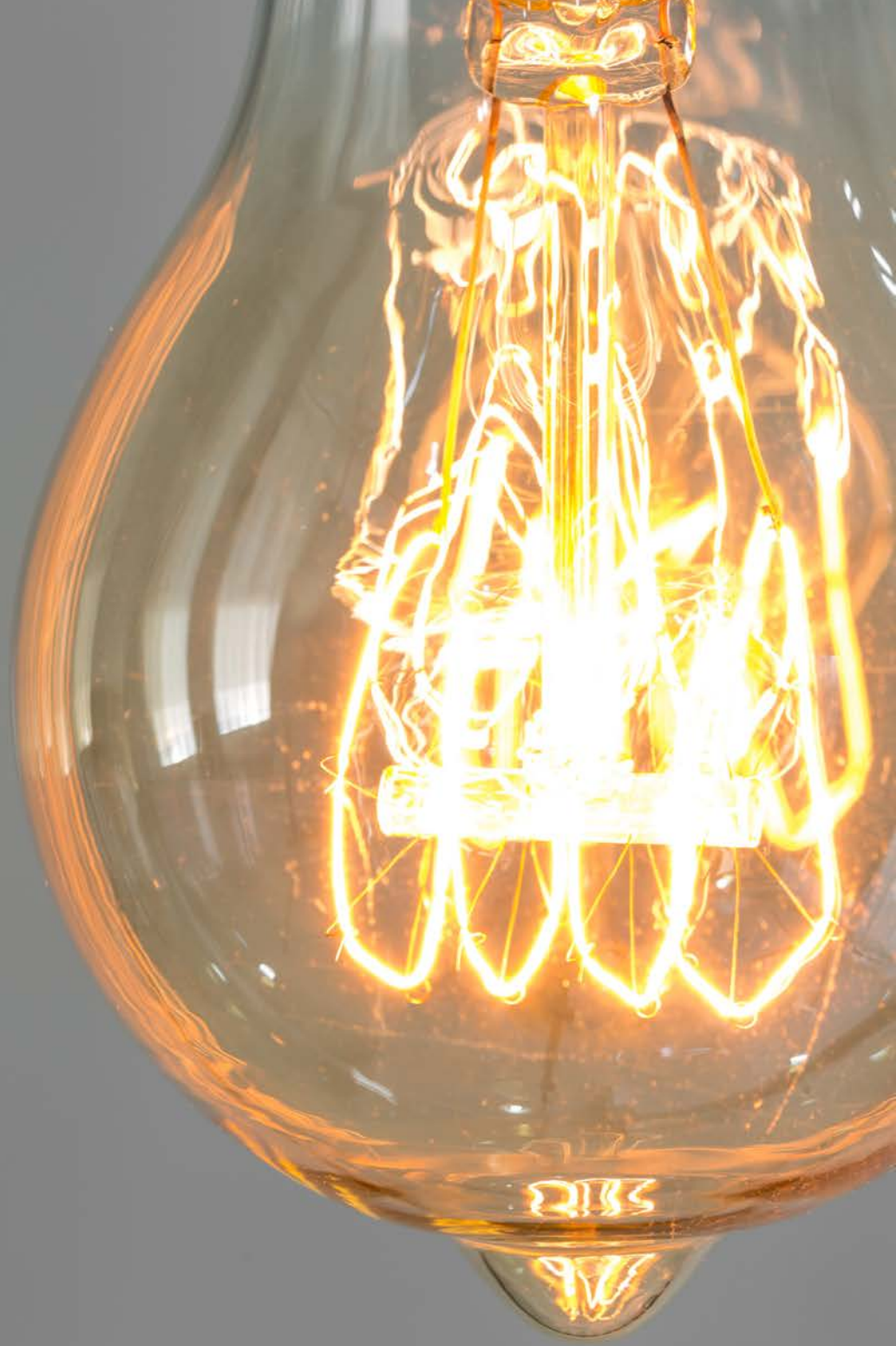
THE Dulwich ESTATE

IMPROVING THE ENERGY EFFICIENCY OF YOUR HOME

For residents subject to
the Scheme of Management



What can you do to your home to help reduce carbon emissions?

Many residents living on the Dulwich Estate are considering how they can significantly reduce their carbon emissions, make their homes more comfortable and save money on fuel bills.

This guide explains how you can use less energy and reduce heat loss, making your home warmer and cheaper to run. It includes practical measures that you might consider, along with links to sources of suppliers, retrofit specialists and organisations that are also working towards net zero carbon emissions by 2050.

The Scheme of Management recognise the importance of supporting residents in making changes that respond to the climate crisis. Our focus in this guide is on straight forward measures that you can start on today, that do not affect the external appearance of your home and therefore do not require you to make a Scheme of Management application.

