Draft energy efficiency planning guidance

for Dartmouth Park Conservation Area

Foreword

This guidance aims to provide residents in the Dartmouth Park Conservation Area with clear information about how energy efficiency improvements can be made to homes without harming the character and appearance of the conservation area.

This guidance sets out information on measures to improve the energy efficiency of your home, reduce heating bills and generate renewable energy. It explains which measures require an application for planning permission, and then gives guidance on which works are likely to be granted permission. The measures considered range from small DIY interventions to larger building projects.

The guidance has been produced as part of a pilot project and is a precursor to guidance for all homes in Camden conservation areas

Dartmouth Park Conservation Area was chosen for the pilot because it includes a wide range of house types against which the issues could be tested. The Highgate area also has an established interest in environmental sustainability: the ward had the borough's first Green Councillor, and Highgate Climate Action Network was established in 2008. This work has therefore connected into an existing network of sustainability and climate change activity in the area.

The guidance follows on from Camden's June 2011 Retrofitting Planning Guidance www.camden.gov.uk which provided information on the current permissions required to install energy efficiency measures in homes across Camden as a whole.

Local residents involvement in preparation of draft guidance

This guidance has been developed in consultation with a working group comprising representatives from the Dartmouth Park Conservation Area Advisory Committee, Transition Highgate and Transition Kentish Town (Transition Dartmouth Park was also formed following the start of the working group) and Residents' Associations from across the area.

The working group met to consider the scope of the pilot, discuss the issues and conduct walkabouts of the area to look at the buildings and consider what the effect of energy efficiency measures would be on the conservation area's character and appearance. An architectural advisor and energy specialist assisted the group with technical advice and case studies. A questionnaire was also devised and sent to all residents in the conservation area to gain information about current levels of knowledge and opinions.

The draft guidance was written by Council officers with input from the working group.

Questionnaire responses

A questionnaire was sent to all residents in the conservation area in February 2012. 463 responses (nearly 14% of the total number sent out) were received and the headline results are set out below. (The percentages have been rounded up for ease of reference).

- 42% of respondents have heard of the Green Deal but slightly more (46%) haven't.
- 40% of respondents said they would consider taking out a Green Deal loan whilst 20% responded that they would not. 25% of respondents needed to know more information about what it involves.
- Respondents considered the following as obstacles to installing energy efficient measures with cost considered to be the largest obstacle by most.
    1. Cost (63%)
    2. Lack of information of what to do and how (40%)
    3. Potential disruption from the works (35%)
    4. Need for planning permission and other consents (32%)
    5. Finding local suppliers/fitters (25%)
    6. Ownership issues (17%)
- The majority of respondents (66%) are worried about future energy price rises although they can manage at the moment. 13% of residents currently consider the cost of heating their home to be unaffordable.
- 30% of respondents consider that external wall insulation should be used wherever possible throughout the conservation area. Just over 50% of respondents are concerned that external solid wall insulation would change the appearance of the conservation area. 38% of residents think it should be encouraged on parts of the property which are not visible from the street.
- Almost 40% of respondents consider brick slips to be an appropriate finish for external wall insulation, with coloured render and white render supported by 24% and 21% of residents respectively. 17% of respondents do not consider any of the finishes as appropriate in the conservation area.
- The majority of respondents (almost 70%) would prefer to see sash windows (or casements where relevant) retained at the front and backs of properties but with their performance upgraded. 33% of residents would prefer to see original windows retained at the front but are less concerned about areas not visible from the street. One fifth of respondents do not want to see the use of secondary glazing in the conservation area.
- 34% of respondents are not concerned with solar electric and solar hot water panels being located on front roof slopes whilst 23% of respondents don't want to see any changes to the front roof slopes even if this would be the only viable roof top location.
- Just over half (53%) of respondents would be happy to see doors installed within porches if designed sympathetically to relate to the period character of the building. 18% of residents would rather see front doors replaced with more efficient ones to match, as they consider external draught lobbies would harm the traditional appearance of buildings and the conservation area.

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SECTION 1. Introduction

1.1 The relationship between climate change, homes and the conservation area

Climate change is already affecting people around the world and the UK is committed through the 2008 Climate Change Act to an 80% reduction by 2050 of greenhouse gas emissions (resulting from the burning of fossil fuels) which contribute to climate change.

Over 25% of UK greenhouse gas emissions come from housing and over 90% of these emissions stem from heating and powering homes built before the 1980s. It is therefore clear that if we are to achieve national carbon reduction targets we must improve the energy efficiency of our older homes.

The challenge is magnified in Camden because around 55,000 of the 95,000 houses in the borough were built before 1919 and these homes tend to have very poor energy performance. The extent to which this is true varies from home to home, but on average a terraced Victorian house is likely to use around four times as much energy as a home built to current building regulations.

With over 75% of homes in Camden (and a higher percentage of the pre-1919 homes) located in conservation areas which have policies to preserve and enhance the area's character and appearance, a sensitive approach is required. This may exclude some energy efficiency improvements to the building fabric.

Finding ways to improve the energy efficiency, comfort and energy affordability of homes in conservation areas that do not harm the area's recognised special character and appearance is therefore a key challenge for national carbon dioxide emissions reduction.

Development in the conservation area is controlled through the planning process and decisions are made in line with the Council's adopted Local Development Framework policies, such as Development Policy DP22 - Promoting sustainable design and construction, DP 24 - Securing high quality design and DP25 – Conserving Camden's heritage. Additional guidance is provided by supplementary planning guidance on matters such as design, materials, and conservation areas to ensure that new work relates sensitively to the existing setting.

