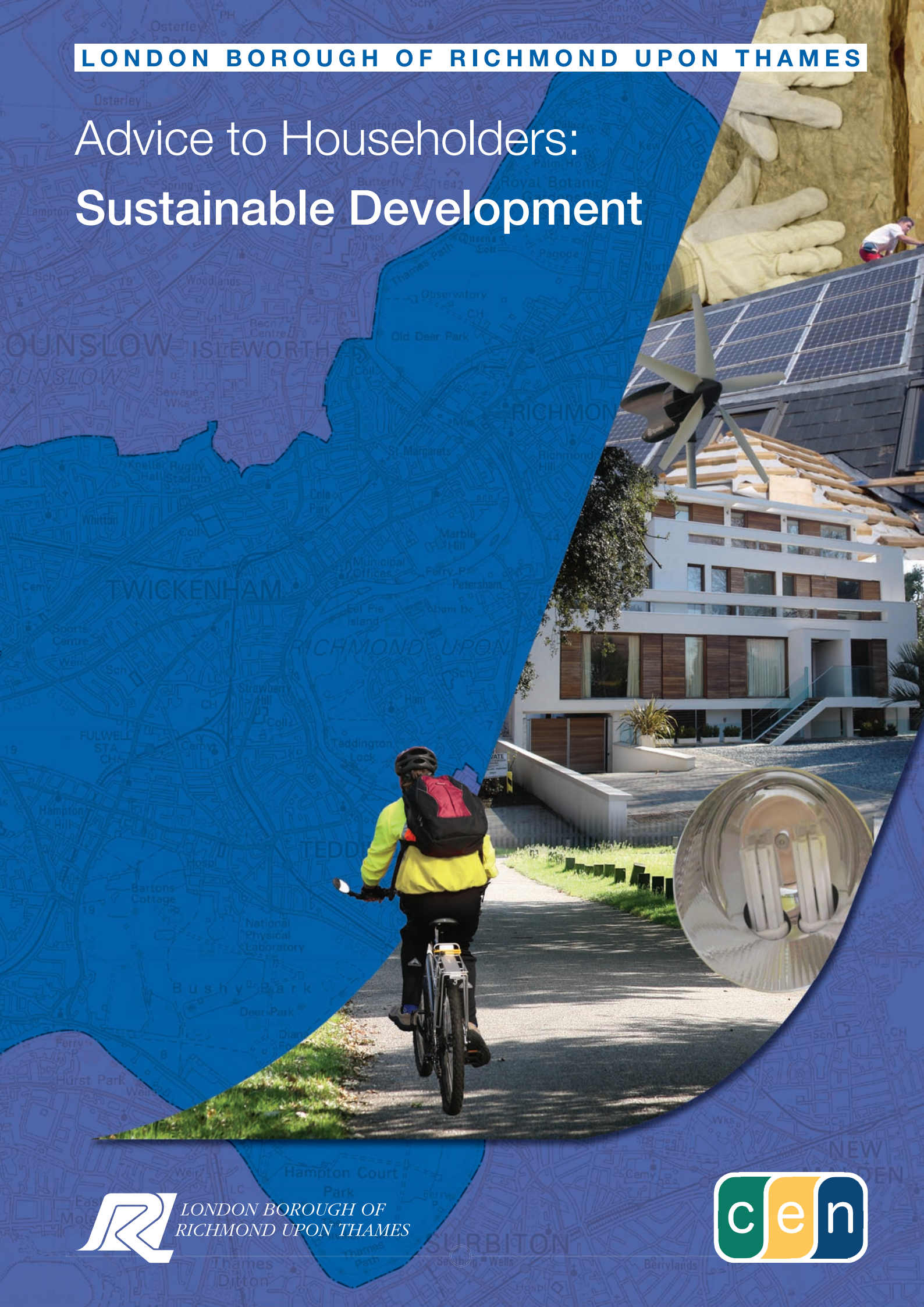


# Advice to Householders: Sustainable Development



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# INTRODUCTION

## PURPOSE AND SCOPE OF THIS DOCUMENT

The aim of this document is to provide guidance on how sustainable design and construction principles can be applied when building an extension or carrying out other external alteration works to your home.

