Energy efficiency planning guidance for
Holly Lodge Estate Conservation Area

Introduction

Executive Summary

Improving the energy efficiency of homes in the borough is desirable to Camden's residents for a range of reasons: to provide warm and dry homes that are comfortable and healthy for their inhabitants, to reduce the amount of disposable income spent on gas and electricity bills, and to contribute to global action on reducing greenhouse gas emissions that cause climate change.

Camden's built environment is of high quality and 75% of its developed areas are protected by conservation area status. This brings with it a responsibility to preserve and enhance its special character and appearance. The National Planning Policy Framework (March 2012) provides the basis by which the planning issues of conservation and environmental sustainability are jointly considered. This requires that 'great weight' is given to the conservation of these heritage assets as we support residents in the borough to make the transition to a low carbon future.

Because our response to the pressing need to reducing energy use must be sensitive to the borough's many areas of high environmental quality and heritage significance, this guidance has been produced to give detailed advice to homeowners within Holly Lodge Estate Conservation Area on how to take positive actions to improve the energy efficiency of their homes while also protecting the local distinctiveness of the area. This guidance focuses on homes because a significant proportion (over 25%) of UK greenhouse gas emissions come from heating and powering our homes.

The guidance shows that historic homes of the types found in Camden's conservation areas can be made more energy efficient, often through relatively minor and easy interventions, and still retain their special character and appearance. Where major energy efficiency measures are required, the guidance sets out how and where these are likely to be acceptable.

A structured approach is set out which homeowners should use to decide how and where to take action and allows for a consideration of the relative costs, impacts and benefits of a range of measures which will influence homeowners' choices.

Whilst the guidance is targeted at homeowners, it also recognises that Council tenants or leaseholders and private sector tenants and landlords will also wish to participate in improving the energy efficiency of their homes. Advice on measures that they or their freeholders may be able to carry out in their homes and on sources of grant funding for energy efficiency works are included in the appendices.

Acknowledgements

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Introduction

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SECTION 1. Why energy upgrade your home?

1.1 Our changing energy context

Climate change is already affecting people around the world. It is recognised that the burning of fossil fuels and the associated carbon dioxide emissions are key contributors to climate change and, to address this, the UK has committed to an 80% reduction in greenhouse gas emissions by 2050.

Over 25% of UK greenhouse gas emissions come from our housing through the energy that is used to heat and provide electricity to power lights and appliances in our homes. Improving the energy efficiency of our homes will therefore play an essential part in achieving national emissions reduction targets.

Camden has set its own borough wide carbon dioxide emissions reduction target of 40% by 2020. The Council's approach to meeting this target is set out in a carbon reduction study that can be found at **www.camden.gov.uk/greenaction**

The study highlights three key areas in which action needs to be focussed in order to achieve this target:

- Supporting programmes that help decarbonise the national grid, for example national and local renewable energy generation projects
- Significant energy efficiency improvements to over half of the c95,000 existing homes in Camden, alongside changes in the way we use our homes
- Combined heat and power (CHP) energy networks principally around commercial growth areas in Camden

For further information on how you can help Camden contribute to national climate change work please visit **www.camden.gov.uk/green**

1.2 Caring for our heritage

Camden benefits greatly from having a high number of historic buildings of significant quality which enhance the appearance and interest of its built environment, and many of these are listed or fall within conservation areas. The Council requires development in conservation areas to preserve and enhance the special character and appearance of the area.

The methods and materials used in the construction of traditional buildings are different to those used in modern buildings and they function differently, particularly in terms of how they absorb and release water vapour to help maintain a comfortable internal environment. However, in their unimproved state they are likely to have a lower energy performance due in part to uncontrolled ventilation through the building fabric. Sizable improvements to the energy performance of these buildings can be made, but a careful and considered approach must be taken which recognises the nature of their architectural and historic significance and understands the impacts of measures on the way the traditional construction works. An informed approach will ensure that beneficial energy efficiency measures do not cause damage to the building fabric or the appearance of the buildings and the area.

Regular maintenance and repair of traditional houses is an essential precursor to making energy efficiency improvements. It will ensure that building elements perform their best and will also prevent costly damage such as rot or mould growth. A useful maintenance checklist is available at **www.english-heritage.org.uk/your-property**

1.3 The Green Deal

The Government recognises the need for a step-change in the energy performance of our nation's existing homes and is targeting energy efficiency improvements to 7 million homes nationally by 2020.

To finance this programme, the Government will be launching the Green Deal programme in late 2012. Under the Green Deal, householders will be able to appoint a nationally accredited Green Deal provider to arrange installation of appropriate energy efficiency measures (such as insulation and double glazing) in their home at no up-front cost. The householder would effectively enter into a contract with the Green Deal provider to pay a charge for the measures on the basis that the charge would be less than or equal to the energy savings resulting from the energy efficiency improvements. The residents only pay the charge while they are in occupation and enjoying the benefits of the improvements; after they move, the charge is paid by the next occupants. The 'Golden Rule' is that annual repayments via the charge must never exceed the expected fuel cost savings associated with the improvements.

Further information on the Green Deal is available at www.decc.gov.uk/greendeal, www.camden.gov.uk/greendeal and in the Institute for Sustainability's Retrofit Guide A (see Appendices for reference).

Camden Council recognises that some energy efficiency measures can affect the character and appearance of the homes at which they are installed, and in the case of traditional buildings may have deleterious impacts on their fabric if not designed and implemented very carefully. It is particularly concerned to manage Green Deal delivery in Camden's conservation areas in a way that supports residents who wish to participate whilst also protecting our valuable architectural heritage.

Although we cannot yet be sure of the levels of Green Deal interest and uptake in Camden, we hope that this guidance will limit the potentially negative impact of uncontrolled Green Deal delivery on Camden's historic built environment.

Section 2. Making a low carbon retrofit plan

Unless you are planning major work to your home, improving its energy performance and turning it into a 'low carbon' home is likely to be a gradual process punctuated by minor interventions such as replacing a window or medium scale interventions made when re-roofing or updating heating controls when replacing an old boiler.

Regardless of the scale of intervention you are planning, it makes sense to establish a 'low carbon retrofit plan' for your home that considers the potential energy efficiency approaches you could employ alongside an assessment of the heritage significance of your home. By reflecting on these areas together, the retrofit solution is more likely to secure environmental benefits to your home in a way that is not detrimental to the character and appearance of the building or conservation area.

An important feature of any plan should be application of the 'energy hierarchy' principle. Broadly speaking, the principle prioritises lower-cost demand reduction and passive energy efficiency measures, such as insulation, over higher-cost active systems such as high efficiency boilers and renewable energy technologies. Were you to take the opposite approach and install the active and renewable systems first, those systems would be unnecessarily large and expensive.

Your plan should therefore adopt the following priorities:

1. Lifestyle and behaviour (turning off lights, closing curtains, etc)
2. The building fabric (draughtproofing, windows and doors, roofs, exposed floors, walls)
3. The building services (ventilation, heating, hot water and lighting)
4. Renewable energy (solar water heating, photovoltaics, heat pumps).

In practice your priorities will also be influenced by other factors such as ownership of the property, the availability of funding and opportunities that arise (e.g. installing roof mounted solar panels when re-roofing). The plan will provide a 'shopping list' of measures that are appropriate to install, as well as identifying interdependencies and opportunities that need to be preserved for the future. More information about making a plan may be found in the Construction Products Association's Guide to Low Carbon Housing Refurbishment (CPA 2010).

The following "Low carbon retrofit plan" framework can be used to achieve these objectives.

2.1 Initial assessment

An initial assessment of your home will help establish retrofitting opportunities which align with both the future plans for your home and the constraints of the conservation area setting. It typically follows these key steps:

- Assess the heritage significance of your home by reviewing the Holly Lodge Estate Conservation Area Appraisal and Management Strategy (**www.camden.gov.uk/planning**) and identify areas where change is unlikely to be acceptable. For example, if the elevations of your home have significant detailing in timber or tile which is of noted value in the considered Conservation Area Appraisal, introducing rendered external insulation to them is unlikely to be acceptable. The planning guidance in section 3 will also help you assess what is likely to be considered acceptable.
- Assess the condition of building fabric and building services to identify elements of your home that need repair, renovation or replacement and consider the linked opportunities. For example, if your boiler needs replacing introducing a solar hot water system at the same time is likely to produce savings across both technologies.
- Assess your home for opportunities for low cost energy efficiency measures that will not detract from the heritage significance of the property, for example, draught-proofing or low energy appliances.

2.2 Design stage – prioritising

Once you have completed the initial assessment and clearly defined the areas of your home where energy efficiency improvements can be made, the next step is to establish how to prioritise work.

Section 2. Making a low carbon retrofit plan

The best way to prioritise energy efficiency work is through the application of the energy hierarchy principle. The **energy hierarchy** prioritises lower cost demand reduction and passive energy efficiency measures, such as behaviour change, insulation and draught-proofing, over higher cost active systems like condensing boilers and renewable energy technologies.

Behavioural changes can significantly reduce your domestic energy use. Things to try include:

- Closing curtains (or shutters) at dusk.
- Turning off lights in rooms that are unoccupied or where there is good daylight
- Not leaving appliances such as televisions and computers on ‘stand by’ mode.
- Not leaving chargers for telephones, games consoles, etc, plugged in when not in use
- Ensuring that appliances such as washing machines are not run part-loaded.
- Reducing the duration of showers (perhaps by using a shower timer).
- Avoiding leaving taps running when washing up, shaving or cleaning teeth.
- Programming the heating to ensure that it is only on when it is needed.
- Lowering the heating thermostat setting slightly and wearing warmer clothes.
- Keeping doors closed between a cool conservatory and the heated part of house.

Often, **lower cost demand reduction measures** are also those that pose the least threat to the heritage value of the property. Examples include:

- insulation to roof spaces and suspended floors;
- flue dampers to open fireplaces - (closed in winter, open in summer);
- thermally lined curtains, blinds and window shutters;
- energy efficient lighting and appliances;
- draught-proofing to doors and windows; and
- hot water cylinder jackets and pipe insulation.

If you are planning to carry out work in your house and think this is a trigger for more expensive energy efficiency measures, do try and put the behavioural changes and lower cost demand reduction measures into action first, as this will help you to specify more efficient measures for your home.

As a general rule, low cost demand reduction and passive energy efficiency measures typical of the energy hierarchy tend to also have the best carbon cost-effectiveness. However in some instances, available subsidies and grants (such as the Government’s Feed-in Tariff for solar electricity panels or Renewable Heat Incentive for Biomass Boilers) alter the natural order by strengthening the financial case for traditionally higher cost active systems.

The **carbon cost-effectiveness** of a measure is the capital cost of the measure, less the lifetime fuel cost savings, divided by the lifetime carbon dioxide emissions savings). Understanding the carbon cost effectiveness of measures will help you decide which measures to install so as to get the most emissions reduction value for your money. Calculators such as that on www.T-zero.org.uk can help you make these calculations for your house and take into consideration its design and how you use it. The changing costs of both technologies and fuel costs means that the conclusions will vary over time.

The table below provides an overview of the approximate carbon cost effectiveness of a range of measures that are applicable in Camden. Once you have considered the likely impacts on the heritage significance of your home as set out in Section 2.1 above, the following table will help you to assess the likely costs and benefits of the measures that may be appropriate for your home.