Please remember

Solar panel installations and other changes affecting the external appearance of your property require a Scheme of Management licence application

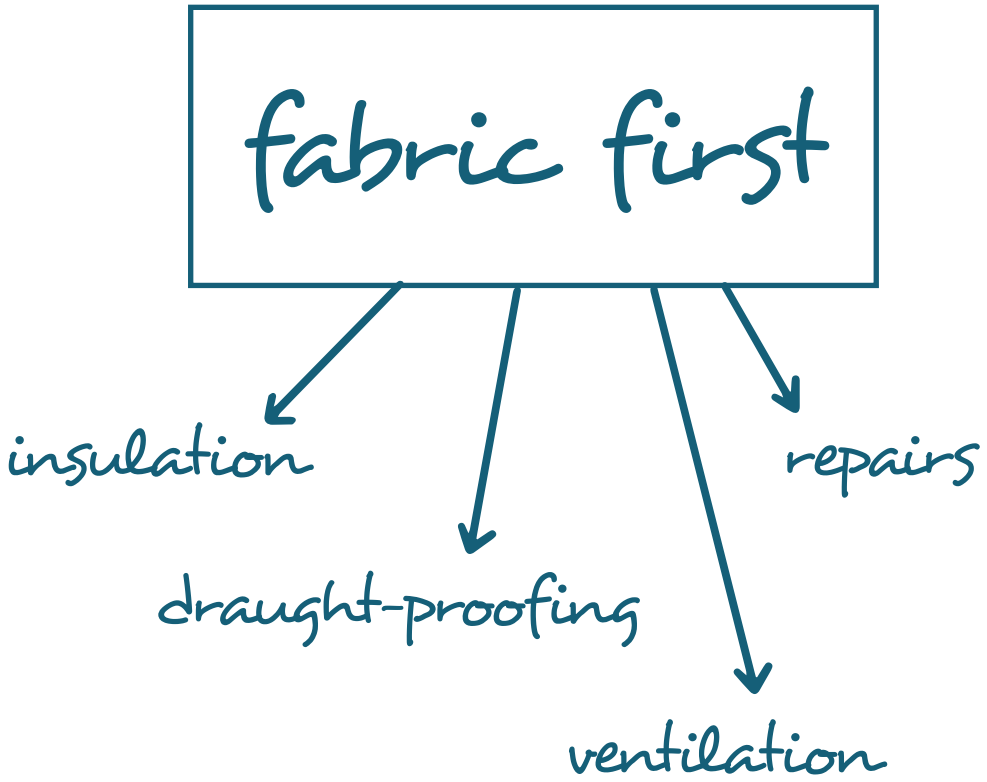
Improving the energy efficiency of your home

There are many reasons to make your home more energy efficient. You can lower your carbon emissions, reduce your fuel bills and increase levels of comfort in your home. It is also important to ensure your home is well maintained, as building fabric elements contribute to the ability of a house to keep warm, dry, and draught-free.

Please remember

Simple measures can be very effective in reducing your carbon emissions.

A 'fabric first' approach prioritises actions that help to retain heat and reduce air leakage



5 things that would make a BIG difference

1 Insulate

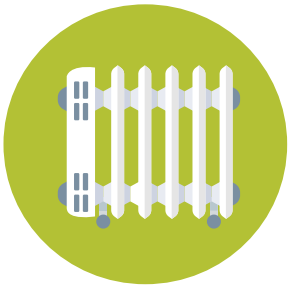
Boost internal insulation particularly your roof

2 Draught proof

Reduce heat loss though windows, doors and chimneys

3 Lighting

Switch all your bulbs to LED which are cheaper to run



4 Heating

Consult a heating engineer about upgrading your boiler and improving your heating system

5 Maintain

Look after your building and use breathable finishes to reduce the need to replace things

Don't forget...

An external change to your home may require Scheme of Management consent. You may also require Planning Permission or Listed Building Consent and Building Regulations approval. You should contact your Local Authority for advice.