### This guide addresses the following key areas:

- Appointing an architect and builder with 'green' credentials
- Energy efficiency
- Integration of renewable energy technologies
- Water conservation and sustainable drainage
- Sustainable materials specification
- Green/ brown roofs

It is not the aim of this guide to provide lengthy explanations for each of the above topics, but to list key measures and design considerations and signpost to other organisations for further support or to publications and web sites for further reading. The document is split into two sections as follows;

**Section one** lists the key steps that you can take to make your extension or alteration as sustainable as possible. Each 'step' is accompanied by recommendations on where to go for further support and information.

**Section two** advises on how you can improve the overall energy performance of your home and reduce potable water consumption through measures such as loft insulation, cavity wall insulation, rainwater butts and water efficient sanitaryware.

Appendix A provides a schedule of potential measures that can be undertaken and Appendix B provides a checklist we would encourage you to complete and return to us, in order that we can monitor the level of sustainable design and construction taking place in the borough. We will also use the checklist submissions to better understand the constraints facing homeowners who wish to upgrade and improve their homes in a sustainable way. You may wish to use the checklist (or parts of the checklist) as a design brief for your architect or builder. Appendix C comprises a glossary of terms.

## WHAT IS SUSTAINABLE DESIGN AND CONSTRUCTION?

A 'sustainable' approach is one that aims to provide the best outcomes for human and natural environments both now and for the future. In relation to design and construction, there is growing recognition of the negative environmental impact that the construction and renovation of our homes can have, and so the objectives of a sustainable approach include:

- Maximising the use of natural systems (e.g. sunlight for warmth and light)
- Conserving energy (through energy efficiency and use of renewable energy)
- Conserving water and minimising flood risk
- Selecting construction materials with low negative environmental impact
- Enhancing biodiversity through inclusion of features such as green roofs

For further information or support with the use of this document, please contact Creative Environmental Networks (CEN): Tel: 020 8683 6813



# I. EXTENSIONS AND EXTERNAL ALTERATIONS - ISSUES TO CONSIDER

## I.1 BUILDING DESIGN AND CONSTRUCTION PROFESSIONALS

If you have decided to make your construction project sustainable by design, you may wish to appoint an architect or builder with 'green' credentials. The following organisation can help you find architects or builders with knowledge and understanding of sustainable building design and construction:

- The Association for Environment Conscious Building (AECB), Tel: 01559 370908, [www.aecb.net](http://www.aecb.net)
- The Green Register of Construction Professionals, Tel: 020 7582 9191, [www.greenregister.org](http://www.greenregister.org)
- The Royal Institute of British Architects (RIBA) Client Services, Tel: 020 7307 3700, [www.riba.org](http://www.riba.org).

## I.2 ENERGY EFFICIENCY

One quarter of the UK's carbon dioxide emissions every year originate from the energy we use to heat and light our homes. When building an extension or converting your loft, you have the opportunity to exceed building regulation standards for energy efficiency, thereby saving carbon dioxide and money on fuel bills, and creating a more comfortable living environment.

The Energy Saving Trust manages the Energy Efficiency Best Practice Programme for Housing. This programme has produced a range of reference materials that provide up to date information on energy efficiency for domestic projects. Many of these publications are referred to in the table below and can be downloaded at [www.est.org.uk/housingbuildings/professionals/](http://www.est.org.uk/housingbuildings/professionals/).

Key areas to consider when designing and building an extension to your home include:

### Form and layout of building

– Can renewables be integrated into the design? Are exposed surfaces minimised to reduce heat loss.

**Glazing** – Is the glazing in the building sized and oriented to reduce heat loss while allowing light and heat from the sun to enter?

**Conservatories** – Is the structure well-insulated and separated from the main building? Could a "sun-room" be built instead?

**Insulation** – Will doors, windows, walls floors and roofs be insulated to high standards to reduce heat loss and save energy?

**Thermal bridging** – Is the building designed to minimise heat loss via areas of poor insulation?

**Windows and doors** – Will windows and doors allow you to; conserve heat in cold weather; help cool the building in summer; resist condensation; keep out wind?

**Ventilation** – Mechanical ventilation should be considered only when and where needed. Has passive or energy-efficient ventilation been considered?