Section 2. Making a low carbon retrofit plan

Carbon cost-effectiveness of retrofit measures

Technology	Capital cost	Carbon Dioxide Emissions Reduction benefit	Subsidy available	Carbon cost effectiveness with subsidy
Solar PV panels	**£ £ £ £** £	★☆☆☆☆	Feed in Tariff	High
Solar thermal panels	**£ £ £** £ £	★★☆☆☆	Renewable Heat incentive	Medium
Air source heat pumps	**£ £ £** £ £	★☆☆☆☆	Renewable Heat Incentive – in some cases	Low
Biomass heating (stoves and boilers)	**£ £ £** £ £	★★☆☆☆	Renewable Heat Incentive – in some cases	Low - Medium
Wind turbine	**£ £ £** £ £	★☆☆☆☆	Feed in Tariff	Low
Domestic Combined Heat and Power (CHP)	**£ £ £ £** £	★★☆☆☆	Feed in Tariff - limited	Low
Solid Wall insulation (Internal/External)	**£ £ £ £ £**	★★★★★	Energy company obligation (ECO)	Medium
Double glazing	**£ £ £ £** £	★★☆☆☆	Green Deal	Low – medium
Secondary glazing	**£ £ £** £ £	★★☆☆☆	No	Low - medium
Loft insulation	**£** £ £ £ £	★★★★☆	Energy Company Obligation	High
Floor insulation	**£ £ £** £ £	★★★★☆	Green Deal	Medium - high
Condensing boiler	**£ £ £** £ £	★★☆☆☆	Green Deal	Low - medium
Draught-proofing	**£** £ £ £ £	★★☆☆☆	No (but practical assistance may be available from local Transition initiatives)	High
Other minor measures	**£** £ £ £ £	★★☆☆☆	Varies	High

2.3 Implementation

The performance of any measure and its impact on energy efficiency in your property will depend on the quality of the installation and the occupants' behaviour. As with any building project, we recommend that independent professional advice is sought before any works begin. Each energy efficiency measure has its own risks and counter mitigation and these are set out in more detail in the Technical Guidance section, overleaf.

Section 3. Seeking Planning Permission

You may need to obtain planning permission for some energy efficiency works prior to carrying them out. The following table in 3.1 sets out what does and does not need planning permission.

The guidance in 3.2 gives advice on how to design your work so that your planning application is successful.

3.1 What requires planning permission?

Energy Efficiency Measure	Is planning permission needed?	Comments
External Wall Insulation	YES	
Internal Wall Insulation	NO	
Window repair/ draught proofing	NO	
Secondary glazing	NO	
Double Glazing	**Dwellinghouse - NO, if it complies with the following condition:** • materials of new windows are to be of similar appearance to the existing ones **Flats - YES**	UPVC or aluminium are not considered to be of a similar appearance to timber. If your works do not comply with the conditions then planning permission is required.
Porch	**Dwellinghouse – NO, if it complies with the following condition:** • the ground area (measured externally) of the structure would exceed 3 square metres; • any part of the structure would be more than 3 metres above ground level; or • any part of the structure would be within 2 metres of any boundary of the curtilage of the dwellinghouse with a highway. **Flats- YES**	If your works do not comply with the conditions then planning permission is required.

Adding a door to an existing porch	**NO, if it complies with the following conditions:** • the materials shall be of a similar appearance to those used in the construction of the exterior of the existing dwellinghouse; **Flats - YES**	If your works do not comply with the conditions then planning permission is required.
Mechanical ventilation with heat recovery (MVHR)	**NO**	
Solar panels **PV & hot water** **Attached to a building (main or one in curtilage, for example on a garden shed)**	**NO, if it complies with the following conditions:** • It is not on a main or side wall where visible from the highway • It does not protrude more than 200mm from the roof slope or wall • It is no higher than the roof line (excluding chimney) • It is sited, so far as practicable, to minimise its effect on the external appearance of the building and the amenity of the area • Solar panels no longer needed for microgeneration shall be removed as soon as reasonably practicable.	If your works do not comply with the conditions then planning permission is required.
Solar panels **PV & hot water** **Free standing (for example in a garden)**	**NO, if it complies with the following conditions:** – No more than one panel/array – No higher than 4m above ground level – Not visible from the highway – Not within 5m of the property boundary – Area of panels not to exceed 9m2 – Any single dimension of an array not to exceed 3m	If your works do not comply with the conditions then planning permission is required.

Air source heat pumps	**YES**	
Ground source heat pumps (Vertical and horizontal)	**NO**	
Biomass heating system, including wood-burning stoves **Combined heat and power system**	**NO, if it complies with the following conditions:** - Flue not to exceed highest part of the roof by more than 1m - boiler/stove is to be an 'exempt' appliance or authorised fuels are to be burnt, as required by the Clean Air Act	A list of 'exempt' appliance and authorised fuels can be found on the smoke control section on the DEFRA web-site If your works do not comply with the conditions then planning permission is required.

To find out whether planning permission is required for other works please visit **www.planningportal.org.uk** or **www.camden.gov.uk**.

This guidance relates only to unlisted buildings. If your home is listed all of the measure mentioned above (except freestanding solar panels) will also require listed building consent. Further advice may be sought from the planning department.

3.2 Planning Guidance

When considering planning applications for works to homes in conservation areas, the Council will consider the impact of the proposal on the heritage significance of the building and area and any harm to it will be weighed against the public benefits of the proposal.

The heritage significance of the building and area

The heritage significance of the buildings, spaces and views which together make up the valued character and appearance of Holly Lodge Estate Conservation Area is set out in the Holly Lodge Estate Conservation Area Appraisal and Management Strategy. This sets out what is special about the area and gives guidance as to how this should be preserved or enhanced.

Holly Lodge Estate is a product of the pioneering early 20th century garden suburb movement. The street layout and use of the south facing slope to dramatic effect, profusion of green landscaping in public and private areas and incorporation of former landscaping of Holly Lodge House, the distribution of varied house types in an English vernacular idiom with a wealth of architectural detailing all contribute to the rich and high quality character of the estate.

The impact of the proposal on the heritage significance

The impacts of energy efficiency measures on the heritage significance of the building or area can be visual and/or physical.

The extent of visual impact revolves around how far from the existing palette of materials and detailing the proposal goes, and the extent to which it is visible. It is important therefore to consider the design, materials and siting of measures carefully so as to minimise this impact.

The physical impact will vary depending on the measure and how it is installed. Some measures may require the removal of historic fabric (e.g. historic joinery, roof slates, lime plaster) or may have a detrimental impact on fabric if not installed with due care (all internal insulation must be designed to allow the passage of air and moisture through the building to prevent condensation and rot of timbers, for instance).

These impacts may be possible to reverse at some point in the future (e.g. the removal of solar panels from roofs at the end of their lifespan) or permanent (such as the application of external solid wall insulation). Reversible measures may have significant visual impact in the short to medium term, but they leave open the opportunity to amend this in the event of future technological or design advances. Permanent measures cause irreversible change to the fabric and/or appearance of the building so it is essential that these are very carefully designed and installed.

Public benefit

Energy efficiency measures or renewable energy technologies may generally be said to benefit the wider public by virtue of the contribution that they make to the reduction of carbon dioxide emissions and minimising the risks of climate change. Measures will vary in their contribution to reducing carbon dioxide emissions depending on their materials, manufacturing processes, transportation, and effectiveness on site. However, installing measures in the right order is essential if the greatest emissions reduction is to be achieved: installing a highly efficient new boiler will only result in emissions reductions if the heat it produces is retained, so the house needs to be draughtproofed and insulated first

The order in which to install measures is set out in Section 2.2 – Design stage.

When considering planning applications for measures higher up the energy hierarchy and weighing their public benefit against any harm to the heritage significance, the Council would expect measures lower down the energy hierarchy to have already been carried out.

Energy Efficiency Measures

The following guidance looks in detail at those energy efficiency measures which do require planning permission in some circumstances. See the table in section 3.1 for clarification as to whether your measure requires planning permission.

The guidance covers the following measures:

3.2.7 External solid wall insulation

3.2.2 Windows

3.2.3 Porches, draught lobbies and front doors

3.2.4 Solar PV (Electricity generation) and Solar Thermal (Hot water) mounted on a building

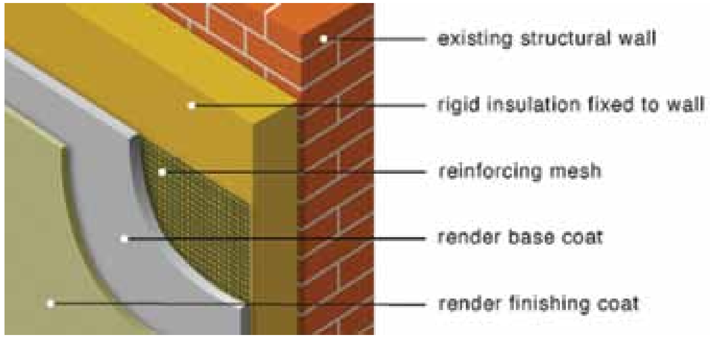
3.2.5 Air source heat pumps

3.2.6 Biomass heating systems

Some external measures may be acceptable in one location but not in another, depending on the visibility, the nature of the building, its orientation and the design of the measure itself. As each house will have different constraints and relationships with its neighbours this guidance cannot be definitive but we intend it to be an initial indicator of likely acceptability to help you consider your options.

This guidance relates only to unlisted buildings. If your home is listed all of the measures discussed (except for freestanding solar panels) will also require listed building consent. Further advice may be sought from the planning department (see contact details in Appendices).

3.2.1 External solid wall insulation



External solid wall insulation (ESWI) can change the appearance of the area by covering up traditional brickwork and obscuring decorative details in the architecture.

It needs planning permission in a conservation area and

- It is unlikely to be acceptable on the front elevation of a building
- It may be acceptable on the side elevation of a building if
  - render is the original finish on that property;
  - it can be applied without the need to extend the roof eaves;
  - original detailing such as tiled cills and drips are reinstated;
  - the junction with the front elevation is a seamless render finish; and
  - The insulation is given a render finish which matches the colour and texture of the prevailing render finish.
- It may not be acceptable on highly exposed flank elevations, for instance at road junctions, where these include windows, doors and decorative detailing whose appearance will be altered by the application of insulation
- It is likely to be acceptable on the rears of properties and their rear extensions where a rendered or painted finish is the prevailing appearance of the conservation area if
  - Render finishes match the colour and texture of the prevailing render or painted finish.

Care will be needed on semi-detached properties to ensure that ESWI does not disrupt the visual symmetry of the building.

Note - total coverage of the external walls, either with external or internal wall insulation - is recommended to avoid leaving cold spots. Whole house solid wall insulation in a conservation area is therefore likely to be a mixture of internal and external insulation.

3.2.2 Windows

Windows are a key feature in a house, and their design is important in providing visual interest and detail to a building. The houses and mansion blocks in Holly Lodge Estate were built with timber multi-paned casement windows, a style which was popular in garden suburbs and evoked the vernacular cottage style as opposed to the sash window used in urban terraced housing.

Timber windows can have an indefinite lifespan if they are regularly maintained, and if sections, typically cills, do deteriorate then these sections can be cut out rand replaced by a joiner. Their performance can also be improved by ensuring that they close tightly, with draughtproofing added where necessary. Secondary glazing can also be added to the inside of the window frame, and these works do not require planning permission.

Replacing an existing window with one of different material or appearance does require planning permission. Use of materials other than timber will be resisted in the conservation area. Where windows are proposed for replacement the appearance of the new window should match the original, and important features to match are the width of the glazing bars.

Double glazed windows may be acceptable if they are timber, and they replicate the appearance and dimensions of frame and glazing bars accurately. Double glazed timber casement windows have recently been installed in Makepeace Mansions as part of the comprehensive refurbishment of those properties and windows that match the details of those are likely to be acceptable (see application reference 2009/5796/P on the Council's website).