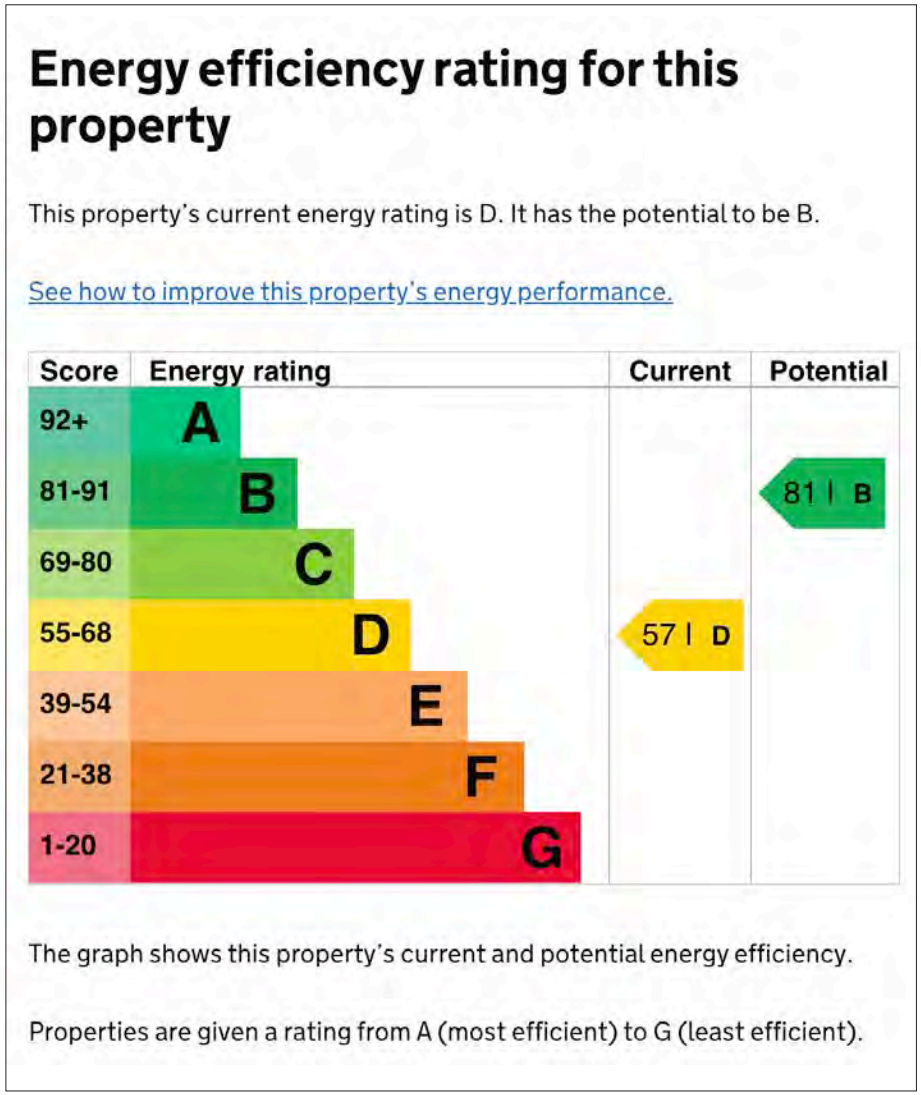
Understanding your home

An Energy Performance Certificate (EPC) contains information about a property and how energy efficient it was when the certificate was issued. You can find your property's EPC by postcode online at Find an energy certificate - GOV.UK (www.gov.uk)

This assessment uses a Reduced data Standard Assessment Procedure (RdSAP) using a site visit and a non-invasive survey. The EPC website also sets out what potential rating could be achieved and the steps to achieve this.

The average energy rating for a property is D with an average energy score of 60.

An EPC makes assumptions regarding the fabric and thermal performance of your home. Achieving a B or C rating will significantly improve your carbon footprint, but in order to meet the 2050 target for net zero you will need to go further and take professional advice.



Sample of an EPC

Retrofit best practice

If you are considering retrofitting your home you will be working to a budget and you should consider all the factors regarding energy use in order to prioritise. Retrofit best practice involves understanding the unique make-up of your home, its context, and all the factors affecting your energy use. This is called a Whole House Approach.

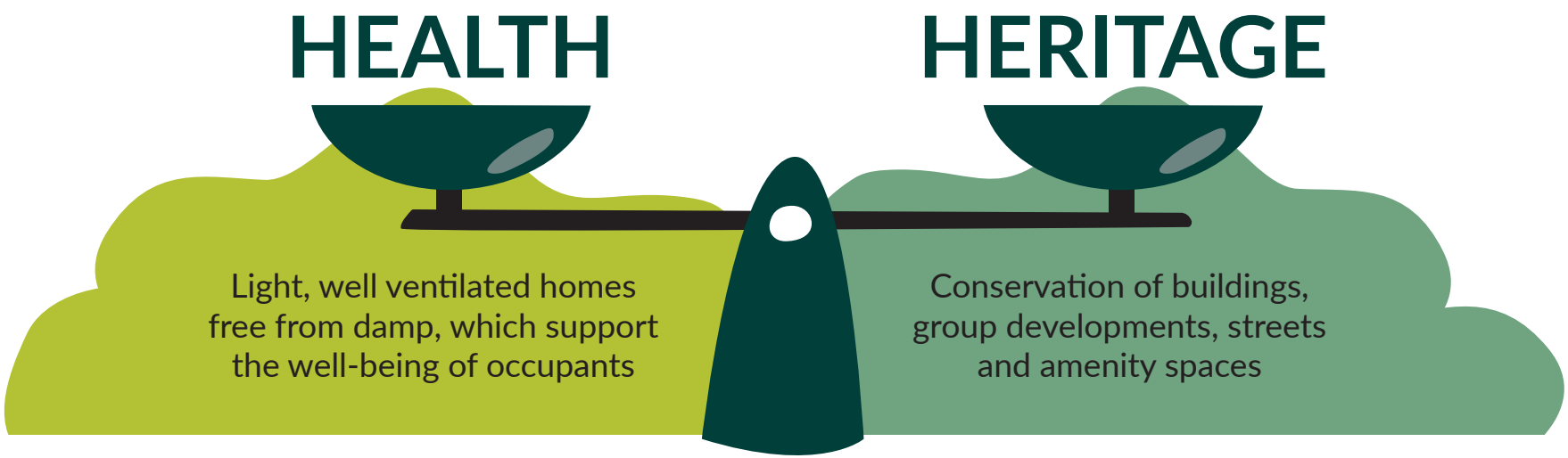
It is often considered that older houses are not energy efficient and must be radically upgraded to improve their energy performance. Getting energy efficiency measures wrong (or doing them badly) can harm building fabric and human health and also impact the character of your home and local amenity. It is important to consider the actual savings or reductions in environmental impact. For example, increasing insulation in your home will require adequate ventilation to avoid condensation and damp.

