be incorporated into the design to stop surface water from discharging across the public footway.

It is essential that a planting scheme accompanies the works and that existing mature landscapes are retained and any damage repaired. This will reduce the visual impact of parked vehicles, encourage wildlife and absorb water and CO₂:

- Shrubs that are particularly suitable for front gardens include Laurustinus (*Viburnum tinus*), Forsythia, Lavender, Fishbone Cotoneaster, Mock Orange (*Philadelphus coronarius*), Firethorn (*Pyracantha*) and Honeysuckle.
- Trees include Golden Robinia, Mountain Ash (*Sorbus*), Common Almond, Crab Apple (*Malus*) and Hawthorn (*Crataegus*).
- Retain hedges as much as possible

7.2

Bicycle storage

The eco-friendly way of maintaining your personal mobility, scooting through city traffic and keeping fit is to get on your bike. However, for people who live in cities, cycle storage can be an issue.

Some lucky householders have garages or cycle storage built into their homes. Others resort to keeping bikes in their front gardens (where it may be prone to vandalism or theft), or in their living room (which is a pricey option when you consider the cost per square foot/metre of urban homes!).

If you have your own garden, a cycle shed may be the answer. Bicycle sheds can come with an easy-access up-and-over door and can be supplied flat-packed. Sheds sized at 6 by 3 ft can hold two bicycles and be discretely located in the front or rear garden. Most versions require that a concrete base be laid as a foundation.

Where outdoor space will not allow for a cycle shed, a security anchor screwed into the garden wall provides something to which a bike can be locked. Use one of these with a cycle cover and you have cheap, secure, outdoor storage. Alternatively, opt for a folding bike, which can sit under the dining table at home and under the desk at work. It is also the only bike allowed free on all forms of public transport.



Did You Know?

- In the year 2000, Londoners travelled almost 65 billion passenger-kilometres, of which almost 50 billion were attributed to road traffic (car, van, taxi, bus and coach)

7.3

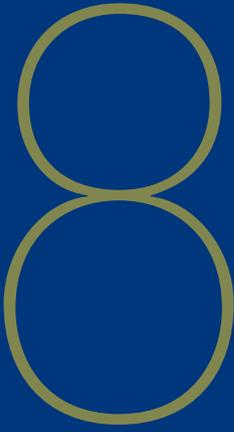
Water

conservation

in the garden

If you have a garden, you may find that your household uses 50% more water when it is hot outside. To keep your garden blooming and to save water, you could install a water butt to collect rainwater from the down pipes connected to your home's guttering. Rainwater is free and is proven to be better for your plants than mains water due to lower chlorine levels.





Conserving

resources in

your home

8.1

Energy

efficiency

Cut 10% off your annual bill by turning down your thermostat by one degree, lag your hot-water tank to save £15 a year, stop draughty gaps with newspaper, close your curtains at dusk to stop heat escaping, and you'll be in the money. Occasionally, it will be necessary to speculate in order to accumulate: energy efficient bulbs cost more to buy, but they last around 12 times longer than conventional bulbs and save £7 electricity per year per bulb (and avoid quite so many spent bulbs going to landfill). Tot it all up on your solar-powered calculator and you will find that the typical household can save up to £200 a year on their fuel bills - without losing either warmth or comfort - by simply using energy efficiently and effectively.

**Did You Know?**

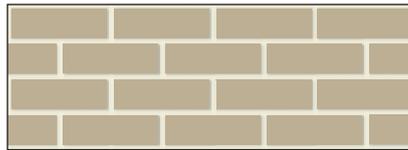
- The average home emits 6 tonnes of CO₂ per year (heating and hot water).
- Our homes' energy use contributes 30% of all CO₂ emissions in the UK.
- A typical household could save up to £200 per year through simple energy efficiency measures.

8.1.1 Simple, low (or no) cost measures

- Eliminate draughts and wasted heat with an easy-to-fix brush or non-PVC seal on exterior doors.
- Stop draughts and heat escaping through floorboards and skirting boards by filling gaps with newspaper, beading or sealant.
- Make sure your windows are draught-proofed.
- Hot water doesn't need to be scalding. Setting the cylinder thermostat at 60°C/140°F is fine for bathing and washing.
- Always put the plug in your basin or sink. Leaving hot water to run straight down the drain means throwing money away.
- Close curtains at dusk to stop heat escaping through windows.
- Always turn lights off when you leave a room and adjust your curtains or blinds to let in as much light as possible during the day.
- Avoid leaving appliances on standby; this wastes more energy than you would think.
- Don't leave the fridge door open for longer than necessary, as cold air will escape. Avoid putting hot or warm food straight into the fridge but allow it to cool down first.

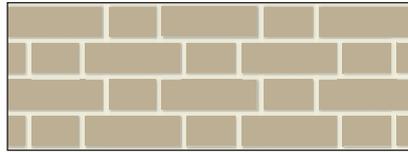
How do you know if you have cavity walls?

Typical cavity wall



Notice the different brick arrangements

Typical solid brick wall



- Defrost your freezer regularly to keep it running efficiently. If it frosts up quickly, check the door seal.
- Always wash a full load of clothes in your washing machine and use the low temperature programmes. Most modern washing powders are just as effective at lower temperatures (30-40°C). Wring out really wet clothes, or give them an extra spin, before putting them into a spin dryer or on the washing line. Don't forget – half load programmes use more than half the water and energy of full programmes.
- Avoid using a tumble dryer – it uses large amounts of energy.
- Try and use your dishwasher on low temperature programmes, and ensure you wash a full load.