**Heating system and controls** – Will a boiler with a fuel efficiency of at least 90% be installed? Will controls be installed to regulate use and ensure any unnecessary energy consumption?

**Lighting** – Will energy efficient lighting be used?

**Energy efficient appliances** – Will white goods with a high energy efficiency rating be installed?

## I.3 INTEGRATION OF RENEWABLE ENERGY TECHNOLOGIES

Renewable energy is energy derived from renewable or replaceable resources, such as the sun, wind, water and plant material. The building of a large extension may present an opportunity for the installation of renewable energy technologies. The table below lists these technologies. Information on indicative costs of systems and the grants available are provided in section 2.3.1.

Renewable energy should be integrated with energy efficient design and technologies for maximum benefit.

**Important: The potential to integrate renewable energy technologies is site specific (the presence of trees and other buildings can dramatically impair system performance) and expert advice should be sought from a consultant or qualified installer before proceeding with an installation.**



Your home may be suitable for installing the following technologies to provide a supply of renewable or low-carbon energy:

**Solar water heating** – A system of flat panels or vacuum tubes may be installed on a suitable roof to collect heat from the sun and provide 50-70% of annual hot water demand.

**Solar Photovoltaics (PV)** – These panels can be installed on a suitable roof and convert the sun's light into electrical energy which can be used in the home or exported to the national grid.

**Biomass heating** – Biomass refers to living and recently dead biological material that can be used as fuel. You could consider a stand-alone stove for space-heating of a room or a biomass boiler to supply central heating and hot water (where primary heating system is replaced). For small-scale domestic applications of biomass the fuel usually takes the form of wood pellets, wood chips or wood logs.

**Ground source heat pump** – A heat pump is a device that moves heat from one place to another. Generally, heat is moved from a low temperature source (in this case the heat stored in the ground at a relatively constant temperature) to a higher temperature heat sink, for example, a domestic heating system. Typically, one unit of energy can be used to move three units of energy to a heating system, so the amount of energy needed to heat the building is a lot less than it would usually be. In order to install such a system, you will need a suitably sized area of open ground or garden to house a ground loop.

**Air source heat pump** – Air source heat pumps use air outside the building as a source for heat. An air source heat pump can be fitted in a roof space or to the outside of a building.

**Wind turbine** – A wind turbine can be installed to harness the energy of the wind, converting it into electrical energy. Turbines can be mounted on a building or on a mast away from a building if sufficient space is available. It should be noted that the performance of building-mounted wind turbines is not proven and independent professional advice should be sought when considering installing one.

### 1.3.1 Indicative costs and grants for renewable energy technologies

Indicative costs of renewable energy technologies and the grants available are included in the main report and are



correct at time of writing. The availability, source and value of grants will vary over time. For up to date information on costs of and grants for renewable energy technologies, contact the Energy Saving Trust ([www.est.org.uk](http://www.est.org.uk)) on 0800 512 012.

The DTI's Low Carbon Buildings programme (LCBP) currently (at time of writing) provides grants for micro-generation technologies for householders, community organisations, schools, the public sector and businesses.

The aim of the LCBP is to give a more holistic approach to reducing carbon emissions by demonstrating combinations of both energy efficiency measures and micro-generation products in a single development. For more information about the programme, contact EST on 0800 512 012.

**Important: The installation of renewable energy technologies may be subject to planning permission. Contact the Council's planning department on 0845 612 2660 to find out whether your proposed scheme requires planning permission.**

## 1.4 WATER CONSERVATION AND SUSTAINABLE DRAINAGE

The South East of England is one of the driest parts of the country and experiences high levels of water demand. In some areas the existing balance of supply to demand is very sensitive, with demand close to exceeding currently available sustainable supply. This issue can be addressed through use of water efficient sanitaryware and through installing simple measures such as a rainwater butt.

30 - 40% of highly treated drinking water is flushed down the toilet. Rainwater harvesting systems capture rainwater from the roof of your home and once filtered the water collected can be channelled to your WC, washing machine or used for landscape watering. Grey water recycling systems collect waste water from sinks, baths, basins, showers and washing machines for reuse for non-potable purposes, usually for flushing WCs.