The Passivhaus standard is a 'whole house' design approach and an international energy performance standard that applies to new build properties. It requires highly insulated walls, floors and roofs, and high-quality airtight construction to minimise heat loss. Heating is provided by designing for solar gain using the radiant heat from the sun, boosted by electric energy from renewable sources such as Air or Ground Source Heat Pumps, solar panels, and Mechanical Ventilation with Heat Recovery (MVHR) which utilises energy from showering, cooking and appliances.

EnerPHit is the adapted Passivhaus standard for retrofitting existing properties. It is a certification scheme that can ensure your older home attains the highest standards of energy efficiency possible.

Further information on a Whole House Approach is available from from the **Sustainable Traditional Building Alliance (STBA).**

Actions for energy efficiency
Should also balance health and heritage



Average existing UK home	New build home	EnerPhit retrofitted home
Uses on average 160-180 kilowatt-hours per square metre per year	Uses on average 15 kilowatt-hours per square metre per year	Uses on average 25 kilowatt-hours per square metre per year

Changes you can make that won't cost you much

Turn down your heating thermostat by 1 or 2 degrees. Turn off radiators in rooms you do not use and only have the heating on when you need it

Seal your loft hatch. Buy a chimney balloon, or use newspaper to block up unused chimneys. Fill gaps to prevent draughts via windows or doors

Pipes can be insulated by covering them with a foam tube - check the size, you can buy from a DIY store

Maintain your radiators, bleed them regularly to remove air locks and have the system flushed through to remove sludge which can reduce performance. Tuck curtains behind to stop heat escaping

Turn off appliances and battery chargers when they are not in use

Close internal doors and use a draught excluder. Draught-proof your letterbox and door locks

Keep gutters, downpipes and drains clear to reduce damp. Damp walls lose more heat

To avoid using air conditioning in summer, insulate your roof and close curtains or shutters during the day to keep rooms cool. Thick curtains and thermal blinds also help retain heat in the winter months

Wearing layered clothing and using a hot water bottle can make a difference to your comfort

If you are seeking expert advice

A qualified architect, surveyor, or an accredited home energy or retrofit assessor can provide you with a Whole House Plan in accordance with PAS2035. They can also provide budget and project management advice to help you prioritise. Air-tightness tests and thermal imaging surveys can help determine what will lead to the biggest energy reductions and cost savings.

Who to contact

The Royal Institute of British Architects (RIBA)
Can help you find a Chartered Architect experienced in domestic retrofit

The Royal Institution of Chartered Surveyors (RICS)
Can help you find a retrofit experienced Chartered Surveyor

The Passive House Trust
Guidance and advice and a directory of architects, contractors and suppliers

Microgeneration Certifcation Scheme (MCS)
A directory of certified contractors and installers and a product directory