Important considerations

- Ensure appliances, including cookers and boilers, have adequate ventilation to operate safely.
- Do not block existing vents - they are there for your safety.
- Make sure flues used by appliances are regularly swept and checked for blockages.
- For more information on safety visit www.co-gassafety.co.uk

8.1.2 Insulation

Whether you are moving into a new home or are an existing owner, it is worth checking if you have insulation in your cavity walls (if you have them), in the loft and floors. These insulation measures, alongside draught proofing, hot water tank and pipe insulation and double-, secondary or triple glazing, will significantly reduce your fuel bills.

There are a range of natural insulation materials available for use in your home that bring environmental and efficiency benefits. See section 6.1.7: Environmentally Friendly Construction Materials for further information.

Further information

- Grants are available - Call your local Energy Efficiency Advice Centre on **0800 512012** for free, impartial energy efficiency advice and information.

Cavity wall insulation

Un-insulated cavity walls cost you money. More heat is lost through walls than through any other part of the building. If your home has cavity walls that are not insulated, then they are rapidly leaking heat into the atmosphere. Cavity wall insulation is a quick, clean and relatively inexpensive means of addressing this issue.

Cavity wall insulation is injected into the cavity between the inner and outer leaves of brickwork that make up the external wall of your property. On existing homes, an installer will do this from the outside of your property by drilling holes and injecting the insulating material. There are a variety of different insulating materials, but all work in the same way: by combining with the still captive air, the insulation acts as a barrier to heat loss.

The material used will most likely be a mineral wool or polystyrene bead. It must be properly accredited as a building material, through guarantee by the Cavity Insulation Guarantee Agency (CIGA), and must be installed by a certified contractor. If you use a professional, the Cavity Insulation Guarantee Agency (CIGA) will guarantee the work for 25 years. To find out more visit the CIGA website at <http://www.ciga.co.uk/> or call **01525 853300**.

Cavity wall insulation will cost approximately £125-300 but will pay for itself in two to five years, the average fuel bill saving being £70 - £100 a year.

Did You Know?

- Around one third of all heat loss from the home escapes through uninsulated cavity walls.

Not only will cavity wall insulation help you save money and reduce heat loss, but your home will also feel much more comfortable. It will give your home a more even temperature, help prevent condensation on the walls and ceilings and can even help to prevent excessive heat building up inside your home during hot summer spells.

Loft insulation

It is a well-known fact that heat rises.

But did you know that 25% of the heat loss from your home could be escaping through your roof? This can be easily remedied: loft insulation will keep your roof's energy-leaking habits at bay.

Loft insulation is a very effective way of reducing your heating bills. By simply adding a layer of 250mm (10 inch) thick insulation, you can save wasted energy and money. You can even do it yourself. Why not talk to your local DIY store or builders' merchants for details?

Floor insulation

Your home can sometimes feel cold due to strong draughts, which rise up from gaps in-between the floorboards, or between the skirting board and floor. Investing in tube sealant (such as silicone), and filling these gaps can easily resolve this and will save you around £10 a year in heating bills.

Another means of reducing draughty floors is to insulate beneath the floorboards on the ground floor. As well as making the room feel warmer, it will save you up to £25 a year. However, you must remember not to block any under-floor airbricks in your outside walls. Without adequate ventilation floorboards and wooden joists will rot.

Most 'around the home' insulating work does not have to be carried out by a professional. It is often cheaper to carry out the smaller jobs yourself, using materials from your local DIY store.

	What does it cost? (DIY)	What will I save?
Under-floor insulation	From £100	£15-£25 a year
Filling gaps in-between	Around £25	£5-£10 a year

Draught-proofing

In an un-insulated home approximately 20% of all heat is lost through ventilation and draughts, so draught-proofing is a cost-effective way to reduce your heating bills.

To find out if your home requires draught proofing, you can apply the following test: hold the palm of your hand up against the windows. If you can feel cold air coming through, warm air is escaping; this is easy to fix. Most draught proofing materials are widely available from DIY stores, but take care to check the quality of the product, as this will affect its performance and durability. Make sure it conforms to the standard BS 7386.

There are several types of materials available - from brushes, foams and sealants to strips and shaped rubber or plastic.

! Important Information

- Ventilation is essential if you have solid fuel fires, gas fires or a boiler with an open flue.
- Ensure kitchens and bathrooms have sufficient ventilation to avoid condensation

It is important to remember that adequate ventilation is just as important as draught proofing. Without it, your home will become stale and stuffy and could suffer from condensation, dampness and mould.

Remember that ventilation is especially essential if you have solid fuel fires, gas fires or a boiler with an open flue. These heaters will consume oxygen from within the room – the same oxygen you need to breathe! If you do have these heating systems in your home, ensure that chimneys are swept regularly and check your airbricks for any blockages.