Despite this, the appearance of the streets and buildings and the way people use them has changed over time in response to developments in transport, technology, and everyday family life. Car parking and road signage; television aerials and satellite dishes, conservatory extensions, wheelie bins and gas meters all reflect changes that have been absorbed into the area as everyday expressions of the society and age we live in.

The challenge of addressing climate change through retrofitting buildings is likely to bring changes that may initially be considered new and controversial but may, similarly, become ordinary features in our future lives: legitimate expressions of the challenges facing global citizens living in the conservation area in the 21st century. This guidance aims to identify locations where retrofitting measures can be carried out in a way that minimises harm to what is valued in the area and where change is considered acceptable. It will also assist in guiding its design so that its quality helps it to be accommodated comfortably within the area.

1.2 Rising energy costs and resource depletion

Alongside the impact that older homes have on national greenhouse gas emissions is a growing concern about the poor resilience of such properties to rising energy prices. Energy price inflation is a complex issue influenced by a range of political, commercial and physical conditions. However there is an appreciation that the fossil fuels we rely on to heat and power our homes are becoming increasingly scarce and contested and that energy prices are therefore likely to continue to rise.

1.3 The Green Deal

The Government also recognises the need for a step-change in the energy performance of 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 charge is attached to the house, rather than to the people living in the property, and repaid through a charge on the electricity bill. 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 Section 4 for reference).

1.4 The Green Deal and Conservation Areas

Camden Council recognises that energy efficiency measures can often affect the character and appearance of the homes at which they are installed. 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 be sure yet 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.

1.5 Energy efficiency guidance for Dartmouth Park Conservation Area

Camden Council is committed to conserving the borough's historic environment. The borough's conservation areas and listed buildings contribute much to our enjoyment of living in the city and their special characteristics can improve people's quality of life through a greater sense of place and civic pride. Historic buildings such as the Victorian terraces of Dartmouth Park Conservation Area provide adaptable and comfortable accommodation which has been enjoyed for over 100 years and are likely to be with us well into the future.

Designation as a conservation area recognises the special historic or architectural character and appearance. A conservation area appraisal and management strategy was adopted for Dartmouth Park CA in 2009 (available on the Council's website) and this provides an assessment of the special character and appearance of the area, how this may be preserved and how it may be enhanced. Designation does not prohibit change, but is intended to provide a framework within which change can be managed so that it is sensitive to the area's character and appearance.

The primary concern is the protection of the area as seen from the public realm, but in Dartmouth Park Conservation Area this isn't restricted to the front faces of buildings. The particular arrangement of buildings and gardens and the hilly topography in Dartmouth Park Conservation Area allow a multitude of views between houses, across back gardens, of the rear elevations of whole terraces, and across the rooftops from the higher ground. This is a particularly distinctive characteristic of this conservation area and means that rear, secondary elevations need to be considered just as carefully as the front, public faces in order to preserve the special character and appearance.

The technical guidance in Section 2 is designed to help you understand the range of energy efficiency measures that exist and their various benefits and things to watch out for when considering whether they're appropriate for your house.

The planning guidance in Section 3 explains which measures require planning permission, and provides guidance on the circumstances in which such measures might be considered acceptable in Dartmouth Park Conservation Area and therefore be granted permission.

Dartmouth Park Conservation Area contains a number of listed buildings and alterations that affect their appearance and fabric, internally as well as externally, is protected by law. This guidance does not aim to provide advice for retrofitting listed buildings as a greater level of detail would be required. Much of the general advice here will apply but we advise owners of listed buildings to contact the planning department to seek specific advice. Listed Building Consent is likely to be necessary for many retrofitting measures.

1.6 Council tenants and leaseholders

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, utilising 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.

Section 2. Technical guidance on energy efficiency measures

This section sets out how to plan your retrofitting works so as to maximise their cost effectiveness, and gives details of a range of energy improvement measures that are likely to be of interest to residents in the Dartmouth Park Conservation Area. This includes No Cost and Low Cost measures that residents are likely to be able to carry out themselves or with a little help,   as well as larger more expensive interventions which would require the services of specialist contractors.

In this guide we can only provide a brief summary of each improvement measure, but more information can be obtained via the references and links in Section 4, in particular the Institute for Sustainability's *Low Carbon Domestic Retrofit Guides* (Rickaby *et al*, 2011).

The section is structured as follows:

2.1 Making a low carbon retrofit plan
2.2 No cost, low cost measures
2.3 Insulation
2.4 Windows, external doors and draught lobbies
2.5 Air-tightness
2.6 Ventilation
2.7 Heating and hot water systems, including solar hot water
2.8 Photovoltaic electricity generation
2.9 Heat pumps
2.10 Domestic combined heat and power

2.1 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 replacing a bathroom or kitchen.

Regardless of what scale you are working at, it makes sense to establish an overall 'low carbon retrofit plan' - perhaps spanning twenty years or more - that embraces both your current needs and longer term objectives for your home. 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 and draughtproofing, above 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.

This approach is also known as '**fabric first'**. It

a) prioritises improvement of the building fabric in order to reduce heat losses,
b) then moves on to the building services, in order to improve efficiency and
c) Only considers expensive renewable energy systems are only considered after the building fabric and services have been improved, in order to reduce or offset the carbon dioxide emissions associated with energy use.

Your plan should therefore adopt the following priorities:

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

In practice your priorities will also be influenced by other factors such as ownership of the property, the availability of financing and the 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 (CPA 2010).