Elmhurst Energy
A directory of accredited Home Energy Assessors

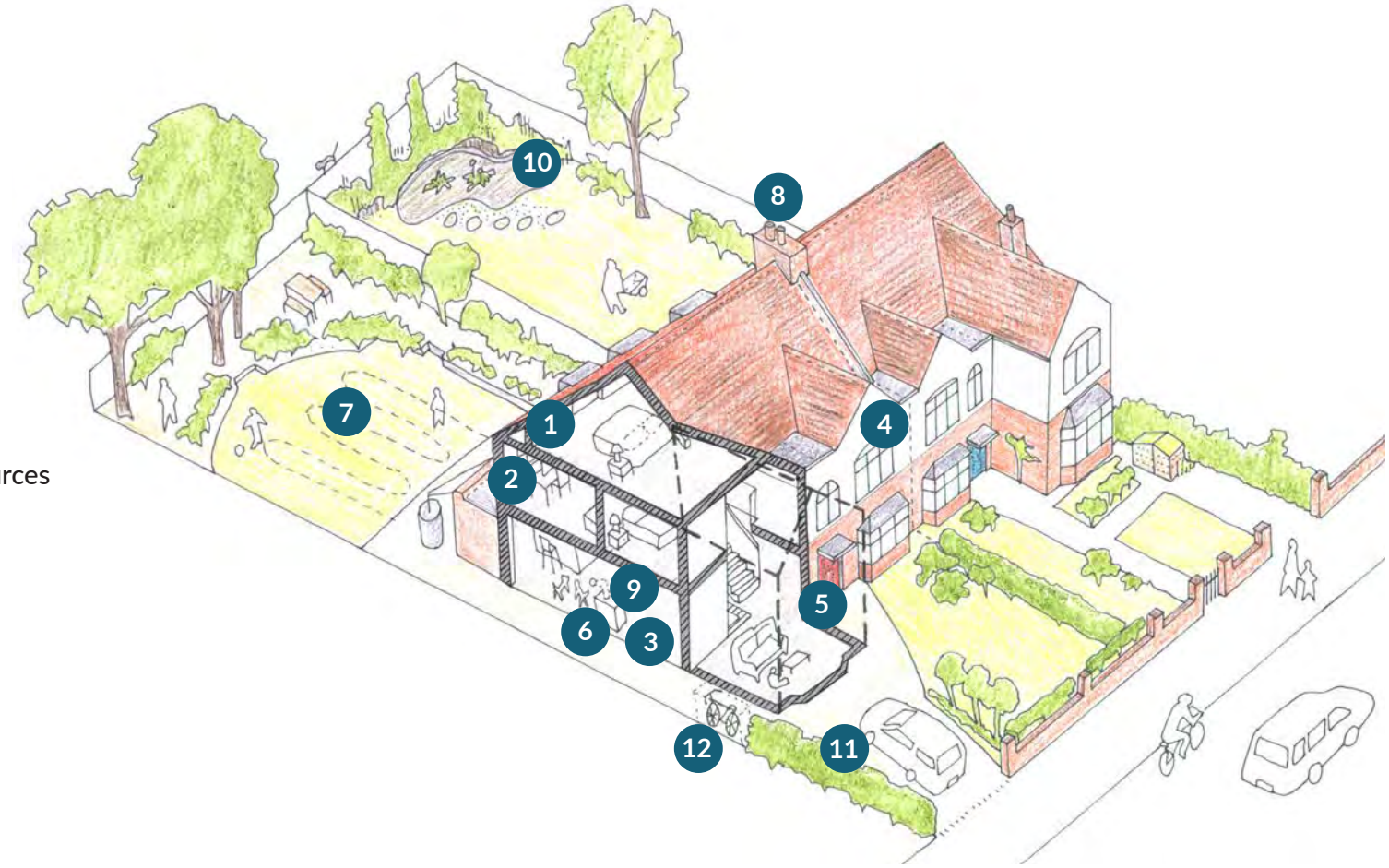
TrustMark
A directory of retrofit installers

Draught Proofing Advisory Association (DPAA)
Can help you draught proof your home

Improving the energy efficiency of your home

The following sections provide detail of actions that can be undertaken without requiring a licence application

1. Roof insulation
2. Wall insulation
3. Floor insulation
4. Windows
5. Front doors
6. Reducing your energy usage
7. Alternative renewable energy sources
8. Chimneys
9. Sustainable materials
10. Gardens and water conservation
11. Electric vehicle charging points
12. Cycle storage