The rooms where you need most ventilation are usually kitchens and bathrooms as these are the places where most moisture is generated. Internal doors can be draught-proofed, but ensure kitchen and bathroom windows have sufficient ventilation to keep condensation under control. If you do have a problem with condensation, fitting an extractor fan will help. Also, close the door and open the window while cooking, running hot water or drying clothes.

Trickle vents in a window frame provide background ventilation, but do not usually provide sufficient ventilation on their own; they merely reduce the need to open windows that can be draughty.

Further information

- Grants are available - Call you local Energy Efficiency Advice Centre on **0800 512012** for free, impartial energy efficiency advice

Costs of fitting draught-proofing measures

Cost of fitting – by Installer	£85 - £110
Cost of fitting – DIY	From £40
Average Annual Saving on fuel bills	£10-£15
Costs recovered (Installer)	6-11 years
Costs recovered (DIY)	3-4 years



8.1.3 Energy efficient heating systems

Boilers are amongst the least energy efficient appliances in your home and account for up to a third of all domestic CO₂ emissions. As the current lifespan of a boiler is 10-15 years, making the wrong decision about what boiler to have could waste considerable amounts of your money and harm the environment.

A heating system that uses a high efficiency condensing boiler with the correct heating controls can save you as much as 40% on your heating bills.

Look out for the Energy Efficiency Recommended logo when shopping for the most energy-efficient products. Your local Energy Efficiency Advice Centre (EEAC) can give you guidance on the most up-to-date products on the market.

A high efficiency-condensing boiler is the most efficient boiler available. It converts more than 88% of the fuel it uses into heat, compared with around 72% for conventional boiler types.

? Did You Know?

- From 1 April 2005, the energy performance standard for new and replacement gas-fired hot-water central-heating boilers was raised. When you plan to install a new boiler or replace an existing one, you will need a condensing boiler to meet the higher standards for energy efficiency. For more information, read the Gas and Oil Central Heating Boilers: Advice to Householders guide produced by the Office of the Deputy Prime Minister (Now Communities and Local Government):

http://www.odpm.gov.uk/stellent/groups/odpm_buidreg/documents/page/odpm_breg_037023.pdf

High efficiency condensing boilers have either a larger or second heat exchanger, which saves the heat, which would normally escape up the flue. This reduces the temperature of the flue gases to a point where water vapour produced during combustion is 'condensed out'. Hence the name 'high efficiency condensing boiler'.

High efficiency condensing boilers are established products and can be fitted to most new and old heating systems. They are relatively easy to install and can be bought for oil- and gas-fuelled homes, even LPG (liquefied petroleum gas). These boilers are often no larger than conventional boilers. You can buy condensing boilers as either combination boilers (which heat up water on demand), or conventional system boilers (where a separate hot water cylinder is required).

The easiest way of telling whether your boiler is energy efficient or not is by checking how old it is. If it is between 10-15 years old, then it is likely to be a less efficient boiler. If your boiler is quite old, then replacing it with a new high efficiency condensing boiler (with the right heat output for your home), will save you around a third on your heating bills. If your existing boiler is 15 years old or more, or needs a major repair, then replacing it altogether will avoid wasted energy and expensive call outs. Similarly, if you are refitting your kitchen or bathroom, why not minimise cost and disruption by fitting a new high efficiency condensing boiler at the same time?

Condensing boilers can be put on the wall or on the floor. The boiler exhaust or 'flue' should be positioned away from the neighbouring property, and away from doors and windows, because the water vapour makes a slight 'plume' from the flue, similar to your breath on a cold day. If this isn't practical, you may be able to install a vertical flue through the roof or simply move the boiler. Building regulations apply to both boilers and flues.

As with other appliances, boilers are given an average seasonal efficiency rating from A to G. Before choosing a boiler, check its average seasonal efficiency; manufacturers should include this in the manual. There is a special rating scheme, called SEDBUK (Seasonal Efficiency of Domestic Boilers in the UK). Be sure to look for boilers that are recommended for their energy efficiency and to compare the efficiency of different boilers (old and new) using the SEDBUK Boiler Efficiency Database (www.sedbuk.com) or, ask your Energy Efficiency Installer for advice. The best available A-rated boilers are more than 90% efficient.

Ensuring most effective use of your heating system

- Install heating controls to control the temperature in different parts of your home. These could include an electronic programmer/timer, a room thermostat, and thermostatic valves on all of your radiators.
- Reduce the room thermostat setting: a 1° difference can save 10% on your fuel bill.
- Insulate the hot water cylinder and pipes: 3 inches (75mm) is recommended.
- Reduce the temperature at which the hot water is stored by using a tank thermostat and set it to 60°C to give you the hot water you need without wasting energy.
- Make sure all parts of the house are properly insulated and that doors and windows are draught-proofed.
- Fit reflective foil behind any radiators on outside walls.

? Did You Know?

- If everyone in the UK installed a high efficiency condensing boiler, we would save enough money to pay the entire annual fuel bills of over two million households.