Covering driveways, gardens and patios with hard surfacing is increasingly popular, yet it prevents rainwater seeping into the ground, forcing the water to run off quickly into drains, or to pool on the surface. The cumulative effect of many small areas of impermeable surfacing has become an increasing problem across the borough. Sustainable Urban Drainage Systems (SUDS) allow rainwater to permeate

safely into the ground, helping to maintain groundwater levels and reduce flooding.

When carrying out renovations to your home or adding an extension, water-efficient sanitaryware that meets the following (or lower) specifications can be installed at low or no additional cost:

**WC** – 6/3 litre dual flush WCs

**Taps** – consider the use of a Tapmagic insert, which can be fitted to most taps with a round outlet hole or standard metric thread, or water-saving cartridges for single-lever mixer taps

**Shower** – Install reduced flow showers (<10l per minute) with thermostatic mixers

In addition, the following should be considered where more extensive work is being carried out:

**Rainwater harvesting** – Consider the installation of a rainwater harvesting system for internal and external tasks where mains water would normally be used but water processed to meet strict drinking water standards is not required (e.g. WC flushing, landscape watering and washing machines)

**Greywater recycling** – Consider the installation of a grey water recycling system to collect waste water from sinks, baths, basins, showers and washing machines for reuse for non-potable purposes, usually for flushing WCs

If you have a garden, a Rainwater butt can be installed regardless of whether work is being carried out on your house. This should be connected to a drainpipe to collect water for watering plants.

**SUDS** – If you are thinking of paving, or replacing your driveway, garden or patio, consider sustainable drainage by laying permeable paving that is simply designed with spaces between each block, to allow rainwater to pass through into the ground, rather than traditional impermeable surfacing.

**Important: From October 2008, you may require planning permission to lay impermeable hard surfacing outside your home. Contact the Council's planning department on 0845 612 2660 to find out whether you need to submit a planning application for your proposed works.**

## 1.5 SUSTAINABLE MATERIALS SPECIFICATION

The maintenance of a healthy economy requires an adequate supply of minerals and related products to support housing and commercial development and key infrastructure projects. However, materials used for construction of buildings

frequently cause environmental damage during their production. For example, quarrying damages landscape; wood can come from unsustainable sources; metals use significant amounts of energy in their production and PVC production results in atmospheric pollution. Reclaimed materials and products made from recycled material cause less environmental damage than new products and can also reduce refuse and land fill.

In order that the impact of construction materials on the environment is minimised, the following procurement hierarchy is often applied (where 1 is most desirable):

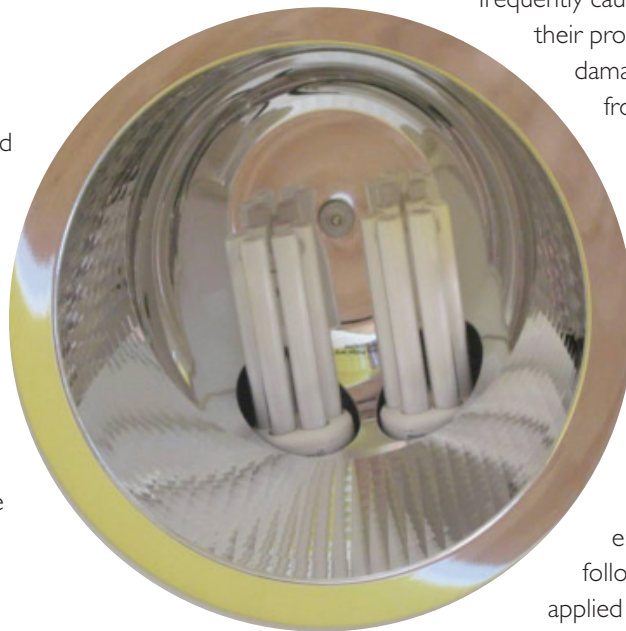
1. Reclaimed from on site demolition (e.g. reusing bricks as bricks)
2. Recycled from on site demolition (e.g. crushing bricks for sub-base use)
3. Reclaimed from other sites
4. High recycled content
5. Sustainable materials sources (e.g. natural insulation, certified timber, etc)
6. Materials with an "A" rating in the BRE Publication 'Green Guide to Housing Specification'

This hierarchy can be applied to all manner of building projects, from large-scale housing developments to small-scale projects undertaken by homeowners.