Carbon Cost-effectiveness

The carbon cost-effectiveness of a measure is the capital cost of the measure/s, less the lifetime fuel cost savings, divided by the lifetime carbon dioxide emissions savings) of measures for each house. Understanding the carbon cost effectiveness of measures will help you decide which measures to install so as to get the most effect for your money spent. Calculators such as that on www.T-zero.org.uk can help you measure this 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.

2.2 No cost, low cost measures

It is appropriate to concentrate on 'no cost, low cost' measures first, before moving on to improvements that involve more significant investment.

No cost measures involve simple lifestyle changes:

- 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.

Low cost measures - residents may find these easy to do themselves or with the help of a friend or neighbour:

- Add thermal linings to your curtains
- Draughtproof your window and doors
- Fit a draught-excluding letter box cover
- Block small gaps in the external walls, for instance where water or boiler pipes exit the building, or where floors and skirting boards meet.
- Install a chimney balloon to block a chimney that is permanently out of use.
- Fit a water-saving aerating shower head to your existing shower hose to reduce your hot water usage.
- Insulate your hot water pipes and cylinder to stop heat escaping

Fitting an energy monitor is also a good way of becoming more aware of energy use in the home, and of the level of consumption of various domestic appliances and devices. These small devices plug into an electricity socket and give you real time information on your electricity usage.

Camden Council runs workshops with local Transition groups on adding thermal linings to your curtains and on draughtproofing your windows and doors. For more details on how to join please see the **Green Camden** pages of the Council's website www.camden.gov.uk/green.

2.3 Insulation

Roof insulation

Dartmouth Park Conservation Area contains a wide variety of roof forms, including mansards, single pitched, pitched and hipped, central valley roofs, and flat roofs. The following section gives advice for the two generic roof forms – pitched and flat. The advice can be adapted to suit the variations that exist in the conservation area.

Insulation of pitched roofs between the ceiling joists

Advantages
- 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.

Disadvantages
- Any existing insulation may be in poor repair, and may have to be removed before the new insulation is installed.
- 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.
- Cold water storage tanks located in lofts may have to be insulated – this can be difficult to do properly.

Watch points
- 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.
- It is essential that cold lofts above insulated ceilings are ventilated, in order to reduce the risk of condensation and rot on the cold underside of the roof; 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.
- Insulation must not block bathroom or toilet extract ventilation ducts; if such ducts terminate in the roofspace 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.
- If loose fill insulation is present, and the composition is not clear, seek expert advice.

Insulation of pitched roofs at the rafters

Advantages
- 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).

Disadvantages

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

Watch points

- 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.
- 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, above).
- In the case of valley roofs, ensure that insulation is continuous beneath the valley, between the two pitches, in order to avoid thermal bridging.
- 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.
- Planning permission is required if the height of the roof ridge is to be raised.

Flat roofs

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.

Watch points

- 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.
- 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

Most houses and extensions built before the 1950s in Dartmouth Park Conservation Area have suspended timber floors. Houses built after this date, and flats in blocks are more likely to 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 via concrete beams with infill blocks. It is common practice to top the structural layer with a cement screed.

Timber floors

- 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.
- Air tightness measures should be applied. 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.

Watch points

- Insulating the ground floor is one of the most disruptive of all retrofit measures, often requiring temporary removal of all internal fittings, furniture and finishes from the area being insulated.
- Timber floors should be checked for structural soundness and the presence of wet or dry rot before proceeding to retrofit 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.

Solid wall insulation

Dartmouth Park Conservation Area is largely typified by houses with solid brick external walls, without a cavity. There are two options for insulating solid walls: external or internal insulation. Technically, it is always preferable to insulate externally, but this is not always possible. (Some houses in the conservation area that were built after 1935 will be of cavity walled construction, with or without insulation in the cavity).

External Wall Insulation

Insulation is 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). Some render finishes can also be given a brick-like appearance. These finishes may be more acceptable in some locations in the conservation area 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.

Advantages

- This can dramatically reduce heat loss from the house.
- The layer of insulation is continuous (except across windows and doors), reducing thermal bridging and cold spots, and helping to improve air tightness.
- There is a choice of finishes that may be used to respond sensitively to the architectural context: render (in various colours and textures, including a finish that looks like brickwork); brick slips (clay tile with the surface dimensions of a traditional brick that are applied to the outer surface of the insulation to look like brickwork), or timber weather board cladding.
- Occupants may usually remain in the house while the work is carried out

Disadvantages

- Planning permission will always be required in conservation areas.
- External insulation may not be acceptable on all elevations, or to the full height or width of any elevation for planning reasons (See Planning Guidance in Section 3) and should in these situations be combined with internal wall insulation
- External fittings such as rainwater pipes, power and telephone cables and satellite dishes will have to be removed and re-fixed after the insulation has been installed.
- The eaves and/or verge overhang of the roof may have to be extended.
- Windows cills 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.
- Application of ESWI to only one property in a terrace 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 dwelling’s external walls.

Watch points

- 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.
- A Party wall agreement is likely to be required where one house in a terrace applies ESWI that ends at a party wall.

External wall insulation is very compatible with window replacement, and it is often appropriate to install both measures at the same time.

Internal Wall Insulation

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.

Advantages

- Planning permission is not required in most cases (but Listed Building Consent may be required, for Listed buildings).
- The external appearance of the building is not affected.
- A wide variety of insulation materials of different thicknesses is available, including mineral wool, sheep's wool, wood fibre boards and rigid plastic insulation boards.