Further information

- Always look for the Energy Efficiency Recommended logo
- Call your local Energy Efficiency Advice Centre on **0800 512012** for free energy efficiency advice (including grants)
- As with other appliances, boilers are rated for efficiency from A to G. See www.sedbuk.com for more information

Energy		Washing machine
Manufacturer Model		
More efficient A B C D E F G Less efficient		A
Energy consumption kWh/cycle (based on standard test results for 60°C cotton cycle) <small>Actual energy consumption will depend on how the appliance is used</small>		1.05
Washing performance <small>A: higher & lower</small>		A B C D E F G
Spin drying performance <small>A: higher & lower Spin speed (rpm)</small>		A B C D E F G 1400
Capacity (cotton) kg		5.0
Water consumption l		5.5
Noise (dB(A) re 1 pW)	Washing	5.2
	Spinning	7.0
<small>Further information is contained on product brochures.</small>		

8.1.4 Lighting and appliances

Lighting

In most homes, lighting accounts for 10 - 25% of the electricity bill. Simple tasks like switching off lights can save energy and money.

Energy saving bulbs / tubes - even though they have a higher initial cost – have a longer life span than equivalent regular bulbs and lower running costs: you can see a payback for your purchase within a year. It is estimated that if every household in the UK used one energy-efficient light bulb, we could switch off a whole power station. And it is not just about the energy saved, but the issue of spent lights in landfill: the contents of a single fluorescent tube, for example, can pollute up to 30,000 litres of water.

Choose good quality, energy efficient bulbs or light fittings (remember to look for the Energy Efficiency Recommended logo when you buy). Ensure that all external lighting is equipped with controls that turn the lights off in daylight and after a specific period of time or at lower light levels during darkness hours.

Appliances

Before purchasing appliances, always look for their Energy Efficiency Recommended logo (European energy labels). These help you to choose more efficient products which save you money. Most appliances are rated on a scale of 'A' to 'G' with 'A' being most efficient and 'G' the least. Normally these labels will show the energy/water consumed and for washing machines, tumble and spin driers the noise levels also. For further information contact your local Energy Efficiency Advice Centre on **0800 512 012**.



Important Information

- Energy saving bulbs may not work with electronic seasons, dimmers and timers - always check the instructions before purchasing.

8.1.5 A summary of savings from sustainable energy measures

Project	Yearly energy saving cost	estimated cost from	Payback** years
Detached house or bungalow			
Loft insulation (DIY)	£30	£170	7–12
Floor insulation (DIY)	£30	£100	3 – 4
Hot water cylinder insulation (DIY including pipework between boiler and water tank)	£15	£20	1 – 2
Draught stripping – DIY	£13	£40	3 – 4
– Contractors	£13	£125	8 – 15
Energy efficient light bulbs	£20	£20	1
Upgrade heating controls (eg room thermostat, heat control valves on radiators)	£75	£125	2 – 4
Gas or oil fired high efficiency boiler*	£45	£150	3 – 4
Cavity wall insulation	£130	£360	2 – 5

** Payback is the estimated number of years the project will take to pay for itself in reduced energy bills

* Item requires work or needs replacing anyway
Always consult an appropriately qualified person before undertaking any project. DIY assumes the correct level of skills.

Semi-detached or end terrace			
Loft insulation (DIY)	£15	£140	5 – 7
Floor insulation (DIY)	£20	£100	4 – 7
Hot water cylinder insulation (DIY)	£15	£20	1 – 2
Draught stripping – DIY	£13	£40	3 – 4
– Contractors	£13	£85	6 – 11
Energy efficient light bulbs	£20	£20	1
Upgrade heating controls	£55	£125	2 – 5
Gas or oil fired high efficiency boiler*	£35	£150	4 – 5
Cavity wall insulation	£85	£260	3 – 5

Mid-terrace			
Loft insulation (DIY)	£25	£130	6 – 9
Floor insulation (DIY)	£20	£70	3 – 5
Hot water cylinder insulation (DIY)	£15	£20	1 – 2
Draught stripping – DIY	£13	£40	3 – 4
– Contractors	£13	£85	6 – 11
Energy efficient light bulbs	£20	£20	1
Upgrade heating controls	£45	£125	3 – 6
Gas or oil fired high efficiency boiler*	£25	£150	5 – 8
Cavity wall insulation	£55	£210	3 – 8

Flats			
Loft insulation (DIY)	£35	£200	5 – 7
Floor insulation (DIY)	£15	£100	5 – 10
Hot water cylinder insulation (DIY)	£15	£20	1 – 2
Draught stripping – DIY	£7	£40	4 – 8
– Contractors	£7	£50	5 – 10
Energy efficient light bulbs	£20	£20	1
Upgrade heating controls	£35	£125	3 – 8
Gas or oil fired high efficiency boiler*	£20	£150	8

8.2

Renewable
energy

Renewable energy is energy that is derived from inexhaustible sources such as the wind, Sun, sea, or replaceable sources such as crops.

Why should you consider installing renewable energy measures at home? Because renewable energy does not deplete the Earth's resources, or pump out gases that harm the environment.

By using renewable energy sources alongside traditional forms of energy (used efficiently), you can positively help tackle climate change. In addition you can protect yourself from potential fuel price increases.

The types of renewable energy technologies available in UK and potentially suitable for integration with your home include:

- Solar water heating
- Solar photovoltaic (PV)
- Biomass (often wood fuel heating)
- Ground source heat pumps
- Small scale wind

Some people believe that renewable energy is too costly, but even on a modest budget you can do something very simple like switching to a green tariff from your energy supplier. When you sign up to a green tariff, your home's electricity will come from renewable sources, such as wind power. To find the best green tariff for you visit

<http://www.etheco.com/energy/ukpower/wepayyou.html>

**Grants Available**

- The DTI's Low Carbon Buildings Programme offers grants towards solar thermal systems, photovoltaics, wind turbines
- Contact CEN's Green Energy Centre on **020 8683 6683** for more information.