3.2.3 Porch doors and front doors

Heat is also lost through external doors and this can be reduced by thermally upgrading your existing external doors or replacing them with more efficient modern doors. These measures do not require planning permission. Adding a draught lobby inside the front door also does not require planning permission.

The houses in the conservation area display a wide variety of architectural and decorative treatments which focus special attention on the front doors, including having the door set within a recess or open porch, beneath projecting timber hoods, either flat topped with a balcony above or with pitched and tiled roofs; and many have a variety of brick and tiled detailing around the door itself.

Adding a porch to the front of a house does not require planning permission, however enclosing an existing porch may require planning permission depending on the materials and design of the proposal, so you are advised to contact the planning department for confirmation if you wish to carry this out.

Front doors have been enclosed in some cases which has had a detrimental visual effect on the original appearance of houses by obscuring the original detailing. This effect is additionally harmful on semi-detached properties when the visual symmetry of the pair is eroded.

If you plan to enclose a porch then designing it so that it preserves the appearance of the front door area in a way that is sympathetic to the character of the building is essential to preserving the character of the building and conservation area.

3.2.4 Solar PV (Electricity generation) and Solar Thermal (Hot water)

Provided that solar pv or thermal installations meet a number of conditions about their siting and visibility they do not need planning permission. See Section 3.1- What requires planning permission above for details of the conditions.

Where they do need planning the Council will require them to be located, where possible, where they will not be highly visible from the public realm, and to be flush with the plane of the roof, so as to preserve the prominent views of the roofscapes that are visible across the conservation area, most particularly in views up Hillway.

However, it may be permitted development for you to locate a panel in such a location, depending on the individual circumstances of your house. If you are not sure whether your proposed installation meets the requirements and conditions stated above, we would strongly advise you or your agent to use our duty planner and pre-application advice service and then apply for a Certificate of Lawful Development from the planning department.

In Holly Lodge Conservation Area roofs are predominantly pitched, with a variety of hips and gables. Flat roofs also exist on top of roof and rear extensions. There is therefore only a narrow range of roof types upon which solar panels could be mounted, and these differ in the extent to which they are visible from the public realm.

- South facing roof slopes on Hillway and on the north sides of the Avenues: panels located here would be highly visible from the public realm and would have a significant effect on the appearance of the building and area. Alternative locations should be investigated.
- South facing roofs on the south sides of the Avenues: panels located here would not be highly visible from the public realm and would have a lesser visual impact on the appearance of the building and area.

An alternative approach to solar photovoltaic panels are solar slates or tiles, which replace the existing roof slates or tiles and closely match their appearance, thereby lessening any visual impact on the appearance of the conservation area. Solar slates are currently twice the price of solar panels (2012) but are expected to fall to meet the price of solar panels by 2020. Planning permission is not required for solar slates or tiles.

3.2.5 Air source heat pumps

Air source heat pumps need to be situated where they will get a sufficient flow of air and the optimum location is likely to be freestanding in a rear garden. You are advised to consider the location and colour of the unit so that it blends in it with a garden setting and so that the visual impact is minimised, A noise impact statement will be required with a planning application for an air source heat pump.

3.2.6 Biomass heating systems

New or altered flues and chimneys may be highly visible in the conservation area due to the views of the roofscape that the sloping land allows. Where possible existing chimneys should be used. New flues should not be located on the principal or side elevations if they would be visible from the street, and they should be constructed of materials to match the existing construction.

An air quality assessment is required with a planning application for a biomass installation to demonstrate ‘negligible impacts on air quality. The impacts on neighbouring amenity space may also be considered on environmental health grounds.

This section gives advice on a range of technical energy efficiency measures that may be applicable to homeowners in Holly Lodge Estate Conservation Area.

In this guide we can provide only a brief summary of each improvement measure but more information can be obtained via the references and links in the appendices, in particular the Institute for Sustainability's Low Carbon Domestic Retrofit Guides (Rickaby et al, 2011).

The measures discussed are as follows:

1.1 Insulation

1.2 Windows, external doors and draught lobbies

1.3 Ventilation

1.4 Heating and hot water systems, including solar hot water and biomass

1.5 Photovoltaic electricity generation

1.6 Heat pumps

1.7 Domestic combined heat and power

4.1 Insulation

Insulation of roofs, floors and walls are considered in this section. When selecting insulation materials for older buildings, preference should be given to natural fibre based materials that prevent moisture retention in the building fabric.

Roof Insulation

The roofs of Holly Lodge Estate Conservation Area are pitched, with or without hips and gables, some with dormer windows. Rear and side extensions often have flat roofs. This section gives advice for the two generic roof forms – pitched and flat, and also includes advice on insulating dormer windows. The advice can be adapted to suit the variations that exist in the conservation area.

Insulation of pitched roofs between the ceiling joists

Initial Assessment

- Loft insulation can be installed without causing visual impact on the building or conservation area
- Loft insulation is inexpensive, and may be installed at reduced cost by an energy company.
- Loft insulation is also easy to install on a DIY basis.

Design Stage

- Any existing insulation may be in poor repair, and may have to be removed before the new insulation is installed.
- If loose fill insulation is present, and the composition is not clear, seek expert advice.
- Lofts must be cleared of stored property before they are insulated, and boarding may be required above the insulation, to allow property to be re-stored and people to walk around safely.
- Ventilation must be provided to prevent condensation and rot. Eaves ventilators must not be blocked by new insulation; if no ventilators are present they should be installed.
- Insulation must not be placed over electrical wiring or recessed ceiling lights; wiring should be relocated above the insulation to avoid the risk of overheating; thermal hoods may be required for recessed ceiling lights.
- Cold water storage tanks located in lofts may have to be insulated

Implementation

- One layer of insulation should be laid between the ceiling joists (to the full depth of the joists), and another layer should be laid across the ceiling joists (at right angles to them); the total insulation thickness should be at least 300 mm.

- Insulation must not block bathroom or toilet extract ventilation ducts; if such ducts terminate in the roof-space they must be extended through the roof itself.
- In the case of valley roofs, ensure that insulation is continuous beneath the valley, between the two loft spaces, in order to avoid thermal bridging.
- It is essential that cold lofts above insulated ceilings are ventilated, in order to reduce the risk of condensation and rot on the underside of the roof.

Insulation of pitched roofs at the rafters

Initial Assessment and Design

- Planning permission is required if the height of the roof ridge is to be raised, and may not be granted if the house is semi detached
- The position of the insulation will depend on the amount of work being done to the roof. If the roof covering is replaced, insulation may be placed between and/or over the rafters before re-covering. If the roof covering is not replaced, insulation must be placed between and/or under the rafters before any new linings are fixed.
- This method of insulating creates a 'warm' loft space (i.e. the loft is within the insulated envelope) and potentially a 'room in roof' (if not already present).

- Insulation fixed to the undersides of rafters will reduce headroom.
- Existing plasterboard linings in attic rooms and loft conversions may have to be removed, and subsequently replaced.
- It is often difficult to insulate all the way down to the eaves and valleys, because they are inaccessible.

Implementation

- The roof insulation should connect to the wall insulation at the eaves and verges, if possible; exposed gable walls should be insulated (see Solid Wall Insulation, below).
- A vapour barrier should be included on the warmer side of the insulation (behind any linings) in order to prevent warm moist air penetrating into the construction and the consequent risk of condensation and rot.
- Where first floor rooms sit partly within the roof slope, roof insulation should also include the section of roof slope that extends below the attic floor joists.
- In the case of valley roofs, ensure that insulation is continuous beneath the valley, between the two pitches, in order to avoid thermal bridging.

Insulating Roof Dormers

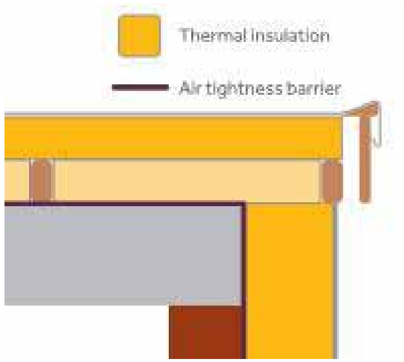
Dormer windows are a prominent feature of some houses in Holly Lodge Estate Conservation Area and come in a variety of shapes, sizes and materials. They can be a difficult area to insulate but, if insulation is left out or is poorly detailed then the energy efficiency of the whole roof can be compromised. The upgrading of dormer windows should therefore be undertaken in conjunction with roof upgrading work.

Initial Assessment and Design

- A change in the proportion of dormer windows or their external detailing is unlikely to be acceptable. This is particularly important if their design reflects dormer windows in adjoining or neighbouring houses. Insulation of dormer windows that results in external changes may require planning permission and you should check with the planning department.
- ensure that ventilation paths to any roof spaces above the dormers are not disturbed
- Minimise the risk of corrosion to the underside of any lead used to clad dormer cheeks or roof by taking care with how the insulating material is detailed and installed

Flat roofs

Initial Assessment and Design



- The easiest way to insulate an existing flat roof is when the whole roof is being renewed. Insulation can be placed on top of the existing joists, with the weatherproof covering applied on top of the insulation, creating a 'warm roof' construction. The type of insulation depends on the choice of weatherproofing.
- If the whole roof is not being renewed the insulation must be installed from the underside of the roof (this is known as a 'cold roof'). The finish to the ceiling below must be removed and insulation fitted between the joists.
- Older flat roofs (built in the 1960s and 70s) may have been constructed with asbestos-based cement boards. If your roof dates from this period seek specialist advice.
- A 'green roof' also has excellent insulating qualities, and can be designed to support a variety of plant species on flat or sloping roofs. It also has the benefit of slowing rainwater run off into the sewers which can reduce the risk of flooding, providing an additional habitat for birds and insects, and reducing the visual impact of extensions.

Implementation

In cold roof construction, where the insulation is between the joists, there must be a ventilated cavity above the insulation (between or above the joists), and a vapour barrier below it, to reduce the risk of warm moist internal air penetrating to the underside of the cold roof deck, causing condensation and rot. To reduce thermal bridging by the joists a layer of insulation should be added to the underside of the rafters, before the ceilings are re-instated.

Floor insulation

Houses in Holly Lodge Estate Conservation Area were built with suspended timber floors and later extensions may have solid concrete floors.

Suspended floors are usually very poor thermally, constructed of timber joists spanning between load-bearing walls and supporting timber floorboards. They are notoriously leaky and cold but, unlike concrete floors, are relatively easy to upgrade.

Solid floors are usually constructed of concrete, which might bear directly on to the ground or be supported on concrete beams with infill blocks. It is common practice to top the structural layer with a cement screed.

Timber floors

Initial Assessment and Design

- Timber floors should be checked for structural soundness and the presence of wet or dry rot before proceeding to fit any insulation.
- When insulating suspended floors it is important to maintain the ventilation under the floor void, in order to avoid condensation and the risk of rot. The void should be cross-ventilated via vents in the external walls.
- When insulating timber floors a Building Control Officer should be consulted to ensure that the correct fire performance is achieved.

Implementation

- Timber floorboards can be lifted and insulation fitted between the joists. The most common technique is to use mineral fibre supported on plastic netting; rigid insulation can also be wedged or cut to fit tightly between the joists (although this is less reliable) or supported on timber battens fixed to the joists. It is important to completely fill the space between the joists, above the netting and beneath the floorboards.
- With old square-edged floorboards, laying hardboard over the whole floor will eliminate draughts from between the boards. The hardboard should be taped at the joints and sealed at the edges. Alternatively the gaps can be sealed with a sealant. Gaps and holes where pipes or cables rise from below should be sealed with tightly-packed mineral fibre or expanding foam.
- An air-tightness membrane under the boards, sealed to the walls or skirting boards, is recommended.