## 1.6 GREEN / BROWN ROOFS

Green or brown roofs are, in short, vegetated roofs, or roofs with vegetated spaces. They are also referred to as eco-roofs and roof gardens. They bring many benefits including:

- Reducing and managing rainwater run-off (thereby helping to prevent overloading of drainage systems and flooding)
- Improved thermal performance of building
- Reduction in sound transmission
- Improvement in air quality
- Reduction in the urban heat island effect
- Provision of habitat for native flora and fauna.



## 2. IMPROVEMENTS TO YOUR EXISTING HOME

**2.1** Where an extension or other external alteration works are being carried out to your home, why not consider opportunities to improve its overall sustainability? This section describes at a high level how you can improve the overall energy performance of your home and reduce potable water consumption through measures such as loft insulation, cavity wall insulation, rainwater butts and water efficient sanitaryware.

**2.2** There will be a phased implementation of the Home Information Pack (HIP) from 1st August 2007. An Energy Performance Certificate is now a compulsory part of the Home Information Pack (HIP). It provides a home energy rating from A to G, similar to those which already exist on consumer products like fridges, dishwashers, tumble-dryers and lighting. The Certificate not only outlines the costs of heating, hot water and lighting in homes, but also gives advice on how to cut these costs and reduce climate-changing emissions. An energy efficient home is likely to sell faster and also sell for more. Research by the Energy Saving Trust (EST) shows that buyers are willing to pay up to £10,000 more for an environmentally friendly house – and that 70% consider energy efficiency is important when buying a home.

**2.3** The Energy Saving Trust has produced an excellent guide entitled 'Domestic energy primer – an introduction to energy efficiency in existing homes GPG 171', which provides information on how home owners can identify opportunities for improving energy efficiency and the associated typical costs and savings. To download a copy of this guide, go to: <http://www.energysavingtrust.org.uk/housingbuildings/publications/>.

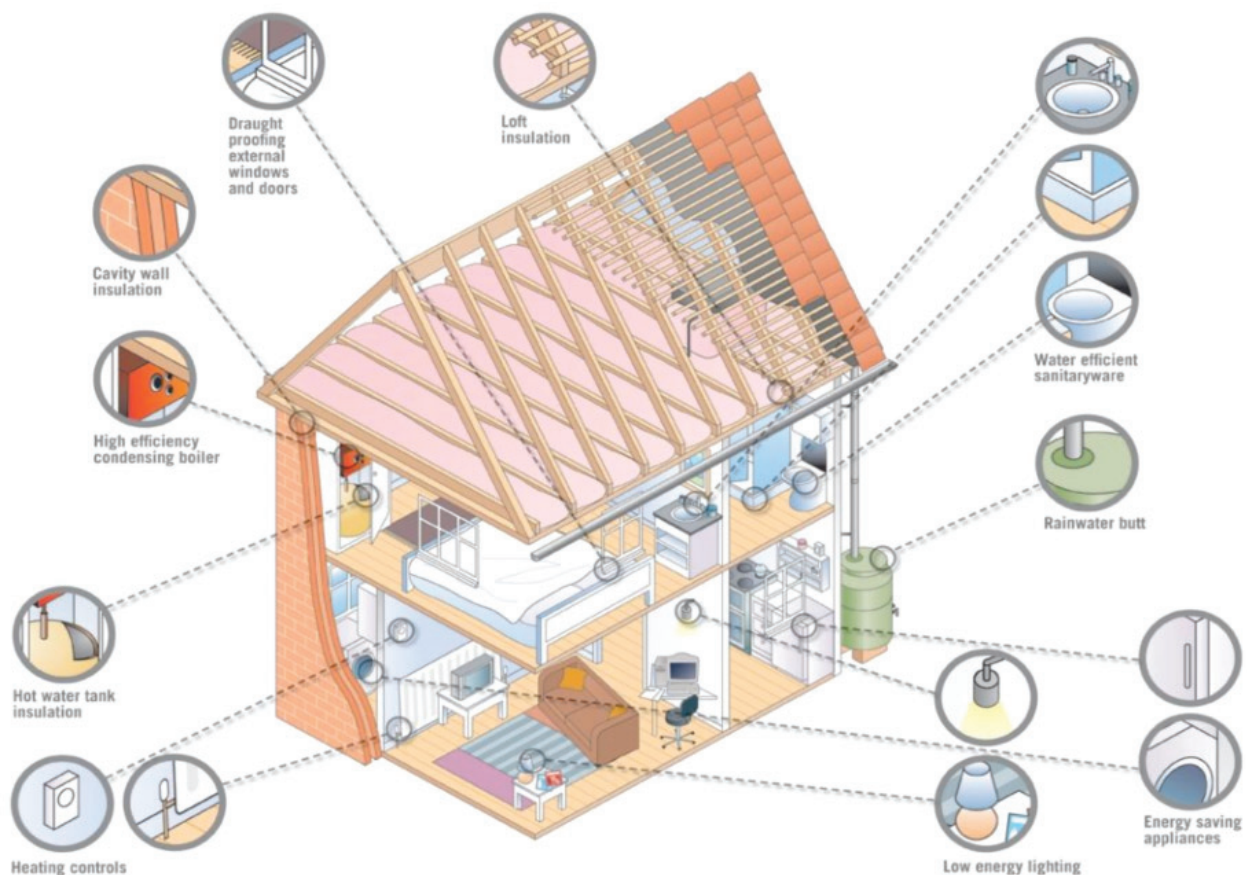
For further information and support contact the Energy Saving Trust on 0800 512 012, website: [www.est.org.uk](http://www.est.org.uk).