8.2.1 Solar water heating systems

Solar water heating systems gather energy radiated by the Sun and convert it into useful heat in the form of hot water. This technology is well developed, with a large choice of equipment to suit many applications. Solar water heating works alongside conventional water heating systems to provide hot water.

The benefits of solar water heating systems:

- It can provide almost all of your hot water during the summer months and between 50 to 70% year round.
- It will reduce your impact on the environment. The average domestic system can reduce CO₂ emissions by 0.25-0.5 tonne per year, depending on the fuel replaced.

**Important Information**

- You do not usually need planning permission unless the building is listed or in a conservation area. However, you should always call your local council's planning department to check.

Different types of system

There are two types of solar water heating systems: flat plate systems and evacuated tube systems. Evacuated tube systems are more efficient and therefore can be slightly smaller, whilst achieving the same output. The system which best suits your needs depends on a range of factors, including:

- Amount of South-facing roof space
- Existing water heating system (some combination boilers may not be suitable for integration with a solar water heating system).
- The budget that you have for the project
- If you have a flat roof evacuated tube collectors can be placed flush with the roof and are therefore not visible from the road – useful if you are in a conservation area

Solar water heating and your home

Solar water heating can be used for domestic water heating and also for larger scale applications such as swimming pools. A solar water heating system for domestic hot water comprises three main components:

- Solar panels - fitted to your roof they retain heat from the Sun's rays and transfer this heat to a fluid.
- Hot water cylinder - stores the hot water that is heated during the day and supplies it for use later.
- A plumbing system - made up of simple piping and a pump, which moves the fluid around the system.

Is my property suitable?

You will need between three to five square meters of Southeast- to Southwest-facing roof space that receives minimal shading during the main part of the day. Furthermore, your existing hot water cylinder will need to be replaced with a slightly larger, dual-coil cylinder.

Cost and maintenance

Costs vary due to a range of factors. The typical installation costs for flat plate collectors is £3,200 - £4,500 while an evacuated tube system will cost in the region of £4,000 - £5,500 before grants.

Alternatively, you can fit or build the system yourself. It can work out cheaper but will take longer and you will need a certain level of skill. However, you should bear in mind that DIY jobs are not eligible for grant funding and are subject to full VAT.

Solar hot water systems generally come with a 10-year warranty and require very little maintenance. An annual check by the householder and a more detailed check by a professional installer every 3-5 years should be sufficient (although you should consult your system supplier for exact maintenance requirements).

Typical savings are estimated to be around £70 per year.



8.2.2 Photovoltaic systems (solar electricity)

Solar Photovoltaics (PV) uses energy from the Sun to create electricity to run appliances and lighting. Contrary to common misconceptions, PV requires only daylight - not direct sunlight - to generate electricity.

How PV technology works

PV systems use cells (in modules) to convert solar radiation into electricity. The PV cell consists of one or more layers of a semi-conducting material, usually silicon. When light shines on the cell, it creates an electric field across the layers, causing electricity to flow. The greater the intensity of light shining on the cells, the greater the flow of electricity. Several cells are contained in a module and several modules make up an array.

PV systems generate no climate-changing gases, saving approximately 325kg of CO₂ per year for each kiloWatt peak installed (kWp - PV cells are referred to in terms of the amount of energy they generate in Standard Test Conditions).

PV arrays now come in a variety of shapes and colours, ranging from grey 'solar tiles' that look like roof tiles or slates, to panels and transparent cells that you can use on conservatory glass to provide shading as well as generate electricity.

! Important Information

- As with solar water heating, PV systems do not usually need planning permission unless your building is listed or in a conservation area. However, you should check with your local council's planning department.

Solar PV and your home

You can use PV systems on a building with a roof or wall that faces within 90 degrees of South, providing no other buildings or large trees overshadow it. If the roof surface is in shadow for parts of the day, the output of the system decreases. The roof must be strong enough to hold the extra weight of the modules, especially if the modules are going to be placed on top of existing tiles/slates.

You will need to ensure that a trained, experienced installer carries out the PV installation. PV modules generate direct current (DC) electricity so care is required.

Cost and maintenance

Prices for PV systems vary, depending on the size of the system to be installed, the type of PV modules used and the nature of the actual building on which the PV is to be mounted. The size of the system is dictated by the amount of electricity required or the space or budget available.

For the average domestic-sized system, costs are approximately £5,000- £8,000 per kWp installed, with most domestic systems usually between 1.5 and 3 kWp. PV tiles cost more than conventional PV modules and modules that are integrated into a roof (building integrated) are more expensive than those that sit on top (bolt-on). If you intend to have major roof repairs carried out, it may be worth exploring PV tiles as they can offset the cost of roof tiles.

Grid-connected systems require very little maintenance (as there are no moving parts), generally limited to keeping the modules relatively clean and that shade from trees has not become a problem. However, rain and wind usually keep the modules clean enough. The wiring and components of the system should, however, be checked periodically by a qualified technician.