Disadvantages

- Internal insulation can be very disruptive to occupants, who may need to clear individual rooms or move out of their home while the work is carried out.
- It is difficult to ensure that the insulation layer and the associated vapour barrier are continuous.
- To achieve the optimum heat loss reduction there is a loss of room space of up to 150 mm adjacent to external walls.
- 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, etc, may have to be removed and subsequently replaced. Some fittings may require adapting to fit after the insulation has been installed.
- It may not be practicable to insulate the wall area where it passes through the floor void
- It is difficult to insulate behind shutter boxes, but it may be possible to insulate the backs of boxes with thin layers of very high performance insulation such as aerogel board.
- It is almost impossible to insulate behind kitchen and bathroom fittings without removing them. Existing kitchen units may need adapting to fit against the insulated walls.
- Redecoration is required after the insulated linings have been installed.

Watch points

- Unless the insulated linings include a very carefully installed continuous vapour barrier that is sealed at all joints, edges and service penetrations, there is a 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 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.
- 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 waterproofing treatments.
- Re-pointing of Victorian brickwork should always be in lime mortar as this provides a ‘path of least resistance’ to any moisture in the brickwork, and allows the brickwork 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.

Combining internal and external insulation

In conservation areas, architectural and planning considerations often result in solutions that involve a combination of internal and external wall insulation on different walls. 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, 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.

2.4 Windows, external doors and draught lobbies

Improving windows and doors

The key measures for improving the energy efficiency of windows are

- draughtproofing (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.

Windows and glazed doors account for significant heat loss (up to six times as much as the same area of wall or roof). In Dartmouth Park Conservation Area the appearance of windows and doors contributes much to the area's character and so alterations to them must be done sensitively.

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. English Heritage has undertaken research to demonstrate how existing single glazed timber sash windows can be upgraded and their performance improved dramatically by repairing them so they are well fitting, and by using the traditional timber shutters and , heavy curtains or blinds and secondary glazing. They recorded heat loss reductions of up to 41% with heavy curtains, 58% with well fitting shutters and 58% with secondary glazing (see Section 4 for reference)..

Secondary Glazing

Secondary glazing is the cheapest and least disruptive improvement option for windows after draughtproofing, use of timber shutters and thick, thermally lined curtains. 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.

Secondary glazing can be difficult to install where there are internal window shutters that are to remain in use. However, if the secondary glazing is fixed against the back of the existing window frames it is sometimes possible for the shutters to remain in use.

English Heritage's research result of 58% reduction in heat loss (to a U-value of around 1.8 W/m^2K) 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 'slim lite' 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/m^2K.

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 Table 1 below 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/m^{2}K, i.e. they are responsible for approximately twice as much heat loss as new or replacement ones. The very best performing windows can now achieve exceptional U-values of around 0.75 W/m^{2}K through the use of triple-glazing, gas fill, low-emissivity coatings and insulated frames. Replacement double glazed timber windows that are acceptable in Dartmouth Park Conservation Area are likely to achieve between 1.4W/m^{2}K and 1.8 W/m^{2}K, by using low emissivity coatings and gas fill in the glazing units.

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.

Watch points

- 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 draughtproofed.
- 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.

2.5 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 the volume of air loss per m^2 of floor area of the home per hour 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.

Watch points

- 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.
- 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 with no gaps and that all openings are draughtproofed. Air infiltration through a sash window in good condition can be reduced by as much as 86% by adding draught proofing.
- 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.

2.6 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 m^3/m^2h 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 m^3/m^2h 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 m^3/m^2h 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.

Watch points

- Fans must exhaust stale air to the exterior, not to a loft or garage.
- 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 and is unlikely to be applicable in Dartmouth Park Conservation Area.
Watch point

- 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.
Watch points

- MEV 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.
- 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.

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 it is not practical, or too expensive, to install a whole-house system. However, HRRVs can only serve one room, so at least two are required in most houses.

HRRVs supply air to the same spaces that they extract from (usually kitchen and bathrooms), therefore in an airtight house they should be located appropriately to provide a sufficient supply of fresh air. ‘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 to pre-heat 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.

Watch points

- The house must have a good standard of air tightness (air permeability of less than 3 m^3/m^2h @ 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.
- 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.
- 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.

2.7 Heating and hot water systems, including solar hot water

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. The sizing of the boiler will depend on a number of factors including the floor area of your home, the level of insulation nand the type of windows. 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)

Advantages

- GCH uses the least expensive domestic fuel (as of Spring 2012).
- There is a vast range of robust, well-tried component products and a well established installation, servicing and repair industry.

Disadvantages

- Heat distribution is usually via radiators, which may be disruptive to install in a home that does not already have them.

Watch points

- 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.
- 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.
- 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.
- 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.
- 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 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.

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 use 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').

Advantages

- Less expensive to install 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.

Disadvantages

- More expensive to run than GCH.
- On-peak room heaters, which use more expensive day-time electricity, are required for supplementary heating.
- 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.

Watch points

- 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 m^2 of solar panel is required per bedroom in the house.

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 m^2 installation will generate approximately 400 kWh/m^2/yr and thus deliver 1600 kWh/yr and qualify for £136/yr in RHI payments.

Advantages

- Free, zero-carbon domestic hot water: up to 50% of annual hot water demand (including most of the hot water required during the summer).
- Renewable Heat Incentive payments to offset the capital cost of the installation.
- Compatible with direct (electric immersion) or indirect (gas boiler) hot water cylinders.

Disadvantages

- A new, dual coil hot water cylinder may be required.
- Solar water heating is not compatible with unmodified combi boiler systems unless a solar pre-heat tank is installed.
- Roof-mounted installations may not be acceptable on some highly visible roof pitches in the Conservation Area.