### 2.4 SUGGESTED IMPROVEMENTS ARE AS FOLLOWS:

**Loft insulation** – Around 30% of your heating costs could be escaping through your roof. A standard 270mm layer of loft insulation could save as much as £180 to £220 a year on fuel bills.

**Cavity wall insulation** – Cavity wall insulation is quick, clean and relatively cheap to do. It's a straightforward process performed from outside and only takes 3 hours for an average house. The annual savings on heating costs add up to between £130 and £160.

**Draught proofing** – By fitting simple draught proofing materials to your windows and doors yourself, you can save around £20 a year. You can draught proof floors by



applying a regular tube sealant to the gap, which will save you £10 to £20 a year. However, controlled ventilation (trickle vents, extractor fans, etc) are still needed in your home to prevent condensation and damp.

**Hot water tank insulation** – A thick insulating jacket for your hot water tank costs around £10, and could pay for itself in under a year. If your boiler already has a jacket, check the thickness. If it's less than 75mm (3 inches) thick, you'll save energy by replacing it or putting another jacket on top. Insulating hot water pipes, especially those between the boiler and the hot water cylinder, can save you an extra £10 a year.

**High efficiency condensing boiler** – If your boiler is more than 15 years old, replace it with a high efficiency condensing boiler. They waste the least amount of energy by converting around 90% of the fuel they use into heat, compared to 78% for older boilers. Replacing an old boiler could save up to a third on heating bills.

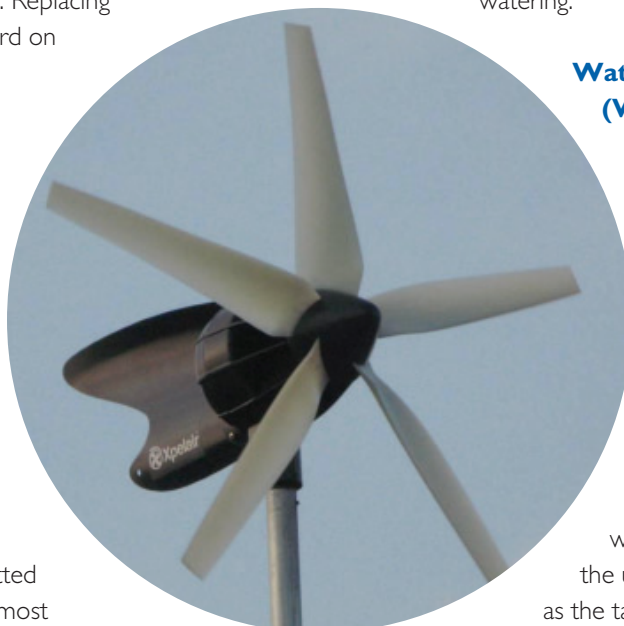
**Heating controls** – Installing heating controls, by adding automatic timer switches for heating and hot water, room and cylinder thermostats and thermostatic radiator valves, will cut running costs even further (up to £100 to £130 a year).