For stand-alone systems, i.e. those not connected to the National Grid, further maintenance is required on other system components, such as batteries.



8.2.3 Biomass and wood fuel heating

Energy from biomass is produced from organic matter of recent origin. It does not include fossil fuels, which have taken millions of years to form. The CO₂ released during the generation of energy from biomass is balanced by that absorbed during the fuel's production. Biomass falls into two main categories:

- **Woody biomass:** includes forest products, untreated wood products and energy crops.
- **Non-woody biomass:** includes animal waste, industrial and biodegradable municipal products.

There are two main methods of using biomass to heat a domestic property:

- **Stand-alone stoves** providing space heating for a room:
 - Can be fuelled by logs or pellets (but only pellets are suitable for automatic feed)
 - Generally 6-12 kW in output
- **Boilers** connected to central heating and hot water systems:
 - Suitable for pellets, logs or chips
 - Generally larger than 15 kW

Stoves can achieve efficiencies of more than 80%. They are normally used to provide aesthetic value as well as background heating. Many wood-burning stoves act as space heaters only, but higher output versions may include an integral back boiler to provide space and water heating.

There are many domestic-scale log, wood-chip and wood pellet burning, central heating boilers available. Log-fired boilers require manual loading and may be unsuitable for some situations, whilst automatic pellet and wood-chip systems can be more expensive. Many boilers will dual-fire both wood chips and pellets, although the wood chip boilers will require larger hoppers to provide the same time interval between re-fuelling.

Is my house suitable?

You should think about the following if you are considering a biomass boiler or stove. An accredited installer will be able to provide more detailed advice regarding suitability.

- Storage space is needed for the fuel, with access for delivery and loading by a local fuel supplier.
- Flue: The vent material must be specifically designed for wood fuel appliances with sufficient air movement for proper operation of the stove. Chimneys can be fitted with a lined flue.
- Installation must comply with safety and building regulations (see Building regulations, Part J).
- Under the Clear Air Act (1956 et al.), exempted appliances only must be used in smokeless zones.
- Planning: If the building is listed, or in an Area of Outstanding Natural Beauty (AONB), then you will need to check with your local council's Planning Department before a flue is fitted.



Costs

- **Capital costs:** This generally depends on the type and size of system. Stand-alone room heaters generally cost £3000 fully installed. The cost for boilers varies depending on the fuel choice. A typical 15kW (average size required for a three- bed semi-detached house) pellet boiler would cost around £5,500- £12,000 installed, including the cost of the flue and commissioning. A manual log-feed system of the same size would be slightly cheaper.
- **Running costs:** Unlike other forms of renewable energy biomass systems will require you to pay for the fuel. Fuel costs are generally dependent on the distance of your home from your fuel supplier. If you have a supplier nearby, this will reduce the costs of the fuel considerably. As a general rule, running costs will be more favourable if you live in an off-gas (network) area.
- **Payback:** This will depend on the fuel being replaced and the type of wood fuel being used and will be more favourable in off-gas (network) areas. However on average a biomass boiler could save you up to £200 a year on your fuel bills



Grants Available

- Grants are available from the Low Carbon Buildings Programme
- <http://www.lowcarbonbuildings.org.uk/home/>
- 0800 915 0990
- For impartial information, call CEN's Green Energy Centre on 020 8683 6683.

8.2.4 Ground source heat pumps

Ground source heat pumps (GSHP) transfer heat from the ground into a building to provide space heating and, in some cases, pre-heating of domestic hot water. For every unit of electricity used to pump the heat, 3-4 units of heat are produced. As well as ground source heat pumps, air source and water source heat pumps are also possible.

Three options are available for the ground loop: borehole, straight horizontal, and spiral horizontal (or 'slinky'). Each has different characteristics allowing you to choose the most suitable solution for your property. Horizontal trenches can cost less than boreholes, but require greater land area. For slinky coil, a trench of about 10m length will provide for about 1kW of heating load.

How does the system work?

There are three important elements to a GSHP:

- Ground loop - comprises lengths of pipe buried in the ground, either in a borehole or a horizontal trench. The pipe is usually a closed circuit and is filled with a mixture of water and antifreeze, which is pumped round the pipe absorbing heat from the ground.
- Heat pump - although we may not know it heat pumps are very familiar to us - fridges and air conditioners are both examples. A heat pump has three main components:
 - Evaporator takes the heat from the water/refrigerant in the ground loop
 - Compressor moves the refrigerant around the heat pump and compresses the gaseous refrigerant to the temperature needed for the heat distribution circuit.
 - Condenser gives up heat to a hot water tank, which feeds the distribution system.

- Heat distribution system - consists of under floor heating or radiators for space heating and in some cases water storage for hot water supply.

Ground Source Heat Pumps and your home

You should think about the following if you are considering a ground source heat pump. An accredited installer will be able to provide more detailed advice regarding suitability.

- The type of heat distribution system: GSHPs can be combined with radiators but under floor heating provides a more optimum performance, as it works at a lower temperature.
- Is there space available for a trench or borehole to accommodate a ground loop?
- Is the ground material suitable for digging a trench or borehole (a ground survey may be required)?
- What fuel is being replaced? If it is electricity, oil or LPG the payback will be more favourable.
- Do you require a back up heating system?
- Is the system for a new building development? Combining the installation with other building works can reduce costs.