Watch points

- 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.
- 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.
- The optimum orientation is due south, tilted by between 20^o and 50^o from the horizontal. Poor orientation reduces overall efficiency, but systems still work well when oriented between south-east and south-west.

It makes economic sense to install solar water heating when a suitably oriented roof is being replaced or repaired.

2.8 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 20^o and 50^o from the horizontal.

Solar slates or tiles which replace the existing roof covering and have a closely matching appearance 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 m^2 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 currently attracts payments from the Feed in Tariff (FiT), and there is an additional lower payment for exported electricity to the national grid. FiT payments are index-linked and continue for twenty-five years. PV installations are expensive, but the prices are falling. The FiT is currently set at a level that will repay the capital cost in about twenty years .

Advantages

- Free zero-carbon electricity to offset the electricity demand of the home and the associated carbon dioxide emissions.
- Twenty-five year index-linked Feed in Tariff payments for all electricity generated, with additional payments for electricity exported to the national grid.
- Little or no maintenance is required.

Disadvantages

- High current capital cost (approximately £3,000 per kWp in 2012).
- Installations require a lot of space: approximately 7 m^2 of well-oriented roofspace per kWp output. Few homes have space for more than a 2-3 kWp installation.
- Roof-mounted solar PV panels may not be acceptable on some highly visible roof pitches in the Conservation Area.

Watch points

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

It makes economic sense to install solar PV panels or slates when a suitably oriented roof is being replaced or repaired.

2.9 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 (ASHP) has a CoP of 2.5 (i.e. it extracts 2.5 times as much energy as it uses). Ground-source heat pumps (GSHPs) and water-source heat pumps (WSHPs) have higher CoPs, but there is little scope for the use of these devices in densely developed urban areas.

Domestic ASHPs usually use warm air for heat distribution. GSHPs and WSHPs 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).

Advantages

- Heat pumps are suitable for domestic heating where mains gas is not available.
- 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.
- Some ASHPs 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.

Disadvantages

- GSHPs require large areas of open land, or vertical boreholes, for ground heat exchangers. Often where there is space for a borehole (e.g. in a back garden) there is little or no access for the machinery to bore the hole, or there are underground services which restrict its location.
- WSHPs require large bodies of water or flowing streams for water heat exchangers, to avoid ice build-up.

Watch points

- Beware of inflated CoP figures; quoted performance may be optimistic, and may not relate to performance in the UK.
- 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.

2.10 Domestic combined heat and power

Domestic combined heat and power (DCHP) systems generate 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.

DCHP 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. DCHP 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). Electricity is not generated when the system is not providing heat (including in summer).

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

Advantages

- DCHP replaces a conventional gas-fired central heating boiler and generates electricity and heat for heating and hot water.
- The electricity generated is eligible for FiT payments (10.5 p/kWh plus 3.1 p/kWh for exported electricity, for the first 30,000 installations).

Disadvantages

- The choice of products suitable for domestic installations is currently limited (Baxi EcoGen and E.On WhisperGen).
- DCHP is only suitable for homes with a high heat demand (heating and/or hot water).

Watch points

- If a property is well insulated, with low heat and hot water demand, DCHP may not be suitable, because it will not run for long enough periods to generate significant amounts of electricity.
- DCHP installation may involve replacement of the existing electricity meter.
- DCHP units are noisier than boilers; they should be installed in a utility room or similar space rather than in a kitchen.

Section 3. Area Specific Planning Guidance

This section provides area specific guidance on the how retrofit measures can be installed without harming the conservation area and is divided into two main sections, 3.1 What Requires Planning Permission and 3.2 Planning Guidance.

Some external measures may be acceptable in one location and not in another, depending on their 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 it is intended to be an initial indicator of likely acceptability to help you as you consider your options.

If you are considering undertaking any of these works you may obtain more detailed advice from the Planning Department about the design of your proposed works prior to submitting a planning application. Please see details of the planning advice and consultation team service offer on the Council's website.

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 Section 4).

3.1 What requires planning permission?

This section sets out which retrofitting works require 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	**NO, if it complies with the following conditions:** • **Dwellinghouse** - materials of new windows are to be of similar appearance to the existing ones • **Flats** – the appearance of the new windows is to be the same as the existing windows	UPVC or aluminium are not considered to be of a similar appearance to timber. If it doesn't comply with the conditions then planning permission is required.
Porch door	• **Dwellinghouse – NO** • **Flat- YES**	
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 it doesn't 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 it doesn't comply with the conditions then planning permission is required.
Air source heat pumps	**YES**	(Likely to change with GPDO revision currently

		being considered by Government)
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 it doesn't comply with the conditions then planning permission is required.

3.2 Planning Guidance

This section gives further guidance on some of the energy efficiency measures that DO require planning permission, to explain the circumstances in which planning permission is likely to be granted. You should refer to it when deciding which energy efficiency measures may be suitable for your house.

This document will have the status of supplementary planning guidance when adopted and will form part of Camden's Local Development Frameswork (LDF). It will then be used by the Council when considering whether planning applications meet its development policies, particularly DP24 - Securing high quality design and DP25 – Conserving Camden's heritage.

All of the following measures (except freestanding solar panels) will also require Listed Building Consent if the building is listed.

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 will rarely be acceptable on the front elevation of a building unless render already exists as part of the buildings original design. In these cases it may be acceptable on flat fronted properties without architectural decoration and only if it is applied to the whole group together. Where projecting bays exist it may be possible where these have no architectural decoration, and again only if applied to the whole group.