**Low energy lighting** – Low-energy lighting, using compact fluorescent lamps (CFLs), can be fitted at any time. Low-energy lighting is most cost-effective when fitted in rooms that are most often used e.g. living room, kitchen and hallway.

**Energy saving appliances** – Products (e.g. washing machines, dishwashers, fridges and freezers, lighting) that carry the Energy Saving Recommended logo have met strict criteria and use less energy than standard appliances. For an up to date list of recommended products and retailers visit the Energy Saving Trust web site [www.energysavingtrust.org.uk](http://www.energysavingtrust.org.uk)

The EU Energy label rates products from A (the most efficient) to G (the least efficient). The most energy efficient products also carry the Energy Saving Recommended logo.

**Rainwater butts** – Install rainwater butts to reduce mains water demand by collecting rainwater for landscape watering.



**Water efficient sanitaryware (WCs, taps, showers)** – Consider the use of a Tapmagic insert, which can be fitted to most taps with a round outlet hole or standard metric thread, or water-saving cartridges for single-lever mixer taps. The Tapmagic unit converts the flow of water into a spray reducing the flow from a standard tap outlet to 2 litres per minute in the low flow mode. However, unlike other water saving devices, it also enables the user to receive a full flow of water as the tap is turned on further.

Where you are replacing your bathroom sanitaryware, install 6/3 litre (or lower) dual flush WCs to reduce water consumption. Reduced flow showers (<10l per minute) with thermostatic mixers will reduce water consumption further.

**Sustainable Urban Drainage Systems (SUDS)** – If you are thinking of paving, or replacing your driveway, garden or patio, consider sustainable drainage by laying permeable paving that is simply designed with spaces between each block, to allow rainwater to pass through into the ground, rather than traditional impermeable surfacing.

**Important: From October 2008, you may require planning permission to lay impermeable hard surfacing outside your home. Contact the Council's planning department on 0845 612 2660 to find out whether you need to submit a planning application for your proposed works.**



### 3. GLOSSARY

**Air source heat pump (ASHP)** – Air source heat pumps use air outside the building as a source for heat. An air source heat pump can be fitted in a roof space or to the outside of a building to provide space heating for your home.

**Biodiversity** – Diversity among and within all living species in an environment.

**Biomass** – Organic matter, esp. plant matter, that can be converted to fuel and is therefore regarded as a potential energy source.

**Brown Roof** – Thin layer of crushed rubble and gravel, ideally obtained at minimal cost from the redevelopment site itself. They are intended to be gradually colonised by spiders and insects and provide a feeding site for insectivorous birds.

**Building Regulations** – Set of minimum standards which exist to ensure the health and safety of people in and around buildings as well as the energy efficiency of buildings.

**Carbon Dioxide** – Gas released during the burning of fuels. It acts as a significant contributor to global warming.

**Cavity Wall Insulation** – In most houses built after the 1920s, the external walls are made of two layers with a small air gap or 'cavity' between them. Filling this gap can significantly reduce heat loss through the walls.

**Deforestation** – The conversion of forested areas to non-forest land use such as arable land, pasture, urban use, logged area, or wasteland. Generally, the removal or destruction of significant areas of forest cover has resulted in a degraded environment with reduced biodiversity. It is one of the major causes of the enhanced greenhouse effect. Trees and other plants remove carbon (in the form of carbon dioxide) from the atmosphere during the process of photosynthesis. Both the decay and burning of wood release much of this stored carbon back to the atmosphere.

**Global Warming** – An increase in temperature of the Earth's atmosphere. It is caused when carbon dioxide and other greenhouse

gases are released into the atmosphere, trapping the sun's heat and causing the planet to warm up.

**Green Roof** – A roof that is partially or completely covered with vegetation and soil or a growing medium, planted over a waterproofing membrane. They have a number of benefits including increasing biodiversity, reducing surface rainwater runoff and helping to insulate and cool the building they cover.