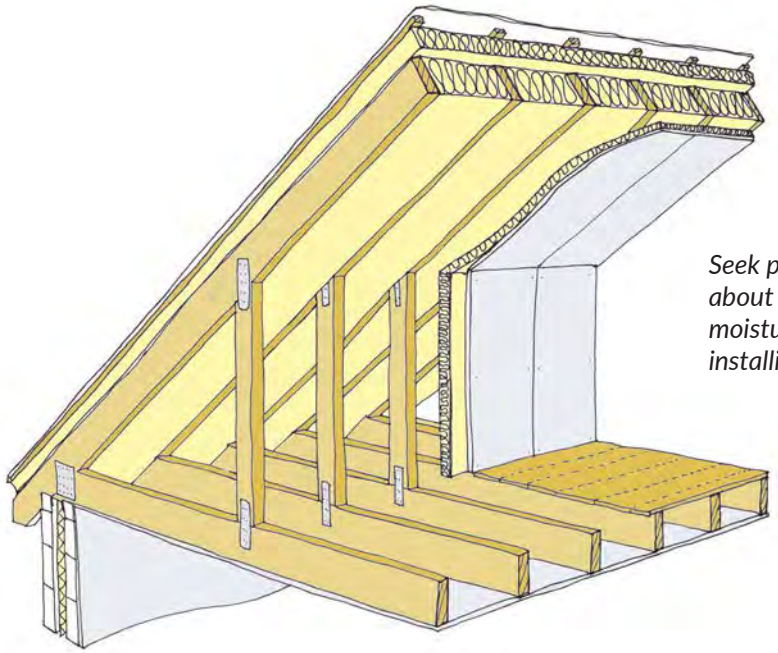


1. Roof insulation

The heat in your home rises and roofs can be a significant area of heat loss. Increasing levels of insulation in your roof is a good place to start improving the energy efficiency of your home. The added benefit is that increasing insulation can also help to keep your house cooler in the summer.

You can add more insulation internally either between or over ceiling joists, or between or under rafters. The new Building Regulations Part L has increased the recommended insulation levels for homes. Most insulation installers will recommend Rock Mineral Wool insulation commonly known as 'roll-batt' which is non-combustible and resistant to rot. Increasing insulation levels can require additional ventilation to avoid damp issues and therefore you should always use a reputable installer. There are alternative materials available made from recycled newspaper, natural wool, hemp and wood fibre products, but you should seek professional advice.

If you are replacing your roof material and wish to add insulation above your rafters, or to install solar panels you will need to apply for a licence from the Scheme of Management. You would be required to send drawings showing the interface details such as the eaves, party walls and gables to ensure that the external appearance of your property is not affected.



Seek professional advice about ventilation and moisture control when installing roof insulation.

Building Regulations

Any new work should meet the current standards and Part L Conservation of fuel and power, Volume 1 deals with the energy efficiency in new and existing dwellings. Further details of the Building Regulations requirements for existing dwellings can be found at www.gov.uk.

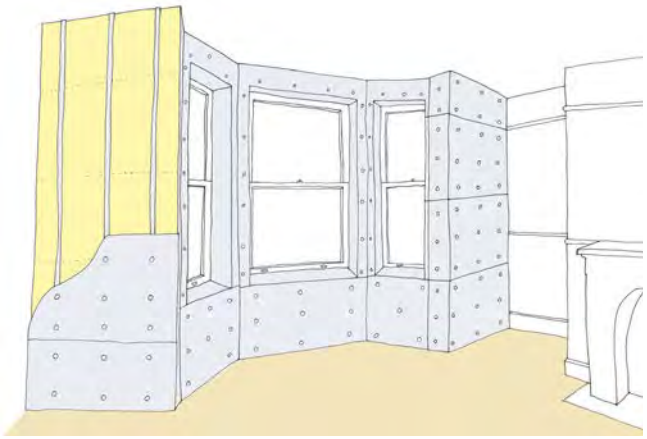
2. Wall insulation

Many historic properties in the UK have solid brick or stone walls. Properties in Dulwich built before 1919 are likely to have solid brick walls without a cavity. Uninsulated cavities were introduced in the 1920s and from the 1960s insulation was installed as a requirement under the Building Regulations. In 2022 the Building Regulations Part L increased the recommended insulation levels for new homes and for retrofitting existing properties. Insulating your walls internally can help reduce the carbon footprint of your home and would improve your EPC rating.

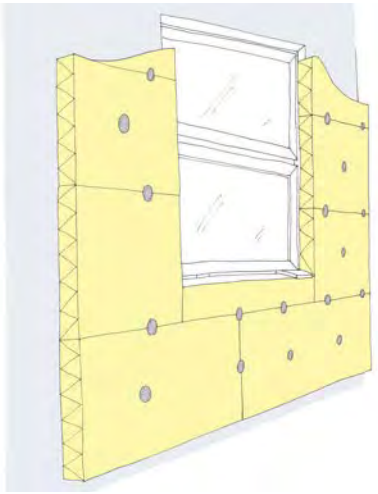
Any installation of insulation to your property should be carried out by a suitably qualified specialist. A pre-installation survey and a damp assessment should be carried out. Damp walls lose heat more quickly and mould can impact your health, so it is a good idea to rectify existing damp problems first. Re-pointing brickwork, and keeping gutters and down pipes in good order for instance, will help to keep your walls dry.

Adding insulation to your home needs careful consideration as it can actually cause new damp problems, damaging your building fabric and impacting your well-being. Specialists should survey your property and identify any issues. Calculating the 'dew point' of your walls helps them to determine the suitability and installation method of insulation products.

If your property walls have an existing cavity and you are considering cavity wall insulation always seek professional advice. The specification and installation should be carried out by a certified installer, following a comprehensive survey, and with an insurance backed guarantee of a minimum 25 years. The Cavity Insulation Guarantee Agency (CIGA) has a directory of registered installers.