- It may be acceptable on the side elevation of a building depending on the prominence of this elevation and the finish used.

    - On semi detached villas ESWI should be set back behind any decoration (e.g. quoins, eaves brackets or dentil cornices) and designed to relate sensitively to features such as expressed chimney stacks. The extent of set back should be designed to minimise the extent of visibility in oblique views along the street, and so may vary depending on the size of gap between the houses.

    - Render finish should be coloured to match the tone of the brickwork. A greater extent may be possible at basement level if this is obscured from the street. Where the elevation is highly visible from the public realm, for instance on end houses in a street, or where houses are set at an angle to the road, we recommend a brick-slip finish to match the existing brickwork.

    - On highly exposed flank elevations that have quoins, decorative brickwork, several windows and doors or overhanging eaves with a decorative eaves treatment, for example, ESWI may not be feasible or acceptable.

    - Where it overhangs a pavement you will also require a permanent overhang licence. Contact Camden on 020 7974 4444, or see www.camden.gov.uk/buildinglicences

- It is likely to be acceptable on the rears of properties where these are not highly visible from the street and are not part of a prominent or decorative architectural composition.

    - Many rear elevations are visible from the street due to long views along the rear of terraces, and an approach which preserves these views is recommended. This will usually mean that ESWI to the garden level will be acceptable, but not upper storeys.

    - ESWI on all elevations of smaller rear extensions (e.g. part width single storey or two storey extensions on 4 storey properties) that are clearly subordinate to the main building are likely to be acceptable.
    - ESWI on higher or wider rear extensions that assume a larger part of the rear elevation would have a greater impact on the appearance of the building as a whole, so ESWI on all elevations of larger and less subordinate rear extensions above garden level are unlikely to be acceptable.
    - Render finishes should match the colour of the brickwork, and/or the predominant existing render colour, where one exists.

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.

The following table gives more detailed information on where and how ESWI might be considered acceptable in the conservation area. You are advised to use this as an initial guide, but it does not guarantee that planning permission will be granted, as each application will need to be assessed with the benefit of a site visit to assess the full impact.

External Solid Wall Insulation – where it is likely to be granted planning permission			
Street	**Front**	**Side**	**Rear**
Balmore Street	Yes if done as a group 5-39 & 10-34, to lower ground floor only	No, unless brick-slip finish to match	Yes - Garden level and rear extensions only
Bertram Street	No	No, unless brick-slip finish to match	Yes - Garden level of elevation and of rear extensions only
Boscastle Street	No	Yes – within terrace if set back from front elevation Not on exposed street-corner side elevations	Yes East side of road – garden level elevation only West side of road – rear extensions and garden level elevation of main house
Bramshill Gardens	No	The variety of building types in this road means it is not possible to give general guidance. Rear EWI is likely to be acceptable at garden level on most properties, and further areas at the rear or side may also be possible on some properties. Complex roof forms means that Solar PV and Thermal may not be technically possible on some. properties, but flat roofs or south facing rear or side roofs offer some opportunities. *Please seek further advice from the planning department.*	
Brookfield Park	No	Yes - full height render finish	Yes – full height render finish
Chester Road	No	*The variety of form, materials and visibility of side and rear elevations in this road means it is not possible to give general guidance. Please seek further advice from the planning department*	
Chetwynd Road (east)	66-80 (even) if done as a group in location of existing stucco and decorative panel retained.	Yes – basement or semi-basement level. Yes -upper levels if set back from front elevation.	Yes – garden level elevation and rear extensions except where visible from street.
Chetwynd Road (west)	No	Yes – 1; 56 & 62 at ground floor level only; No - 2,4,61,54	Yes - Chetwynd Villas Yes – garden level and rear

External Solid Wall Insulation – where it is likely to be granted planning permission			
Street	**Front**	**Side**	**Rear**
			extensions except where visible from the street.
Churchill Road	Yes – where stucco currently exists and if done as a group	Yes	Garden level elevation and rear extensions
College Lane	No	No	Yes, garden level elevation and rear extensions
Colva Walk	Yes	Yes	Yes
Croftdown Road	No	No (except exposed flanks of Regency Lawn)	15-47 garden level elevation and inner flanks of rear extensions
Dartmouth Park Avenue	No	Yes - 2-26 (even) if set back from front elevation (2 – southern flank only if brick-slip finish) Yes- 1-33 (odd) if set back from front elevation (1 southern flank only if brick-slip finish)	2-26 (even) garden level *Elsewhere check with planning department due to varying extent of visibility of rear elevations from Croftdown Road.*
Dartmouth Park Hill	Yes 59-73 (odd) No - Elsewhere	Yes - 59 – 73 (odd) *Elsewhere may be acceptable but check extent and finish with Planning Department*	Yes garden level elevation only
Dartmouth Park Road (east)	No	Yes- if avoids conflict with architectural detailing, set back from front elevation, behind chimney stack where one exists.	Yes garden level elevation only 68-70 (even) Only on southern elevation if brick finish
Dartmouth Park Road (west)	No	Yes- if avoids conflict with architectural detailing, set back from front elevation, behind chimney stack where one exists.	Garden level elevation and rear extensions (except where flank faces road)
Doynton Street	Yes Basement and ground floor elevations of nos 7-35 (odd) if done as a group.	No - flank elevation of no.7.	Yes basement and ground floor elevation, and rear extensions of 9-35 (odd)
Glenhurst Avenue	No	Yes -1&2, No - 23&46	Yes full height elevation and rear extension.