**Ground source heat pump (GSHP)** – Only a few metres below the ground the temperature stays at around 11-12°C throughout the year. Using ground source heat pumps, this heat can be sourced to provide space heating in your home, and in some cases help pre-heat your water for your central heating system.

**Nitrous Oxides (NOx)** – These are emitted from the burning of fossil fuels and contribute to both acid rain and to global warming in the upper atmosphere. At ground level, they react to form ozone, a serious pollutant and irritant at low level.

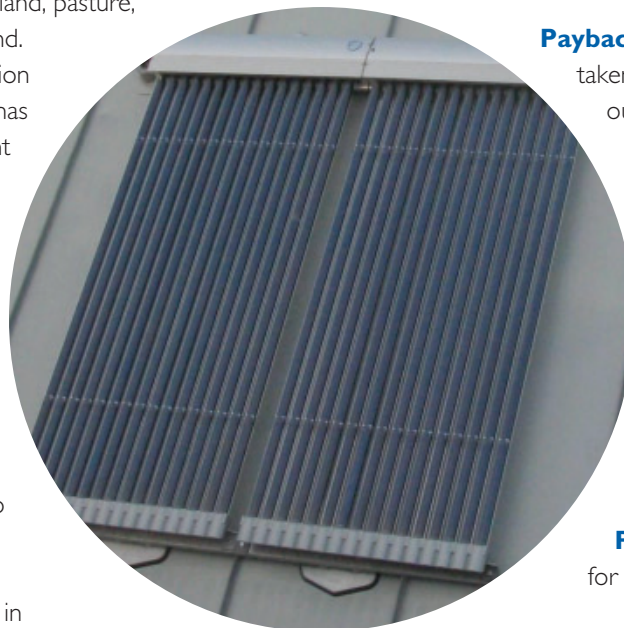
**Passive Stack Ventilation** – Whole house Passive Stack Ventilation systems are based on the 'Stack Effect'. This is the movement of planned air paths through the dwelling as a result of internal and external temperature differences and wind-induced pressure differences. PSV systems ventilate the whole house; extracts are sited in 'wet' rooms (e.g. kitchens and bathrooms, including en-suite) and ducted vertically to individual terminals sited on the roof. Wind induced pressure differences cause moist air in these areas to be drawn up the ducts to be replaced by fresh air entering through inlet vents situated in the walls or window frames of habitable rooms.

**Payback Periods** – The amount of time taken for savings accrued to equal or outweigh an initial capital investment.

**Photovoltaics (PV)** – Solar photovoltaic (PV) technology is a semi-conductor based technology that converts the energy in sunlight into electricity. A PV system comprises the PV panel (generator) and the wiring and electronics.

**Potable** – Fit or suitable for drinking.

**Rainwater Butts** – These collect rainwater for use in the garden.





**Renewable Energy** – Energy (electricity or heat) that is generated from resources that are replenishable and will not become exhausted.

**Solar Photovoltaic (PV) panels** – Solar PV panels convert the light of the sun into electrical energy that can be used in the home or exported to the national grid.

**Solar Water Heating** – Solar water heating uses heat from the sun to warm up a liquid that is pumped through a panel on your roof. In the most common kind of system, this liquid is then pumped through a coil situated in a hot water cylinder, where the heat is transferred to water.

**Sustainable** – Capable of being continued with minimal long-term effect on the environment and future generations.

**Sustainable Urban Drainage Systems (SUDS)** – SUDS comprise a variety of different measures that allow rainwater to permeate safely into the ground, rather than run off into surface water drains and waterways, thereby helping to maintain groundwater levels and reduce flooding.

**Thermal Bridges** – A thermal bridge is created when materials that are poor insulators come in contact with each other, allowing heat to flow through the path created.

**Urban Heat Island Effect** – Metropolitan areas often have a higher temperature than their surrounding rural areas. This is due to the prevalence of large concrete and paved areas which store heat during the day and release it at night.

**U-value** – This serves as a basis for determining transmitted heat loss. The lower the U-Value, the higher the insulation value.

**Wind turbine** – Wind power generation is the conversion of the kinetic energy in the wind to mechanical energy, which in turn is used to generate electricity.