Concrete floors

- If solid floors are to be taken up and re-laid then there is an opportunity to add insulation to the new concrete floor slab. The construction is the same as a new-build floor. Insulation can be added above or below the slab.
- If solid floors are not taken up then the only way to add insulation is to lay it on top of the existing floor. This can cause problems with room heights, door thresholds and at the bottom of the stairs.

Solid wall insulation

The houses of Holly Lodge Estate Conservation Area were built with solid wall construction (i.e. without a cavity), as was generally the case for buildings built before 1935. Many buildings have roughcast render finishes on parts or all of their external brick elevations and there is also a wealth of elevational detailing in timber, brick and tile.

Installing solid wall insulation to existing buildings is complex and must be designed and carried out with great attention to detail to ensure that moisture levels within the walls or inside the house do not rise to levels that could result in mould growth or rot.

Technically, external solid wall insulation to the entire building is the preferable approach because the existing walls remain warm and dry and internal moisture from kitchens and bathrooms can be adequately extracted from the building through mechanical and natural ventilation. However it requires the adjustment of eaves cills and external pipework and in conservation areas insulating the whole of the exterior of the building is rarely possible because of the visual impact. In practise, therefore, an approach where internal solid wall insulation is used either exclusively or in conjunction with partial external insulation will be necessary.

Internal solid wall insulation can be more disruptive to residents and adequate ventilation and/or vapour control barriers are essential to prevent condensation building up on the inner face of the external wall. Because heat loss to the external wall is reduced this will not dry out as quickly after rain which has a number of implications, set out in more detail in the following sections.

Solid wall insulation

External Solid Wall Insulation (ESWI)

Insulating materials are fixed to the outside of the wall, and then covered by a protective finish, which can be render or another form of cladding such as ‘brick slips’ (i.e. thin brick tiles) or timber cladding. Render finishes can be given a variety of different coloured and textured finishes, including a brick-like appearance. These finishes may be more acceptable in some locations but are more expensive: brick slips cost approximately twice that of plain render and render finished to look like brickwork costs approximately two thirds more than plain render.

Initial Assessment and Design

- Planning permission will always be required in conservation areas.
- External solid wall insulation can dramatically reduce heat loss from the house and occupants may usually stay in the house while the work is carried out.
- External wall insulation is very compatible with window replacement, and it is often appropriate to install both measures at the same time.
- In optimum situations the layer of insulation can be continuous (except across windows and doors), reducing thermal bridging and helping to improve air tightness.
- External insulation is unlikely to be acceptable on all elevations, or to the full height or width of any elevation because of the visual impact this would have on the conservation area (see Planning Guidance in Section 3) and should, in these situations, be combined with internal wall insulation.
- External fittings will need to be removed and re-fitted, such as rainwater pipes, power and telephone cables, window reveals and cills, door architraves, gutters and downpipes, soil and vent pipes and satellite dishes
- The eaves and/or verge overhang of the roof may have to be extended.
- Window cillswill have to be extended, internally or externally (depending on the position of the windows).
- Some external doors may have to be repositioned, especially those located against internal corners, to allow the insulation to run continuously around them.
- A party wall agreement may be required where one house in a terrace applies ESWI that ends at a party wall.
- Application of ESWI to only one half of a semi detached pair is likely to benefit your immediate neighbours as the higher level of conserved heat will pass through the party wall to the adjoining dwelling. However, it also carries a risk of condensation and mould growth in the relatively cold internal corners of the adjoining dwellings' external walls.

Implementation

- The existing wall surface may need a parge coat of thin render, to smooth the surface before the insulation is fixed.
- Windows should ideally be repositioned within the insulation layer, as this creates a continuous upgraded external surface. It will also maintain the same set back distance from the wall surface as the original windows, preserving the traditional appearance. If this is not done any exposed reveals of the window openings must be insulated with a thin, high-performance insulation board to reduce thermal bridging.
- If the external wall insulation does not extend to the full height or width of the elevation, it is necessary to use proprietary details to seal the edges of the insulation so that cold external air (and water) cannot penetrate behind it, and to apply internal wall insulation to the other areas so the whole wall in insulated continuously.
- Re-pointing of brickwork should always be in a mortar that is softer than the brickwork as this provides a 'path of least resistance' to any moisture in the brickwork, and allows it to dry out more readily. Hard cement mortar should never be used on historic brickwork as it forces water to move through the bricks and can cause cracking and spalling.

Internal Solid Wall Insulation (ISWI)

Insulation is fixed to the inside of the wall, and then covered by a plasterboard lining. The installation must also include a vapour barrier and/or air-tightness membrane. Sometimes a ventilated space (on the cold side of the insulation) and a wiring void (on the warm side of the insulation and air barrier) are also included.

Initial Assessment and Design

- The external appearance of the building is not affected.
- A wide variety of insulation materials is available, including mineral wool, sheep's wool, wood fibre boards and rigid plastic insulation boards, and a variety of thicknesses, from 10mm (for where space is limited e.g. a staircase wall or inside shutter boxes) upwards
- Individual rooms may need to be cleared while the work is carried out
- To achieve the optimum heat loss reduction a loss of room space of up to 150mm adjacent to external walls would occur.
- Depending on the thickness of insulation used many internal fixtures and fittings, including skirtings, architraves, ceiling coving, power points and switches, radiators, shelving, fitted wardrobes may have to be removed and subsequently replaced. Some fittings may require adapting to fit after the insulation has been installed.
- Redecoration is required after the insulated linings have been installed.
- Once insulated, masonry walls will be colder than previously, and will not dry out as quickly after rain. The ends of timber floor and ceiling joists that pass through the insulated linings and are built into cold masonry walls may become wet, and rot. The cold external surface of very exposed walls may attract algae growth. In freezing weather, water that penetrates into cracks and crevices in very exposed walls may freeze (and not be melted by heat loss), resulting in spalling of brickwork. These risks can be mitigated to some extent by the use of anti-fungal and water resistant treatments to the exterior of the brickwork and very careful detailing of insulation around timber joist ends.

Implementation

- A carefully installed continuous vapour barrier that is sealed at all joints, edges and service penetrations will avoid the significant risk of interstitial condensation, and rot when warm moist internal air penetrates to the cold internal surface of the original masonry wall.
- An alternative method of reducing the risk of interstitial condensation behind the insulated linings is to space the linings at least 25 mm away from the walls and ventilate the resulting cavities with external air.
- Insulated linings should be returned at least 600 mm down party walls and masonry internal partitions, where they meet external walls, in order to reduce thermal bridging and the consequent risk of condensation and mould growth.
- The insulation should be taken below the floorboards and between the joists to reduce the risk of joist ends becoming cold bridges.
- The exposed reveals of window and door openings should be insulated with thin, high performance insulation board, to reduce thermal bridging and the consequent risk of condensation and mould growth.
- Services (e.g. radiators, power points and switches) should be relocated off external walls to avoid penetration of the vapour barrier by pipes and wires. Alternatively, an internal service void can be created behind the plasterboard linings, but inside the vapour barrier and insulation layer, by fixing the plasterboard on timber battens.
- Solid wall insulation should not be applied to damp walls.

Combined internal and external insulation

In conservation areas, architectural and planning considerations may prohibit the addition of external solid wall insulation to some elevations so solutions that involve a combination of internal and external wall insulation on different walls will be required in most cases. In such cases it is important to maintain the integrity of the insulation layers, as far as possible, and reduce the risk of creating cold spots which can lead to condensation and mould growth, by overlapping the interior and external insulation by at least 600 mm on opposite sides of the wall. Without this overlap there is a significant risk of internal condensation and mould growth in the location of the cold spot.

4.2 Windows and external doors

- Windows and glazed doors account for significant heat loss (up to six times as much as the same area of wall or roof). In Holly Lodge Estate Conservation Area the materials and appearance of windows and doors is an integral part of the aesthetic of the architecture and contributes much to the area's character. Alterations to them must therefore be carried out sensitively.
- The key measures for improving the energy efficiency of windows are
- Draught-proofing (see section 2.5 below),
- adding secondary glazing
- upgrading existing single glazed windows by inserting double glazed panes; and
- replacing existing single glazed windows with double glazed units.

Initial Assessment and Design

- Historic timber windows were made of slow grown softwood which was more durable and resistant to decay than a comparable modern softwood, and if they are regularly painted they can have an indefinite lifespan. Adding draughtproofing and ensuring that they closing snugly will significantly reduce the draughts and heat loss – up to a 86% reduction in air infiltration may be achieved.
- English Heritage has undertaken research to demonstrate how traditional windows can be upgraded and their performance dramatically improved by repairing them so they are well fitting, and the significant contribution that the use of heavy curtains or blinds and secondary glazing can make to reducing heat loss. They recorded heat loss reductions of up to 41% with heavy curtains and 58% with secondary glazing (Improving the Thermal Performance of Traditional Windows, Glasgow Caledonian University, 2009).

Secondary glazing

Secondary glazing is the cheapest and least disruptive improvement option for windows after draught-proofing, use of timber shutters and thick, thermally lined curtains, particularly for the multi-paned casements that are common in Holly Lodge Estate. It has the benefit of allowing the historic timber windows to remain in place and in use. It should be draught-proofed to minimise the condensation risk between the original window and the secondary glazing. It can be supplied either as a single pane or as a double glazed unit.

English Heritage's research result of 58% reduction in heat loss (to a U-value of around 1.8 W/m2K) mentioned above involved secondary glazing with a low-emissivity coating.

Reglazing existing windows

Existing timber window frames can be retained and have their individual panes replaced by 'slimlite' or similar vacuum double-glazing units, designed to have a narrower gap between the two panes than a complete new replacement so they can fit within the existing window frame. They can have a low emissivity coating on the inner pane and inert gas in the cavity to reduce heat loss. The performance of this approach is measured per pane, rather than per whole window and any panes that are replaced should have centre pane U-values (i.e. U values measured at the centres of the panes, not including the frames) not exceeding 1.2 W/m2K.

New double glazed windows and doors

Building Regulations Approved Document L Conservation of fuel and power (2010) provides guidance on the thermal performance of new and replacement windows and external doors. The requirement is specified in terms of maximum thermal transmittances (U values): the higher the number the greater the heat loss. The maximum window U-values shown in the table overleaf are for the whole of the window unit, including the glazing and the frame. New and replacement windows must be draught proofed.

Fitting	U-value of existing old door or window (W/m^{2}K)	Building Regulations maximum U-value of new door or window (W/m^{2}K)
Window or rooflight	Around 3.0	1.6
Doors (glazed or solid)	Around 3.0	1.8

Existing single-glazed windows and solid timber doors are likely to have U values of around 3.0 W/m2K, i.e. they emit approximately twice as much heat as new or replacement ones. Replacement double glazed timber windows that are likely to be considered acceptable in Holly Lodge Estate Conservation Area are likely to achieve between 1.4W/m2K and 1.8 W/m2K, by using low emissivity coatings and gas fill in the glazing units.