External Solid Wall Insulation – where it is likely to be granted planning permission			
Street	**Front**	**Side**	**Rear**
	(Ravenswood Yes)		
Gordon House Road	No	Yes- 20 No – 1, unless brick-slip finish to match	Yes, full rear elevation & extensions
Grove Terrace		*Buildings in Grove Terrace are listed and so detailed advice should be sought from the Planning Department*	
Highgate Road	*The variety of building types in this road means it is not possible to give general guidance. Rear EWI is likely to be acceptable at garden level on most properties, and further areas at the rear or side may also be possible on some properties. Many buildings have valley roofs or flat roofed elements and so solar pv and thermal are likely to be widely possible. Please seek further advice from the planning department.*		
Highgate West Hill	No	No	Nos 1-4 (consec) garden level elevation only
Kingswear Road	No	No	May be possible on ground floor elevation
Lady Somerset Road	No	Ground floor elevation only	Ground floor elevation only
Laurier Road (upper)	No (except no.32)	Yes - if avoids conflict with architectural detailing, set back from front elevation, behind chimney stack where one exists; and brick-slip finish where highly visible, e.g. 23, 27, 32a, 34, 36, 38, 42, 45 & 46.	Yes - South side rear extensions & ground floor elevations where not visible from the street North side – ground floor elevations only.

External Solid Wall Insulation – where it is likely to be granted planning permission			
Street	**Front**	**Side**	**Rear**
Laurier Road (lower)	No (except 1b & 1c if brick clad to match)	Yes - if avoids conflict with architectural detailing, set back from front elevation, behind chimney stack where one exists; and brick-slip finish where highly visible, e.g. 1c, 2, 21, 30. No – 21.	Garden level elevation only
Lissenden Gardens	No	Yes	*The blocks have different configurations to the rear and so it is not possible to give general guidance. Some locations may be feasible and acceptable- contact the planning department for further advice.*
Little Green Street	*Buildings in Little Green Street are listed and so detailed advice should be sought from the Planning Department*		
Lulot Gardens	Yes	Yes	Yes
Mortimer Terrace	Ground floor elevation only 1-11 (consec) No – 13-16 (consec)	Yes – nos.13 – 16 (consec) Ground floor elevation only 1-11 (consec)	Yes, full height 1-11 & 13-16 (consec).
Raydon Street	Yes	Yes	Yes
Retcar Place	Yes	Yes	Yes
St Albans Road	No	Yes 2-34 (even), 25-33 (odd), & St Alban's Villas	Yes – 2-34 (even), 25-33 (odd) full height elevations, & St Albans Villa's
St Anne's Close	No	Yes	Yes
Sandstone Place		Yes	Yes
Spencer Rise	No	No. 2 – ground floor only (unless brick-slip	Ground floor elevations and rear

External Solid Wall Insulation – where it is likely to be granted planning permission			
Street	**Front**	**Side**	**Rear**
		finish) Yes- 67 & 48 if brick-slip finish, & 50-90.	extensions , full elevation on 50-90
Stoneleigh Terrace	Yes	Yes	Yes
Swains Lane	No	Yes	Yes full height
Twisden Road	No	Yes – 14, 16, 74, & 25-35 No – 1 & 51	Yes - Garden level elevation and rear extensions, full elevation on 25-35. No – upper levels where visible from the street.
Weslyan Place	No - 4-7 (consec)	Yes – no. 6	Yes full height elevation and rear extensions of 4-7 (consec)
	Nos 1a, 1, 2 & 3 Wesleyan Place are listed buildings and so detailed advice should be sought from the Planning Department		
Winscombe Street	Yes - Basement level nos 1-15	Yes if brick-slip finish	Garden level only
Woodsome Road	Yes – 70-86 & 25-31.	Yes if avoids conflict with architectural detailing, designed to sit behind chimney stack where one exists. Yes – 70-86 & 25-31. No – where adjacent to street	Yes - Garden level elevation and rear extensions (except where adjacent to street) Yes – 70-86 & 25-31.
York Rise	Yes- 2a, 2b, 2c; 16-18 if brick clad; 39. No – 6-14, 20-24, 36-50 (even); 21-27 (odd)	Yes - 21, 24, 31, 50 if brick-slip finish; 26-34. No – 33-37 (odd)	Yes 26-34.

Windows are a key feature in a house, and their design is important in providing visual interest and detail to a building.   Planning permission is required to replace an existing window with one of different material or appearance. Use of uPVC in the conservation area will be resisted.

The houses in Dartmouth Park Conservation Area were mostly built with timber vertically sliding sash windows with a simple glazing pattern of either one pane over one, or two panes over two. Where these are proposed for replacement with double glazing the appearance of the new window should exactly match the original. This can be done by retaining the existing frame and having new double glazed units inserted into it,   or by having new double glazed sashes made up.   Important features to match are the width of the glazing bars; that the glazing bars are integral features of the joinery and not 'stuck on'; the height of the meeting rail; and the presence or absence of 'horns' on the top sash. Some windows have historic coloured glass and this should be retained and re-used. Heavier sash weight may be needed (these are hidden in the sash boxes on either side of the window) to counterbalance the extra weight of the double glazing; new alternatives to traditional sash weights are spiral or spring balanced windows, which are also acceptable in the conservation area.

A small number of dwellings in the conservation area have windows with multi-paned sashes (for instance the west side of Brookfield Park, the west end of Croftdown Road and the mansion flats on Croftdown Road). These are rarely possible to replicate accurately in double glazing and in this small number of cases secondary glazing should be used instead.