Internal wall insulation has no external impact and can be installed without a licence



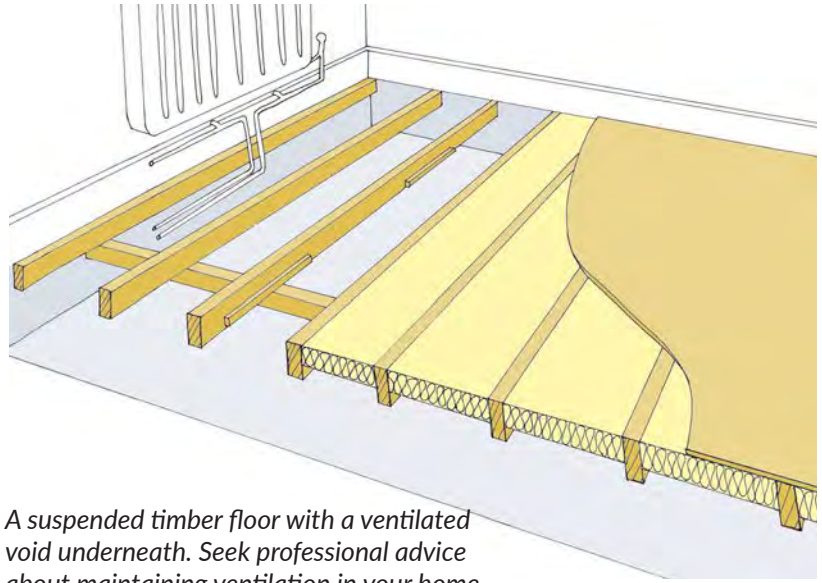
External wall insulation changes the thickness of walls and details such as window sills, door surrounds, roof eaves and downpipes etc. It can cause the loss of original architectural features. Any change to the external appearance of your house requires a licence application. External insulation is generally not recommended for historic properties or those with group value. You should consult a qualified professional who can offer a Whole House survey and explore internal wall insulation options with you.

3. Floor insulation

Ground floors can be a significant source of heat loss, however it is important to determine what type of floor you have before carrying out any works.

Suspended timber ground floors are particularly draughty and thermally inefficient. You can insulate below or above the boards and install a floor finish to help seal the gap between boards and at the edges. Suspended floors stay dry because they are separated from the ground by a void ventilated with external air. It is essential to maintain ventilation to any floor void to prevent damp and rot. Alternatively you can replace a suspended timber floor with solid floor construction, such as concrete, adding significant levels of insulation. However, concrete has a high carbon footprint and changing the floor to an impermeable material such as this can also impact the damp levels in your walls. You should seek professional advice from a Chartered Surveyor or Architect, who can suggest alternative 'breathable' materials such as lime-crete.

If your property has an existing solid floor it is likely to be concrete. If it was installed more than 20 years ago it is unlikely to be insulated. You may also have uninsulated heating pipes within the floor slab. Removing existing concrete floors to add insulation is a significant building project and you should seek advice from an experienced builder, Surveyor or Architect.



A suspended timber floor with a ventilated void underneath. Seek professional advice about maintaining ventilation in your home to avoid damp and condensation.

What is a U Value?

A U-value is a measure of how quickly heat passes through walls, windows, floors or roofs. The lower the numeric value the better the thermal performance of the building element.

Building regulations Part L Volume 1:
Limiting (maximum) U values for new fabric elements in existing dwellings

ROOF	WALL	FLOOR	WINDOWS/DOORS
0.15W/(m²K)	0.18W/(m²K)	0.18W/(m²K)	1.4W/(m²K)

4. Windows

Original windows are often the first items to be replaced when considering energy efficiency measures. Windows are very important to the architectural appearance of a property and most terraced or semi-detached properties, apartments and groups of houses were built with the same windows giving them a consistent appearance.

Retrofitting your original windows can be a cost-effective way of reducing heat loss. A window repair specialist can survey your windows and advise you about repairs, draught exclusion, and installation of slim-fit or standard double-glazed units to the original frames.

Secondary glazing installed internally, can also improve thermal performance. Thermal blinds, heavy curtains and internal shutters are also worth investing in to reduce heat loss at night.

The best way to preserve your windows is to paint them on a regular cycle. This is normally every three years, and high-performance breathable paints can increase this further.

If you decide on replacement, please consider recycling your original frames by offering them to a neighbour or a salvage yard. It is advisable to invest in durable window products. A FENSA approved supplier will provide a FENSA certificate which confirms compliance with the building regulations. They can also provide you with an insurance backed guarantee protecting you if the company ceases to trade. It is worth noting that timber is a renewable material and is more sustainable than aluminium or UPVC. Replacement single or double-glazed windows that exactly replicate the original design do not require a Scheme of Management licence.