Drawbacks of using uPVC windows and alternatives

- uPVC (unplasticised polyvinyl chloride is a non-bio-degradable material that is made from non-renewable petroleum resources.
- The production and disposal (via landfill or incineration) of uPVC windows leads to the release of harmful industrial pollutants (i.e. dioxins, furans, lead, cadmium mercury and organic tin compounds)
- uPVC windows degrade over time and require regular cleaning and maintenance if they are to remain in good condition.
- uPVC windows are very difficult to repair, unlike timber frames
- Based on an analysis of the environmental impact of using different materials for window frames, Greenspec recommend avoiding PVC and using instead Forestry Stewardship Council (FSC) durable temperate hardwood, followed by, in declining order of preference, FSC temperate softwood clad with aluminium (preferably recycled), FSC temperate softwood treated with plant based paint, or certified softwood painted with low VOC paint. (www.greenpeace.org.uk/files/pdfs/migrated/MultimediaFiles/Live/FullReport/5588.pdf; **www.greenspec.co.uk/html/materials/windowframes.html**)

4.3 Draught lobbies

A draught lobby can make a small improvement in the thermal performance of a house by reducing heat loss through the front door and reducing the exchange of warm internal air with cold external air when people enter or leave the house. Draught lobbies can be 'inside' (i.e. within the insulated envelope of the house, for instance the front hall) and therefore heated, or 'outside' (i.e. outside the insulation, for instance in an existing porch) and unheated.

Initial Assessment and Design

Of the two doors that define a draught lobby the one with the better thermal performance (to meet the guidance in Building Regulations Approved Document L – see above) should be the one that aligns with the wall insulation

– that is the outer door of an 'inside' lobby, or the inner door of an 'outside' lobby. Both doors should be draught-proofed.

There should be enough space between the two doors to ensure that the outer door can be closed before the inner one is opened, and vice versa.

4.4 Air-tightness

A factor in heat loss from homes is the unintended movement of air through gaps in the building fabric. The aim of air-tightness measures is to reduce the amount of warm air escaping from the building through these gaps.

However, the introduction of fresh air into a building is vital to remove pollutants (e.g. water vapour from cooking, water vapour and carbon dioxide from breathing) and to keep the occupants of the dwelling cool during the summer. Thus a combination of air-tightness (reducing uncontrolled air infiltration, commonly experienced as 'draughts') and deliberate, controlled ventilation is required. This is summed up in the maxim 'Build tight, ventilate right'. Ventilation is dealt with in the next section.

The measure of air tightness of a building envelope is known as its air permeability (which is measured in m3/m2h at 50 Pa excess pressure, during a fan pressurisation test). It is always a good idea to get a dwelling pressure tested before and after any significant low carbon retrofit work is carried out, in order to establish an air tightness target. It will rarely be practical to reduce the air permeability to less than half the original value.

Initial Assessment and Design

- Improvements to exposed floors, walls and roofs should always include measures to improve air tightness. However, improved air tightness may result in condensation on windows and other cold surfaces, unless adequate ventilation is also provided (see the Ventilation section below).
- Suspended timber floors can be a source of air leakage to under-floor voids, which are ventilated to the outside. See the section on floor insulation, above.

Implementation

- Exposed wall and roof constructions should include air barriers (which may double as vapour barriers) located on the warmer side of any insulation and with taped joints and edges.
- Where windows and external doors are being retained, ensure that the edges of the frames are sealed to the walls and that all openings are weather stripped. Air infiltration through a sash widow in good condition can be reduced by as much as 86% by adding draughtproofing.
- Penetration of air barriers by services (wires and pipes) should be avoided. Some proprietary air barrier systems include grommets that allow electrical cables to run through the barrier while maintaining its integrity.
- If possible, include service voids in walls and ceilings, behind the plasterboard linings but on the warmer sides of the air barriers and insulation.

4.5 Ventilation

Traditionally in the UK the leakiness or air permeability of homes has been allowed to contribute, in an uncontrolled way, to their ventilation (i.e. the removal of stale air and provision of fresh air). However, retrofit work often improves air tightness (i.e. reduces air permeability) and thus reduces the level of ventilation. Therefore, in accordance with the 'Build tight, ventilate right' maxim good deliberate ventilation of retrofitted properties is essential to ensure indoor air quality, remove pollutants and reduce condensation risk. Building Regulations Approved Document F Ventilation provides guidance on minimum acceptable levels of ventilation in dwellings.

There are several options for ventilating a retrofitted property, ranging from intermittent extract fans combined with trickle ventilators to whole-house ventilation systems with heat recovery. Regardless of the method chosen, the ventilation system must be capable of removing stale, moist air and replacing it with fresh air from outside. Systems with heat recovery have the advantage of recovering heat that would otherwise be lost from the stale exhaust air and transferring it to the fresh supply air.

As a general rule, if the tested air permeability of a home after retrofit work has been carried out is 5 m3/m2h at 50 Pa or higher, then natural or passive stack ventilation (see below) should be adequate. However, if the tested air permeability is less than 5 m3/m2h at 50 Pa then some form of whole-house mechanical ventilation system (again, see below) is likely to be required. In more practical terms, simply insulating an exposed floor, or the roof, or the walls, or draught stripping the windows, is unlikely to improve the air tightness to the point where whole-house ventilation is required. However, doing two or three of these things (and especially combining wall insulation with draught-stripping of windows) may trigger the need for whole-house ventilation. If it is an objective of the retrofit project to achieve a very high standard of air tightness (i.e. air permeability less than 3 m3/m2h at 50 Pa) then whole-house ventilation is likely to be essential.

Intermittent extract fans and trickle ventilators

This is the most basic form of ventilation; bizarrely, it is known as 'natural ventilation'. The extract fans are fitted in the 'wet' rooms (bathrooms and kitchens) in order to remove odours and water vapour at source. Fans are usually controlled by light switches, with timed overruns. Fresh air is supplied by trickle ventilators, most commonly installed in the window frames.

The advantage of natural ventilation is that it is inexpensive and easy to fit. However, as the air tightness of a property is improved, reducing uncontrolled air infiltration, the result may be poor air quality, because the fans may not extract enough stale air and/or the trickle vents may not supply enough fresh air.

Initial Assessment and Design

- Fans must exhaust stale air to the exterior, not to a loft or garage.

Implementation

- Energy efficient, low wattage extract fans with DC motors should always be specified.
- Through-the-wall ventilators can be used instead of trickle ventilators, and both can be equipped with humidistat-controlled variable apertures.

Passive Stack Ventilation (PSV)

Passive stack ventilation relies on the natural buoyancy of warm air. There are no fans: instead, warm stale air from the bathrooms and kitchen rises through ducts to the ridge of the roof, where it is vented to the outside. Humidity-sensitive trickle vents in the bathrooms and kitchen control the extract rate, and fresh air is supplied by humidity sensitive trickle ventilators in the living area and bedrooms.

Unless a home is undergoing a major retrofit, installing passive stack ventilation can be difficult, because of the need for vertical ducts rising through the house therefore this type of ventilation system is not often retrofitted. However systems that are located in disused chimneys can provide a similar approach, usually occurring in rooms other than kitchens and bathrooms.

Initial Assessment and Design

- PSV ducts should be as smooth, straight and vertical as possible, and must terminate at the ridge of the roof or at least 600 mm above any lower part of the roof. Ductwork must be properly sealed.

Mechanical Extract Ventilation (MEV)

In properties with good air tightness, a continuously operating ventilation system may be required. This can either be a single fan with ducts to the 'wet' rooms and the kitchen (centralised mechanical extract ventilation), or several fans running continuously (decentralised mechanical extract ventilation). Both types of systems can benefit from low power fans, to reduce the electricity use. Fresh air is supplied by trickle ventilators that may be humidistat controlled

Initial Assessment and Design

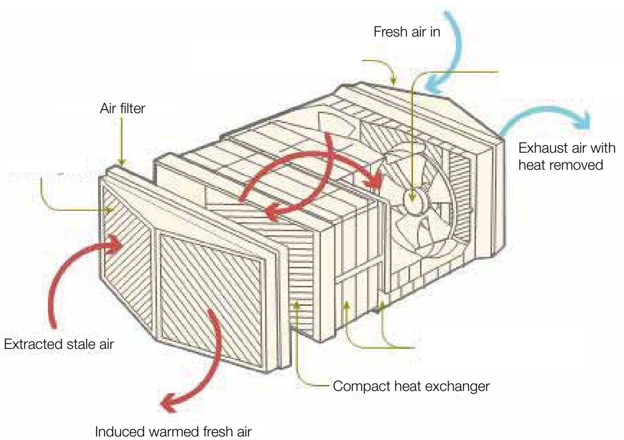
- In order to reduce both noise and fan power, ductwork should be round in section, at least 150 mm in diameter, smooth internally, as straight as possible (with the minimum number of bends) and well sealed.

- An MEV system should always incorporate a boost mode, controlled by light switches or presence detectors, to expel moist air when kitchens and bathrooms are in use.
- MEV systems include air filters, which must be cleaned or replaced every six months.

Implementation

- MEV systems must be installed and commissioned by specialists, who will also design the layout of any ductwork.

Heat recovery room ventilators (HRRVs)



This system combines supply and extract ventilation into one unit serving a single room, with the added advantage that as the warm air is extracted, it is passed through a heat exchanger that removes some of the heat from the outgoing air and uses it to heat the fresh incoming air. Heat recovery efficiency can be as high as 80% and fan power can be as low as 2 W.

HRRVs are especially useful if installing a whole-house system is not practical. However, HRRVs can only serve one room, so at least two are required in most houses.

The disadvantage of HRRVs is that they supply air to the same spaces that they extract from (usually kitchen and bathrooms), so fresh air may not be supplied to the spaces where it is most needed (living rooms and bedrooms). 'Semi-ducted' HRRVs, which can extract stale air from one space and supply fresh air to one other, adjacent space, are under development.

Mechanical ventilation with heat recovery (MVHR)

Whole house MVHR systems run continuously, extracting moist stale, air from kitchens and bathrooms, and supplying fresh air to living spaces and bedrooms, via ducts. The systems recover some of the heat from the extracted air and use it pre-heats the incoming fresh air. Modern MVHR systems use energy efficient DC fan motors for low fan power, and incorporate plastic cross-flow heat exchangers to achieve heat recovery efficiencies as high as 90%.

MVHR systems deliver very good internal air quality, but they are very difficult to install in existing houses, because of the need to route supply or extract ductwork to most rooms. MEV (which requires less ductwork) or HRRVs will almost always be a better option.

Initial Assessment and Design

- The house must have a good standard of air tightness (air permeability of less than 3 m3/m2h @ 50 Pa, measured by a fan pressurisation test).
- The heat exchanger and all ductwork must be accommodated within the insulated envelope of the building, and not in an unheated space such as a loft or garage.
- In summer, the MVHR system should be switched off, and windows opened to provide ventilation instead. If the MVHR system is not switched off (perhaps because of external noise or air pollution) the heat recovery function must be disabled.
- MVHR systems include air filters, which must be cleaned or replaced every six months.

Implementation

- MVHR systems must be installed and commissioned by specialists, who will also design the layout of any ductwork.
- In order to reduce both noise and fan power, ductwork should be round in section, at least 150 mm in diameter, smooth internally, as straight as possible (with the minimum number of bends) and well sealed.

4.6 Heating and hot water systems

Since 1970, the percentage of British homes that have central heating has risen from 31% to over 90%. The vast majority of these homes use mains gas as their heating and hot water fuel. Although the majority still use a separate boiler and hot water cylinder ('system' boilers), around 40% of all gas central heating systems now have combination ('combi') boilers supplying both 'instant' domestic hot water and heating.

A heating system should always be sized to suit the heat loss (and where appropriate the hot water demand) of the home. An over-sized heating system will be less efficient than an appropriately sized one. If the home is to be insulated, and air tightness improved, the heat loss will be reduced – so building fabric improvements should always be carried out before the heating system is replaced (or at the same time), not subsequently.

Gas-fired central heating (GCH)

Initial Assessment

- GCH uses the least expensive domestic fuel (as of Spring 2012)
- There is a huge range of robust, well-tried component products and a well established installation, servicing and repair industry.
- Heat distribution is usually via radiators, which may be disruptive to install in a home that does not already have them.
- Condensing boilers require condensate drains connected to the drainage system. Most modern boilers also have fan assisted balanced flues that must be connected horizontally to the exterior.