Other areas of the conservation area have timber side hung casements (for instance the cottage estate on Croftdown Road and Kingswear Road, the east side of Brookfield Park and some houses on St Albans Road). These have either a single pane in each casement, or are multi-paned. The same approach applies here – single panes can be satisfactorily replaced by double glazing, but multi-panes may be more difficult to achieve an acceptable match. Where this is the case secondary glazing should be used instead.

Porch door Heat is also lost through external doors and this can be reduced by adding a draught lobby either inside or outside the front door. In a small number of cases in the conservation area the front door sits within an open porch or is recessed from the building frontage and an external draught lobby may be acceptable in these cases. This has the added benefit of keeping the room directly above the porch warmer as well. Designing the door so that it matches the special architectural characteristics of the building is essential to preserving the character of the building. Adding a porch door does not need planning permission on a single family dwelling house, but does for a flat.

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

Installation of solar pv or thermal panels on a house, a flat or a building situated in the curtilage of a dwelling house is permitted development and therefore does not need planning permission unless:

- The solar equipment would protrude more than 200mm beyond the plane of the roof slope
- It would result in the highest part of the solar equipment being higher than the highest part of the roof (excluding the chimney)
- It would be installed on a wall forming the principal or side elevation of the house and would be visible from a highway, or
- It would be installed on a wall of a building within the curtilage of the house and would be visible from the highway, or
- The solar equipment would be installed on a building within the curtilage of a listed building.

Special conditions apply to this permitted development right, as follows:

1. Solar equipment installed on a building shall, so far as practicable, be sited so as to minimise its effect on the external appearance of the building;
2. Solar equipment shall, so far as practicable, be sited so as to minimise its effect on the amenity of the area; and
3. solar equipment no longer needed for microgeneration shall be removed as soon as reasonably practicable.

We consider it preferable for them to be erected 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 views of the roofscapes that are visible across the conservation area. 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 to use our duty planner and pre-application advice service and then apply for a Certificate of Lawful Development from the planning department.

In Dartmouth Park Conservation Area there are a variety of roof types which offer different opportunities for the erection of solar pv or thermal panels and differ in the extent to which they are visible from the public realm.

- Valley roofs that are set behind a front parapet wall. These occur predominantly in Bertram Street, Spencer Rise, Winscombe Street and parts of Boscastle, Chester, Churchill and Chetwynd Roads. Solar panels can be set within the roof valley without being visible from the street.
- Roofs with a single pitch to front and rear. These exist predominantly on Balmore Street, Chester Road, Chetwynd Road, College Lane, the cottage estate and mansion blocks on Croftdown Road, Dartmouth Park Hill, Doynton Street, Twisden Road, Woodsome Road, York Rise estate and,the east side of Brookfield Park, parts of Bramshill Gardens and south side of Raydon Street, Suitability for

solar panels and their visibility will vary greatly depending on the orientation of the street.

- Mansards or pitched roofs incorporating significant areas of flat roof. These exist predominantly in Dartmouth Park Avenue, Gordon House Road, Laurier Road, Lissenden Gardens, parts of Boscastle Road and the north side of Croftdown Road, and the flat sections offer opportunities for siting solar panels with minimal visibility from the public realm.
- Roofs with a single pitch to front, side and rear. These exist predominantly on the detached and semi detached houses on Dartmouth Park Avenue, Dartmouth Park Road, and parts of Laurier Road. Suitability for solar panels and their visibility will vary greatly depending on the orientation of the street.
- Flat roofs. These exist predominantly in the blocks of the Whittington Estate, Regency Lawn on Croftdown Road, parts of St Albans Road, Swains Lane and Wesleyan Place. These offer significant opportunities for siting solar panels that are not visible from the public realm.

An alternative approach is 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 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.

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 colourof 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.

Section 4. 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 website includes research on the thermal performance of traditional sash windows (Improving the Thermal Performance of Traditional Windows, Glasgow Caledonian University, 2009), and detailed technical notes on specific energy efficiency measures. See www.climatechangeandyourhome.org

The Energy Saving Trust (EST)has a very extensive 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 Victorian Society has published the presentations given at its London conference on Energy Efficiency in Victorian and Edwardian homes on 11 November 2008. See www.victoriansociety.org.uk/advice/greening

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 National Refurbishment Centre – examples of retrofitted properties. www.rethinkingrefurbishment.com/portal

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

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) *An Introduction to Low Carbon Domestic Refurbishment*, Construction Products Association, London. See www.constructionproducts.org.uk.

Dartmouth Park Conservation Area Advisory Committee provides local knowledge and expertise on matters relating to the Dartmouth Park Conservation Area, including providing advice to the Council on planning applications, policies and guidance that affects the character and appearance of the area. See http://www.dartmouthpark.org

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/

Transition Dartmouth Park is a newly formed Transition Initiative, covering Dartmouth Park and Highgate Newtown. Its stated aim is 'to strengthen our community while improving our environment and cutting our use of fossil fuels, and also having some fun!' See http://transitiondartmouthpark.wordpress.com/

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

For information on what the Council is doing to help residents with energy efficiency and environmental sustainability see www.camden.gov.uk/green. You can also contact the **Green Camden Helpline** on 0800 801738 for advice.

There is information provided for **Council tenants and leaseholders** on energy efficiency on the Council's Housing web pages.

Section 5. 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 chose 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 Initiative is 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

Appendix

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 m^3 of air leakage per m^2 of building envelope per hour, at 50 Pa excess pressure (m^3/m^2h @ 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 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): A 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.

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 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 PassivHaus Institut 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 PassivHaus Institut 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/m^2K); 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 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’).