Costs and maintenance

The installed cost of a typical domestic 6-8kW system varies between £7,300-£11,800 plus the cost of the distribution system. The GSHP's efficiency is measured by its Coefficient of Performance (CoP) - the ratio of the number of units of heat output to each unit of electricity input to drive the compressor and pump. Based on current fuel prices, and assuming a CoP of 3-4, a GSHP can be a cheaper form of space heating than oil, LPG and electric storage heaters. It can, however, be more expensive than mains gas if your home is not adequately insulated. If grid electricity is used for the compressor and pump, then an economy 7 tariff usually gives the lowest running costs.

As with any heating system, regular maintenance of the heat pump will be required.



Grants Available

- Grants are available from the Low Carbon Buildings Programme:
- <http://www.lowcarbonbuildings.org.uk/home/>
- 0800 915 0990



8.2.5 Small-scale wind

Harnessing wind as a renewable energy source involves converting the power within a moving air mass (wind) into rotating shaft power, which in turn generates electricity. Modern wind turbines contain rotors fitted with aerodynamic blades, which utilise lift forces caused by the wind on the blades.

Wind energy resource

In the UK we have 40% of Europe's total wind energy resource, although it remains largely untapped, currently meeting 0.5% of our electricity requirements.

Power from the wind is proportional to the cube of the wind speed. Therefore relatively minor variations in wind speed can result in large changes in potential output.

Individual turbines vary in size and power output from a few hundred watts to 2-3 megawatts (as a guide, an electrical kettle uses approximately 2,000 watts or 2 kilowatt). Uses range from very small turbines supplying energy for battery charging systems (e.g. on boats or in homes), to turbines grouped on wind farms supplying electricity to the grid.

Small-scale wind and your home

Wind speed increases with height so it is best to have the turbine high on a mast or tower. Generally speaking the ideal location is a smooth-top hill with a flat, clear exposure, free from excessive turbulence and obstructions such as large trees, houses or other buildings. However, small-scale building integrated wind turbines suitable for urban locations are available to install in homes and other buildings.

Knowledge of the local wind resource is critical to designing a wind energy system and predicting output. The British Wind Energy Association web site allows download of information about local wind speeds by entering northing and easting coordinates.

Further information

- For free and impartial advice on local wind speeds, grants and accredited installers, call CEN's Renewable Energy Advice Service on **020 8683 6683**

Cost and maintenance

Systems up to 1kW will cost around £3000, however they are unlikely to produce enough electricity to ever offset their costs. Larger systems in the region of 1.5kW to 6kW would cost between £6,000 - £18,000 installed. These costs are inclusive of the turbine, mast, inverters, battery storage (if required) and installation, however it's important to remember that costs vary depending on location and the size and type of system.

Turbines can have a lifespan of up to 20 years but will require service checks every few years to ensure they continue to work efficiently. For battery storage systems, typical battery life is around 6-10 years, so batteries will have to be replaced at some point in the system's life.

£ Grants Available

- Grants are available from the Low Carbon Buildings Programme
- <http://www.lowcarbonbuildings.org.uk/home/>
- **0800 915 0990**

8.3

Saving water

Photo: Courtesy of Fibrestar Ltd



8.3.1 The importance of saving water

Water is a precious natural resource. Shortages can develop quickly during hot, dry periods, so we need to use water carefully to protect the environment and to meet demand now and in the future.

8.3.2 Water conservation

In 2003, the average household spent £245 on water. Households that had water meters spent only £209 a year. Consider asking your water company to install a water meter – they are required to do so (where feasible) for free. If you do not have a water meter your water bill is based on the rateable value of your property and has little to do with the amount of water that you actually use. Unless you have a household with 3 or more occupants, you are likely to save money on your water bill through the installation of a meter.



Important Information

- Don't pour oil, garden pesticides or paint down drains as this causes environmental damage. Contact your local authority to find a site where you can dispose of it safely.

The table below illustrates the approximate costs of everyday water usage in the home.

Action	Cost of Water (Approximate)	Extra Costs (Approximate)
Taking a shower	5p	9p to heat the water
Taking a bath	12p	19p to heat the water
Flushing the toilet	1p	
Using a washing machine	9p	19p to run the machine
Watering the garden with a hosepipe for one hour	78p	
Using a dishwasher	4p	15p to run the machine

8.3.3 Simple low (or no) cost measures

- Toilets use a great deal of water, accounting for 35% of domestic water use. Fit a hippo bag, full plastic bottle or any other item that will take up space in the cistern and displace a proportion of the water used for flushing or fit an eco-flush device with high and low settings
- If you are changing your taps, opt for spray taps
- When buying a new washing machine or dishwasher, check the efficiency label – the water consumption should be under 55 litres per cycle
- Washing machines and dishwashers are water guzzlers, so activate them only when they are full
- Don't leave a leaky tap to drip water
- Try not to run the tap when cleaning your teeth – it wastes water
- Use a bowl of water to wash fruit and rinse soapy dishes
- A 5 minute shower uses about 25 litres of water, a bath about 80 litres and a power shower 120 litres

There are also longer-term measures for the more serious water conservationist. For example, you could install a composting toilet. Alternatively, you could install a grey water recycling or rainwater harvesting system – see section 6.1.5 for more information.