Design

- The guidance in Building Regulations Approved Document L (2010) and the Domestic Building Services Compliance Guide 2010 specifies a minimum seasonal efficiency of 88% for new or replacement condensing boilers, 78% for non-condensing boilers (where permitted) and 75% for range cookers.
- For larger houses the heating system should be split into two or more zones, so that each zone can be controlled separately according to the demands of that zone. Wireless, programmable room thermostats are available, and make retrofitting such improvements into existing homes much easier.
- When an existing gas-fired boiler is replaced the controls for the heat distribution system must be checked and if necessary upgraded. The controls must consist of: a programmer capable of controlling at least two heating periods during the day; a room thermostat that switches the boiler off when the internal temperature reaches the desired level; and thermostatic radiator valves (TRVs) on all radiators except any in the same room as the room thermostat. More sophisticated controls can also be added.
- When replacing a system boiler consider replacing the existing hot water cylinder. Older cylinders are often either not insulated (except perhaps by a DIY jacket) or inadequately insulated. Modern cylinders have the equivalent of 80 mm of foam insulation, and are able to supply hot water to the taps at mains pressure. Replacing the hot water cylinder may be necessary if a solar water heating system is going to be installed, as the solar system will require a dual-coil cylinder.

Implementation

- If a condensing boiler is used (either combi or system) a compensator should be fitted to the boiler. There are two main types of compensator: weather and load. A weather compensator measures the outside temperature and modulates the boiler to keep it operating in the most efficient manner. A load compensator does the same thing, but measures the internal temperature instead.

Electric storage heating

Electric storage heating is sometimes used in smaller properties, or where main gas is not available. Electric storage heating uses electricity tariffs that provide less expensive 'off peak' electricity during times of low demand (overnight) and make only limited use of more expensive electricity during periods of higher demand. The heaters store heat during the night and emit it during the day. Some modern units include resistance heating elements to boost heat output during on-peak periods if the stored heat is insufficient. Storage heaters rely on thermal 'drift' to distribute heat throughout the home. Hot water is usually provided by an off-peak immersion heater in a hot water cylinder, often with a second immersion heater for on-peak top-up (known as 'dual immersion').

Initial Assessment

- Electric storage heating is less expensive to install but more expensive to run than GCH.
- runs on less expensive off-peak electricity (typically the 'Economy 7' tariff available between midnight and 7 am).
- Modern storage heaters are slim and unobtrusive.
- Carbon dioxide emissions are relatively high because of the use of electricity; using one unit of electricity involves approximately two and half times more carbon dioxide being emitted than using one unit of mains gas.

Design

- On-peak room heaters, which use more expensive day-time electricity, are required for supplementary heating.
- An off-peak electricity tariff is required.
- Storage heaters must be carefully positioned for good heat distribution.
- A large hot water cylinder (at least 210 litres) is required to ensure that sufficient hot water is stored overnight, to avoid on-peak top-up.

Solar water heating

A solar water heating system collects thermal energy from the sun via roof-mounted panels and uses the energy to pre-heat the domestic hot water supply, thus reducing heat demand from the boiler. With a conventional gas-fired central heating system a dual-coil hot water cylinder is used: one coil pre-heats the water in the cylinder using solar energy, the second coil is connected to the boiler, which tops-up the temperature to the required level. Where the boiler is a 'combi' type (without a hot water cylinder) a solar pre-heat tank is used to store heat from the solar water heating system.

A well designed solar water heating system can meet most of a home's hot water demand in summer, and a small part of it in winter. Over the year, a solar system can usually deliver approximately half of the annual heat demand for hot water. Typically 1 m2 of solar panel is required per bedroom in the house.

The most effective orientation for a panel is due south. Efficiency falls off progressively from panels facing towards east or west, but may still reach around 80% of maximum efficiency. The panel should be tilted between 20 and 60 degrees from the horizontal.

Solar water heating systems currently qualify for payments under the Renewable Heat Incentive (RHI), provided the home meets a minimum level of overall energy efficiency. The RHI solar thermal tariff is 8.5 p/kWh of heat generated, and payments continue for twenty years. A well designed 4 m2 installation will generate approximately 400 kWh/m2/yr and thus deliver 1600 kWh/yr and qualify for £136/yr in RHI payments.

Initial Assessment

- A suitably oriented location with minimal visual impact on the building or area should be chosen. The optimum orientation is due south, tilted by between 20°and 50° from the horizontal.
- It makes economic sense to consider the installation of solar water heating when the roof is being replaced or repaired.
- May be compatible with direct (electric immersion) or indirect (gas boiler) hot water cylinders.
- Not compatible with unmodified combi boiler systems unless a solar pre-heat tank is installed.

Design

- Systems can be heavy when they are full of heat transfer medium (usually water or glycol); roof structures must be checked prior to installation to ensure that they can carry the additional weight.

Implementation

Solar pre-heat tanks used with combi boiler systems must be heated to 60° C for one hour per week (during the evening) to minimise the risk of legionella infection.

Biomass heating

Biomass heating systems come in two main forms:

- **Wood burning stoves** that burn logs or pellets to heat a single room and can also be fitted with a back boiler to provide hot water.
- **Biomass boilers** that burn logs, pellets or wood chips to power a central heating and hot water system.

In both cases the carbon dioxide emitted during the combustion process is equal to that sequestered by the tree or plant during its lifetime. Carbon dioxide emissions from combustion are therefore considered to be neutralised and the technology secures significant carbon benefits over most other heating systems, provided that the fuel source is close to the point of heat generation.

Smoke Control Area restrictions

Despite the carbon benefits, biomass heating systems can generate emissions (notably nitrogen oxides and particulate matter (PM10 and PM2.5)) that are detrimental to air quality and public health.

Since the Clean Air Act local authorities can declare the whole or part of the authority area a Smoke Control Area. The whole of Camden is a designated Smoke Control Area.

In a Smoke Control Area such as Camden, you are only legally allowed to burn “authorised fuels: anthracite, semi-anthracite, gas and low volatile steam coals on a fireplace or appliance that is not registered with the Department for Food and Rural Affairs (DEFRA) as “exempt” to burn other “non-authorised” fuels. The full list of authorised fuels is available here **http://smokecontrol.defra.gov.uk/fuels.php**

Logs, wood chips and wood pellets typical of most biomass heating systems are “non-authorised” fuels and therefore any biomass boiler or wood burning stove installed in Camden that proposes to use these fuels must be an “exempt appliance”.

"Clean burn", "clean heat" and "low emission appliance" are marketing terms occasionally used by biomass stove and boiler manufacturers or distributors and provide no guarantee that appliances are exempt or suitable for exemption. A full list of exempt appliances are provided by DEFRA **http://smokecontrol.defra.gov.uk/appliances.php?country=e**

The DEFRA exemption certificate for the appliance will also identify the type of fuel that can be burned. Typically wood with a moisture content below 20% should be burnt in an exempt appliance.

Initial Assessment and Design

- If you have an existing working chimney this could be used with a new biomass installation (normally a wood burning stove) without the need for planning consent.
- Where you are considering using an existing chimney it is advisable to carry out a smoke test to confirm the integrity of the chimney. If the chimney is in poor condition it will need to be “lined”.
- Where there is no existing or working chimney then a new flue will be required and this may require planning permission (see Section 3.1 - What requires planning permission). A biomass boiler installation will almost certainly require a new flue.
- In all instances it is advisable to discuss your installation with neighbours, particularly if the chimney or flue exit point is upwind from a point of amenity, for example a terrace or bedroom.
- Consideration should also be given to the availability and source of the fuel supply permitted to be burnt within the appliance. The following website provides lists of local suppliers **http://www.bigbarn.co.uk/logpile/indexen.php**
- For biomass boilers adequate fuel storage space will be an important consideration.

Implementation

- Exempt appliances must either be installed by a Competent Person (in the case of biomass heating systems this must be a HETAS accredited installer) or the resident should seek Building Control approval to ensure compliance with Part J and, potentially, Part L of the Building Regulations. Part J deals with flue heights and sizes, ventilation rates and other safety issues relating to combustion appliances and Part L addresses the conservation of fuel and power in new and existing buildings where specific alterations are proposed.
- Wood fuelled boilers and stoves should be swept regularly to remove ash. Ash quantities are generally low (<1% of fuel volume).
- Biomass boilers often have built in self-cleaning systems. If there is no automatic ash cleaning system the installation will need to be periodically shut down for cleaning purposes. Ash build up will adversely affect combustion conditions and can result in boiler failure.

4.7 Photovoltaic electricity generation

Solar photovoltaic (PV) panels can be used to generate electricity from sunlight. Panels are usually roof-mounted, and should be oriented southwards and be tilted between 20o and 50o from the horizontal. Solar slates or tiles are also available, for use where maintaining the original appearance of the roof is important. Solar slates and tiles are currently double the price of panels (2012) but are expected to fall to a comparable price by 2020.

Solar PV systems generate DC (direct current) electricity, which is converted to AC (alternating current) electricity as used in homes by a device called an inverter. A well designed 1 m2 PV array will generate approximately 750 kWh per year. The electricity can be used in the dwelling or exported to the national electricity grid for use elsewhere. Exported electricity offsets mains electricity used at other times.

All PV generated electricity attracts payments from the Feed in Tariff (FiT), and there is a slightly higher payment for exported electricity. FiT payments are index-linked and continue for twenty-five years. PV installations are expensive, but the prices are falling and the FiT is currently set at a level that will repay the capital cost in about twenty years.

Initial Assessment and Design

- A suitably oriented location with minimal visual impact on the building or area should be chosen.
- Solar PV is very sensitive to orientation, and to shading by other buildings, chimneys, parapet walls, dormers, etc. The power output of poorly oriented and/or shaded installations is significantly reduced.
- Solar slates are an alternative to panels where intermittent shading is an issue as only those slates affected by shade would cease to generate electricity rather than the whole installation.
- Thin film photovoltaic cells are also available on the market, these can be employed within building materials such as windows or roof coverings however costs are high and cell efficiencies can be low.
- It makes economic sense to install solar PV panels or slates when a suitably oriented roof is being replaced or repaired.
- Installations require a lot of space: approximately 7 m2 of well-oriented roof-space per kWp output. Few homes have space for more than a 2-3 kWp installation.

Implementation

- Although solar PV panels have a notional twenty-five year life, the inverters have only a ten year life, so at least one inverter replacement should be allowed for during the life of the system.

4.8 Heat pumps

A heat pump works by extracting heat from an external source and supplying it to the property for heating or domestic hot water. Heat can be extracted from the ground, from water or from the air.

The pump runs on electricity, and the aim is to extract more energy from the source than is required to run the pump. The ratio of heat extracted to electricity used is called the coefficient of performance (CoP). A typical air source heat pump has a CoP of 2.5: i.e. it extracts 2.5 times as much energy as it uses. Ground-source heat pumps and water-source heat pumps have higher CoPs, but there is little scope for the use of these devices in densely developed urban areas.

Domestic Air sourced heat pumps usually use warm air for heat distribution. Ground and Water sourced heat pumps use wet heat distribution systems and are compatible with under-floor heating because the water temperature is lower than that delivered by a gas-fired boiler, and thus more heat emitting area is required.

A well designed heat pump supplying heat to a home will have about the same level of carbon dioxide emissions (associated with the electricity it uses) as a modern gas-fired boiler doing the same job, and similar fuel costs, so the main application of heat pumps is for homes without access to mains gas (i.e. in rural areas or high-rise blocks).