Did You Know?

- Save up to 9 litres a day with a variable-flush handle or 'hippo' in your cistern
- Save up to 4 litres a day by replacing worn tap washers.
- Washing machines can account for 14% of total water consumption in the home.

8.3.4 In the garden

If you have a garden then you can find your household uses 50% more water when it's hot outside. There are many things you can do to keep your garden blooming and save water:

1. Give plants what they want. Water the roots and not the leaves
2. Try chopping the bottom off a plastic water bottle and inserting it into the soil so that the narrow end is directed straight to the roots. Pour water into the upturned bottle and down it goes to where it's needed
3. Water plants in the evening once the Sun has gone down. Less water will evaporate before it's had a chance to soak down to the roots
4. When the soil is moist, apply a layer of mulch or organic matter (such as fermented grass cuttings or compost) to the surface
5. Don't use a sprinkler! It can use up to 540 litres of water an hour. If you have to use a hose, use a seep hose, available from your water company. Fit a trigger-gun head to your hose so that you can turn the water off when you're not using it
6. Don't cut the grass too short - longer grass keeps moisture in the soil and stays green for longer.
7. Use water butts to collect rainwater from the downpipes connected to your house guttering. Rainwater can be better for your plants as it contains lower chlorine levels than mains water (and it's free!)

8.4

Minimising

waste

Every year, each Londoner produces over a tonne of waste. This is likely to be the equivalent of 200 black bin bags per resident. There are over 7 million people in London contributing between them a theoretical 1.5 billion black bags of rubbish each year.

Currently only 10% of this waste is recycled but studies suggest that up to 80% of average household waste can be diverted from the bin.

? Did You Know?

- Londoners consume approximately 94 million litres of mineral water per annum. Assuming all bottles were 2 litres, this would give rise to 2,260 tonnes of plastic waste. A bottle of Evian, the top-selling brand, travels approximately 760 km from the French Alps to the UK.

8.4.1 Reduce

Reducing how much waste we accumulate is the first step. This can be achieved by selecting items with the least packaging, and wherever possible, buying better quality items which last a lot longer.

- Store food in reusable containers to reduce the use of cling film and aluminium foil.
- Register with the mailing preference service at www.mpsonline.org.uk to cut down the amount of junk mail you receive
- Cut down on the amount of food that's wasted by preparing the right amount for meals
- By purchasing a 'bag for life' from your local supermarket you can cut down on the amount of plastic bags used

8.4.2 Re-use

Think twice before putting things in the bin. A lot of what we throw away at home can be given a new lease of life.

- When improving your home consider reconditioning - do you need totally new kitchen units or just new doors?
- Take books, toys or clean clothes to a charity shop.
- Compost your kitchen and garden waste, some packaging is also now compostable (see below for more information).
- Give good quality magazines to your local doctor's surgery or dentist for the waiting room.

Further information

- The Mail Preference Service can be contacted on **0845 7034599**
FREEPOST 29 LON 20771 London W1E 0ZT
www.mpsonline.org.uk

8.4.3 Recycle

After reducing and reusing, the next best option is to recycle.

- Drop your cans, paper, glass bottles and jars off at local recycling banks as part of your regular shopping trips or at the council-run kerbside collection points
- Up to a third of the contents of your bin can be easily composted. If you cannot use composted waste at home in the garden, take your garden waste to your local Household Waste and Recycling Centre
- Glass, cans and paper banks will be available at most public recycling sites. Most Household Waste and Recycling Centres also have facilities for recycling engine oil, batteries and yellow pages. Some also have facilities for clothing, shoes, books, aluminium foil, and plastic bottles.

Further information

- To find your local recycling service enter your postcode into: www.recycleforlondon.com

8.4.4 Composting

Compost bins can be made using all manner of discarded materials such as old tyres, timber and wire mesh. You can construct a simple frame with old pieces of wood by nailing planks to posts knocked into the ground and covering with a piece of old carpet or plastic sheeting. If you'd prefer to buy a bin rather than making your own, you'll find good deals in garden centres, on the web or even through mail order.

Try to place the bin in a fairly sunny area of bare soil or grass. You can also break up the earth underneath to encourage drainage. During cold spells, you might need to use what's referred to as a 'natural activator', which means manure or bedding from vegetarian livestock such as rabbits, chickens or horses.

- In your chosen bin, make a base of 3-4" of woody material to encourage aeration.
- Alternate layers of green (nitrogen – grass, food scraps [wet], garden trimmings) and brown (carbon – fallen leaves, straw, dry newspaper strips) materials. Layers should be between 2-4". Chop up larger materials to expedite decomposition
- Whenever you add a food layer, sprinkle with soil and then finish with a brown layer to prevent smells and flies
- Mix bin contents often at least once every two weeks. This allows for air and gets the bin heating up again
- Moisture content should equal that of a wrung-out dishcloth. Only add water if the contents are very dry after mixing
- The pile will shrink. Keep adding to the bin until almost full. Place carpet or similar on surface of pile to retain heat and moisture
- The compost is ready to use when it looks like soil/ peat, after approximately two to three months. However, it is good to age it for another month