Initial Assessment

- Heat pumps typically have running costs (and carbon dioxide emissions) similar to those of gas-fired heating systems, and lower than those of other electric heating systems.
- Ground sourced heat pumps require large areas of open land, or vertical boreholes, for ground heat exchangers. Where there is space for a borehole (e.g. in a back garden) there may be little or no access for the machinery to bore the hole and there may be underground services which restrict its location.
- Water sourced heat pumps require large bodies of water or flowing streams for water heat exchangers, to avoid ice build-up.
- Some Air sourced heat pumps with warm air heat distribution systems can provide comfort cooling in summer; the cooling option may be useful in future, in a warming climate, but it increases fuel use, fuel costs and carbon dioxide emissions.
- Beware of inflated CoP figures; quoted performance may be optimistic, and may not relate to performance in the UK.

Design

- The external heat exchangers of ASHPs are prone to frosting when the temperature is less than 4°C. Most systems used on-peak electricity for defrosting, and this significantly reduces their overall CoPs. External heat exchangers must be adequately sized and should be installed well away from buildings (not mounted on them) to ensure adequate air-flow.
- If a heat pump is used for water heating, a secondary heat source such as an electric immersion heater will be required to raise the water to an acceptable temperature.

4.9 Domestic combined heat and power

Domestic CHP replaces a conventional gas-fired central heating boiler and generates electricity (2kW or less) as a by product of providing heat and hot water.

A mains gas-fired external combustion engine is used to drive a generator and the heat produced by this process is used to heat the home and/or provide hot water. Some systems also incorporate a small gas-fired boiler.

Domestic CHP units are slightly larger than conventional gas boilers, and can be mounted in kitchens, although because of noise manufacturers may recommend placing them in utility rooms or similar spaces. Domestic CHP units have high heat outputs and are therefore suitable for larger properties with high heat losses and/or hot water demand (either as a result of poor insulation or intensive, all-day occupation).

If a property is well insulated, with low heat and hot water demand, domestic CHP may not be suitable, because it will not run for long enough periods to generate significant amounts of electricity. Electricity is not generated when the system is not providing heat (including in summer).

Electricity generated by Domestic CHP systems may be used in the home or exported to the national electricity grid, and installations currently qualify for the Feed in Tariff (FiT).

Design

- The choice of products suitable for domestic installations is currently limited (BaxiEcoGen and E.OnWhisperGen).
- DCHP installation may involve replacement of the existing electricity meter

Appendices

A1 Council tenants and leaseholders

In addition to single family dwellings, Holly Lodge Estate also contains mansion flats, which are in Camden Council's ownership under a long lease. Works have already been carried out to many of the blocks to upgrade their energy efficiency. Residents will not be able to implement some of the larger measures described in this document, but smaller measures that don't impact on the fabric of the blocks are included below, and these will enable residents to make improvements to the way they use and save energy in their flats. Further information for tenants and leaseholders is available on the housing pages of the Council's website.

Camden Housing department is also seeking to improve the energy efficiency of its properties, and has the following key commitments:

- Make warmth affordable for all council tenants and leaseholders.
- Reduce the carbon footprint of council and leaseholder homes and mainstream sustainability measures in the management and maintenance of those homes.
- Make it easier for residents to reduce their carbon footprint.

Ways that it is doing this are:

- Installing cavity wall insulation: Camden aims to complete insulation to 95% of its cavity walled housing stock by December 2012.
- Providing Warm and Dry grants to vulnerable tenants to help with draught proofing, hot water tank insulation, loft insulation, improved ventilation.
- Installing green roofs to estate blocks wherever suitable save energy through cooling in hot weather and improving insulation in colder weather, as well as reducing the risk of flooding by absorbing rain water, and providing a safe habitat for a variety of wildlife.
- Installing water efficiency measures to reduce water use including over-bath showers wherever suitable, and also installing aerating taps, dual flush WCs and smaller baths.
- Installing 2,500 heat meters to residents on the district heating pool by March 2013 in order that they only pay for the heat they use.
- Developing a large scale combined Heat and Power system for the 1,500 residents in the Gospel Oak area using surplus heat from the Royal Free Hospital.
- Exploring how to replicate on a larger scale retrofitting projects in older houses, using experience gained from exemplar schemes such as the Bertram Street project in Dartmouth Park and specifically examining solid wall insulation and how this can best be implemented to street properties.
- Investigating opportunities for installing solar pv panels

Further information on energy efficiency for tenants and leaseholders is available on the Housing pages of the Councils website.

Council Leaseholders wishing to carry out energy efficiency measures themselves that require changes to the structure and roof of the building must seek written consent via their District Housing Office. Other alterations that do not involve changes to the structure may have unintended consequences on neighbours or to means of escape and so the District Housing Officer should be notified with details of the proposed works prior to them being carried out.

A2 Private Sector landlords and tenants

A number of grant schemes are available to private sector landlords to cover works to improve energy efficiency. Details of the eligibility criteria and works that they cover are available from Green Camden Helpline (0800 801738), or on the Council's website **www.camden.gov.uk/green**

- **Common Parts Lighting Grant** – To encourage landlords and freeholders to install low energy lighting in the common parts of buildings.
- **Decent Homes Standard** – To improve homes to Decent Homes Standard
- **Landlords Energy Efficiency and Insulation** – To encourage landlords to improve their properties by installing energy efficiency measures

- **ECO** - A grant to landlords of private residential property where the applicant receives relevant Council planning permission for the installation of environmentally beneficial installations.
- **Warmer Cheaper Greener Grant** (this is available to the private rented sector but is reliant on eligible tenants applying for the grant with written permission from the landlord) – To encourage installation and maintenance of energy efficiency measures which directly improve health, safety and well-being.

A3 Sources of advice and information

English Heritage has set up a website exclusively focussing on the potential impacts of climate change on the historic environment, and ways to save energy if you own or manage an older home. The 'saving energy' section of the website includes research on the thermal performance of traditional sash windows and detailed advice notes on specific energy efficiency measures. See **www.climatechangeandyourhome.org**.

They have also produced guidance on mediating between the requirements of Part L (Energy Efficiency) of the Building Regulations entitled 'Energy Efficiency and Historic Buildings- Application of Part L of the Building Regulations to historic and traditionally constructed buildings'. This can be downloaded from **www.english-heritage.org.uk/partL**

The Energy Saving Trust (EST) is a government and industry sponsored website which provides advice on energy saving methods in the home and beyond. The website has a grants and discounts database, a home energy checker, and gives links to community activities around the UK, courses for professionals and much more. EST also runs an Energy Efficiency Hotline tel: 0800 512 012. See **www.energysavingtrust.org.uk**

The Sustainable Energy Academy is the charity which runs SuperHomes, an expanding network of over 100 energy-aware households open to the public between May and September. All have refurbished their old homes to high standards of energy efficiency achieving at least 60% reduction in CO_2 emissions. The network provides advice and information to would-be retrofitters and an opportunity to view completed projects. See **www.superhomes.org.uk**

The Building Conservation Directory is an online directory of companies and organisations, products and services 'covering every aspect of the conservation, restoration and repair of the historic built environment', as well as articles, publications and details of seminars and training events. See **www.buildingconservation.com**

The Institute for Sustainability
RICKABY P A, WEDLAKE N and MELLOR A (editors, 2011) Building Opportunities for Business: Low Carbon Domestic Retrofit, a series of twelve guides published by the Institute for Sustainability, London. See **http://instituteforsustainability.co.uk/retrofitguides**.

Construction Products Association (2010) A Guide to Low Carbon Housing Refurbishment, Construction Products Association, London. See **www.constructionproducts.org.uk**.

The Department of Energy and Climate Change (DECC) website has information on climate change and the Green Deal. See **www.decc.gov.uk**

Highgate Climate Action Network (HiCAN) is a community action network founded in April 2008. Its aim is to inform people about the threat of climate change. They hold public talks, discussion groups and workshops as well as lobbying on energy and climate change issues at a local and national level. See **http://hican.wikispaces.com/**

Camden Council – www.camden.gov.uk
For Council policy, guidance, advice and information on Planning, Building Control and sustainability matters.
Contact the **Duty Planner** on 020 7974 4444 or e-mail planning@camden.gov.uk

Contact the **Green Camden Helpline** on 0800 801738
See also information provided for **Council tenants and leaseholders** on energy efficiency on the Housing web pages.

Appendices

A4 Information on suppliers, fitters, architects etc

The Institute for Sustainability Retrofit Guide 1 – An introduction to low carbon domestic retrofit. Appendix B explains the range of skills, training and accreditation schemes for all aspects of domestic retrofit. See **http://instituteforsustainability.co.uk/retrofitguides**.

The Royal Institute of British Architects website has advice on how to choose an architect, and has a directory of practices, chartered members and also a register of accredited conservation architects. Their 'sustainability hub' has news and articles about climate change and retrofitting. See **www.architecture.com**

T-zero is a comparison website for retrofitting your home. You enter your home's details and the website generates retrofitting options, compares their effect in terms of CO2 saving, financial payback period, best long term value etc, and then locates the suppliers, installers and retrofitters in your area. See **www.tzero.org.uk**

The Microgeneration Accreditation Scheme has a website which allows you search for information on products and certificated installation companies for a range of microrenewable technologies. **www.microgenerationcertification.org**

The Victorian Terrace Energy Reduction Initiatives a social enterprise based in North London dedicated to providing advice and assessments for reducing energy bills and cutting CO2 emissions for Victorian and Edwardian houses. It is developing a list of local tradespeople, with recommendations by those who have used them. VICTERI also carries out draughtproofing work to windows and promotes solar renewables. See **www.VICTERI.org.uk**

A5 Glossary

Affordable warmth: Access to an acceptable standard of heating and hot water at a cost not exceeding 10% of household income (the opposite of Fuel Poverty – see below).

Air permeability: A measure of the air tightness of building fabric in m3 of air leakage per m2 of building envelope per hour, at 50 Pa excess pressure (m3/m2h @ 50 Pa).

Air tightness: The resistance of building fabric to adventitious or uncontrolled air leakage.

Building fabric: The external envelope of a building - floors, walls, roof, windows, doors, rooflights etc.

Building Research Establishment Domestic Energy Model (BREDEM): A calculation method for estimating the annual energy requirements for space heating, water heating, cooking, lighting and electrical appliances within a self-contained dwelling, and for estimating the savings resulting from improvement measures.

Carbon Emission Reduction Target (CERT): A programme of energy efficiency improvements carried out by energy supply companies in their customers' buildings as part of the 'Supplier Obligation' imposed by the Government and regulated by Ofgem.

Carbon neutrality: net zero carbon dioxide emission achieved by balancing emissions associated with mains energy use with an equivalent amount of zero emission energy (e.g. electricity generated locally by PV) supplied to the national grid.

Cavity Insulation Guarantee Agency (CIGA): An organisation that provides independent twenty-five year guarantees for cavity wall insulation fitted by registered installers in the UK and Channel Islands.

Climate change adaptation: Adapting buildings to anticipated climate change by means of measures such as solar shading (to mitigate overheating) and sustainable drainage (to improve flood resilience).

Code of Practice for Energy Advice: A Code of Practice (CoP) for all organisations/individuals that provide domestic energy efficiency advice that is specific to individuals and their circumstances. The CoP was created by the Energy Efficiency Partnership for Homes (EEPH) and is managed by the Energy Saving Trust (EST). The CoP consists of a set of core standards related to the quality of advice and information provided, the training and development of advisers, customer access, quality assurance and service improvements.

Community Energy Saving Programme (CESP): A programme of local, community-wide energy efficiency improvements carried out by energy supply companies in partnership with local authorities, as part of the 'Supplier Obligation' imposed by the Government.

Competent Persons Scheme (CPS): A scheme that allows trained and accredited individuals to self-certify that their work complies with certain specified parts of the Building Regulations, as an alternative to submitting a Building Notice, making an application to a Building Control Body or

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employing an Approved Inspector.

Cross-ventilation: Ventilation of a room, or across a floor within a building, that is enabled by arranging ventilation openings on opposite sides of the space, so that fresh air is admitted on one side and stale air is emitted on the other side, driven by wind pressure.

Decentralised energy: Small, local, renewable energy sources e.g. wind farms, community scale CHP, domestic scale solar thermal and photovoltaic arrays.

Department of Energy and Climate Change (DECC): Government department established to take the lead in tackling the challenge of climate change and moving the UK towards a low carbon economy.

Domestic Energy Assessor (DEA): An accredited energy assessor who can issue Energy Performance Certificates (EPCs) for existing self-contained dwellings following an on-site survey.

Energy Company Obligation (ECO): An obligation to be placed by the Government on fuel companies to invest in the energy efficiency of buildings; from autumn 2012 (ECO will replace CERT and CESP, and complement the Green Deal).

Energy Performance Certificate (EPC): A certificate issued following an energy assessment of a building by an accredited assessor (OCDEA for new dwellings, DEA for existing dwellings, CEA or LCEA for non-domestic buildings). The EPC evaluates the energy performance of the dwelling in terms of an Energy Rating on an A to G scale, and identifies potential improvement measures.

European Regional Development Fund (ERDF): A fund allocated by the European Union for the period 2007 – 2013 to promote regional development through measures such as creating sustainable jobs, stimulating economic growth, enhancing access to transport and telecommunications, etc.

External shading: Integrated or building mounted solar shading devices on the outside of a building, including extended eaves, brise soleil, etc.

Feed in Tariff (FiT): a funding scheme that provides payments for electricity that is generated from small scale zero-carbon sources such as solar photovoltaic (PV) systems and wind turbines. The FiT is funded by a levy on all fuel bills.

Fuel poverty: the condition of a household that must spend more than 10% of its income on fuel in order to obtain an acceptable standard of space heating and hot water. Fuel Poverty is the opposite of Affordable Warmth. (Definition currently under review by Government)

Green Deal Adviser (GDA): An accredited adviser who can visit a dwelling, assess its energy performance, evaluate improvement options and provide the occupants with advice about improving energy efficiency of the dwelling.

Green Deal Code of Practice (GDCoP): a public document containing standards and requirements to regulate the behaviour of GDAs, GDPs, suppliers and installers working under the auspices of the Green Deal, in order to provide consumer protection.

Green Deal Provider (GDP): An organisation that arranges the funding and installation of energy improvement measures for dwellings, as recommended by Green Deal Advisers.

Green Deal Publicly Accessible Specification (PAS): A published generic specification (BSI PAS 2030) to which services provided and energy improvement measures installed under the auspices of the Green Deal must conform.

Green Deal: The Government's principal incentive scheme for promoting improvement of the energy efficiency of existing buildings, funded by commercial investment which is subsequently recovered by charges levied on the fuel bills associated with the buildings that are improved.

Green Guide to Building Specification: A guide to the relative environmental impacts of the construction materials commonly used in six different generic types of buildings; in excess of 1500 specifications are outlined in the guide, which is published by BRE Ltd.

Green House Gas: the gases whose increased concentration in the atmosphere promotes warming and consequent climate change; the principal Green House Gas is carbon dioxide, others include methane, and oxides of nitrogen.

Golden Rule: A principle associated with the Green Deal, under which PAYS charges applied to fuel bills and paid by householders must not exceed the expected fuel cost savings associated with installed energy improvement measures.

Home Energy Advisor (HEA): An accredited HEA is a DEA who also provides energy efficiency advice to households about measures to reduce energy use, covering changes that could be made to the dwelling and behavioural changes.

Home Energy Master Plan: A comprehensive evaluation of a dwelling to help the occupier understand the best options for making it warmer, reducing its energy bills and reducing carbon dioxide emissions.

Interstitial Condensation: Condensation that forms when warm, moist air from within the building penetrates into the building fabric (walls, roof or floor) and meets a cold surface, potentially leading to damage or rotting of the building fabric or structure.

Life cycle assessment (LCA): An assessment of the environmental impacts associated with all the stages of a product's life from raw material extraction, materials processing, manufacture, distribution, use, repair and maintenance, and disposal or recycling (i.e. 'from cradle to grave'). Sometimes also known as Whole Life Assessment.

Local renewable energy systems: Renewable energy systems that are installed close to the buildings they serve, but not within their curtilages, i.e. off-site.

Low carbon retrofit: Refurbishment of an existing building with a view to significant reduction in the carbon dioxide emissions associated with energy use.

Microgeneration Certification Scheme (MCS): A product and installer certification scheme that certifies microgeneration technologies that are used to produce electricity and heat from renewable sources (photovoltaics, solar thermal, micro wind turbines, heat pumps – ground and air source, biomass, CHP and micro hydro).

National Home Energy Rating (NHER): A BREDEM-based domestic energy rating based on a scale

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of 0 to 20 (20 being the best), which is similar to the SAP energy rating but takes account of all energy uses (i.e. heating, water heating, cooking, lighting and the use of appliances) and the location and local exposure of the dwelling, all under SAP standard occupancy. The NHER also estimates annual fuel use, fuel costs and carbon dioxide emissions under specified occupancy.

On-site renewable energy systems: Renewable energy systems that are installed within the curtilage of a building (e.g.: on the roof, in the plant room, or elsewhere on site).

Passive House Planning Package (PHPP): A workbook-based performance assessment tool produced by the PassivHausInstitut to assist the design and certification of dwellings to meet the PassivHaus Standard.

Passive House Standard: A performance standard for very energy efficient new dwellings, developed and certified by the PassivHausInstitut and widely taken up across western Europe.

Pay As You Save (PAYS): A funding scheme under which a loan to finance low carbon retrofit is repaid by means of a charge attached to the fuel bills of the dwelling that is improved; the charge remains with the dwelling, even if the occupants change, and is repaid over a period of up to twenty-five years. The 'Golden Rule' is that PAYS charges must not exceed the fuel cost savings expected to arise from the installed improvements.

Pay-back time: The time taken for the capital cost of low carbon retrofit work to pay for itself through fuel cost savings.

Post-occupancy monitoring and evaluation (POE): Monitoring of the performance of a dwelling, after retrofitting and occupation, to evaluate the effectiveness of the improvements.

Rainwater harvesting system: System that collects rainwater falling within the curtilage of a dwelling, for use in the home or garden.

Reduced Data Standard Assessment Procedure (RDSAP): A 'stripped down' version of the Standard Assessment Procedure (SAP) energy rating in which data items that are difficult or time-consuming to determine during a survey (e.g. ground floor insulation, window areas) are replaced by 'least unlikely' default data, in order to reduce the cost of energy surveys.

Renewable Heat Incentive (RHI): a funding scheme that provides payments for heat that is generated from small scale low or zero carbon sources such as solar panels, biofuel boilers, geothermal energy and some types of heat pumps. The RHI is funded by a levy on all fuel bills.

Renewable Heat Incentive Premium Payment: A direct payment from the Government to subsidise heat that is generated from small scale low or zero carbon sources such as solar panels, biofuel boilers, geothermal energy and some types of heat pumps, in return for feedback on system performance; this is an interim subsidy that will apply only until the RHI is implemented for domestic buildings in autumn 2012.

Seasonal efficiency: the seasonal efficiency of a heating boiler is the average efficiency with which energy in the fuel is converted to heat in the building, over the whole heating season; it is usually less than the manufacturer's claimed efficiency because the boiler is less efficient under partial load (e.g. during warmer weather in spring and autumn).

Simple pay-back: a method of assessing the cost effectiveness of a low carbon retrofit measure by evaluating the time taken for the capital cost of low carbon retrofit work to pay for itself through fuel cost savings.

Solid wall insulation (SWI): Insulation that is installed internally (IWI) or externally (EWI) to solid external walls in order to improve their thermal performance.

Solid Wall Insulation Guarantee Agency (SWIGA): An organisation established to develop an independent guarantee and associated industry quality and standards infrastructure for solid wall insulation (EWI and IWI).

Standard Assessment Procedure (SAP): A BREDEM-based domestic energy rating based on the annual fuel cost for heating, hot water and fixed lighting only, under standard occupancy and in a standard location, expressed on a scale of 1 to 100+.

Stratification: The tendency of air in a closed space, or water in a tank, to form layers of different temperatures, with the warmest at the top.

Sustainable urban drainage system (SUDS): A combination of water management practices and control measures designed to drain away surface water in a more sustainable way than conventional mains drainage methods. SUDs techniques include: permeable paving, soakaways, green roofs, swales, site ponds, infiltration ditches, balancing ponds, wetlands etc.

Thermal bridge: an area of building fabric that is less well insulated than surrounding areas, and therefore allows a greater rate of heat loss, as a result of the construction of the building; thermal bridges typically occur where structural members penetrate through insulation layers, at corners and junctions between elements (i.e. between floors, walls and roofs) and around openings such as windows and external doors.

Thermal comfort: perceived comfort in relation to environmental variables including air temperature and the radiant temperatures of surrounding surfaces, as well as personal factors including insulation by clothing, and metabolic heat generation.

Thermal transmittance (also known as U value): the capacity of a construction to transmit heat, measured in Watts per square metre of the construction per unit temperature difference across the construction (W/m2K); the lower the U value the better.

Thermography: The use of infrared thermal imaging equipment to investigate the thermal performance of building envelopes, usually to detect and evaluate thermal bridges and air leakage.

Trickle ventilator: a device for admitting a continuous trickle of fresh air into a home, to balance the stale air extracted by intermittent extract ventilation fans, passive stack ventilation or mechanical extract ventilation; trickle ventilators are usually fitted in window frames but can also be fitted through walls and have humidity-sensitive inlets.

U value: see Thermal transmittance.

Vapour balanced construction: a form of construction that allows water vapour to pass through

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the building fabric from inside to outside, but inhibits its passage in the opposite direction, while maintaining air-tightness; sometimes erroneously called 'breathing' or 'breathable' construction.

Vapour Barrier: a water-resistant membrane inserted into the construction of an exposed, insulated floor, wall or roof (always on the warm side of the insulation) to prevent the passage of moisture through the construction.

Warm Front: A Government-funded scheme that provides insulation and heating grants for low-income households that are in receipt of certain income-related benefits, in order to improve the energy efficiency of their dwellings and thus alleviate fuel poverty.

Waste water heat recovery: A system that uses a heat exchanger to recover heat from waste water from showers, baths, washing machines and dishwashers and return it to the domestic hot water cylinder in order to reduce the energy requirement for water heating.

Whole life assessment (WLA): An assessment of the environmental impacts associated with all the stages of a product's life from raw material extraction, materials processing, manufacture, distribution, use, repair and maintenance, and disposal or recycling (i.e. 'from cradle to grave'). Sometimes also known as Life Cycle Assessment.

Whole life costing (WLC): An assessment of the total cost of a product through all the stages of a its life, including costs associated with raw material extraction, materials processing, manufacture, distribution, use, repair and maintenance, and disposal or recycling (i.e. 'from cradle to grave').

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P19 Insulation installed between and over ceiling joists in loft ECD	Architects
P20 Schematic of flat roof insulation, showing continuity with EWI and air barrier ECD	Architects
P20 Installing insulation between timber floor joists	LowEnergyHouse.com
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