You are advised to seek professional advice for replacement windows and you could ask the following questions:

What is the U value? Do they have thermally insulated frames?

Are the double-glazed units low-E glass filled with Argon gas?

Is it FSC certified timber from a sustainable source?

Do you use low VOC paints/ high performance paint systems?

How long is the guarantee? Is it insurance backed? What is the lifespan?

Do we require trickle ventilation? What is required for maintenance?

Any changes to the appearance of your windows are subject to approval under the Scheme of Management. This includes a change of material and any changes to the overall appearance such as the frame or fenestration design.

What is embodied carbon?

This takes account of the CO_2 emitted in producing a building material or element. It can be estimated from the energy used to grow, extract and transport raw materials, as well as CO_2 emissions from manufacturing. Existing elements such as windows and doors have embodied carbon within them. 19th and 20th century timber was slow-grown and can be more durable than modern timbers. With care these frames can be conserved for hundreds of years.

5. Front doors

As well as being the threshold to your home, front doors and their frames are architecturally significant elements. For many 19th and 20th century properties or terraces, inter-war and post-war group developments, the front door design is the same for all houses. In some cases, the paint colours vary, but this consistent appearance affects the character of the local area which is protected by the Scheme of Management.

When retrofitting your home it is worth considering retaining your original front door rather than replacing it. The existing door has embodied carbon and the wood, if historic, could well be more durable than modern timbers. An experienced joiner, surveyor, or architect can advise you about how your door could be conserved and how you could improve security through repair and reinforcement. You can also achieve energy savings with repairs such as:

- *Timber repairs such as replacement, splicing, or resin repairs*
- *Reinforced door panels and frames*
- *Improved hinges and locks*
- *Draught-proofing seals to the door perimeter and frame*
- *Draught-sealed letter boxes and escutcheons on locks*
- *Low VOC high-performance paint systems*
- *Timber weather bar to the base of the door to deflect rainwater, and a steel bar to the threshold to prevent draughts*
- *Heavy curtains hung internally, or a secondary internal door can improve thermal performance*

If your door cannot be retained, replacements should replicate the original design and materials. Any change to the external appearance, or replacing a modern door to match the original design will need a licence application. Please contact the Scheme of Management with detailed drawings and a supporting statement. If your property is listed, you should contact the Local Authority conservation team for further advice.

Original doors, windows and fanlights are important to local character and can be retrofitted by a skilled joiner

Leaded glass can have internally fitted secondary glazing

What is trickle ventilation?

When replacing windows or draught-proofing to reduce heat loss adequate room ventilation must be maintained. This may involve the introduction of a trickle vent to the window frame or air vents to your walls. Trickle vents can affect the window appearance and should be avoided in prominent locations or if your property is listed.

6. Reducing your energy usage

Reducing the energy used for heat, light and power in your home is an effective way of reducing your carbon footprint. Having a smart meter fitted is a good way to understand your energy use and this can lead to changing habits and thinking about ways of reducing your bills. Your home energy provider will fit a smart meter for free.

Upgrading light fittings and appliances?
Choose energy efficient lighting and electrical appliances. Most now come with an energy efficiency rating of A to G with A+++ being the highest performing. LED lamps or bulbs use only a fraction of the energy of old tungsten and halogen bulbs, and they are available to fit almost all light fittings. [Check with an electrician if your dimmers and transformers need to be replaced].

Upgrading your heating system?
Most properties use gas for their main space heating, however a variety of heating alternatives are now available. Changing to a Green Energy provider for your gas and electric provision is an easy straightforward change.

The efficiency of your existing system can be improved by maintaining your boiler with an annual service and having your radiators and pipes flushed every 5-6 years to remove sludge build-up. Upgrading old radiators and pipework can also make a difference. Consult a qualified plumber as they will assess your current system and will be able to advise on improvements or replacements. Try to get two or three quotes to compare the recommendations and explore the options.

Smart controls and thermostats let you know what temperature your rooms are and allow you to adjust your heating from your phone. You could also consider splitting radiators into separately controlled zones to give greater savings.

Confused about what type of boiler you have?
There are three types of gas boiler to be aware of:

Conventional boiler *heats up radiators directly and the system will have separate cold-water tank (usually in the loft to create pressure) and hot water storage tank(s) to provide hot water. Insulating the hot water tank is important to improve efficiency. Sufficient hot water can be provided for several bathrooms. A good solution for properties with low water pressure. Conventional boilers are compatible with solar thermal panels. An electric immersion heater can be used as a back-up.*

Combi boiler *is compact and doesn't have a hot water cylinder. It produces hot water on demand and is suitable for properties with one main bathroom. They are space saving and can be 90% efficient.*

Condensing boiler *doesn't have a cold-water tank which can be space saving. It requires good mains pressure, and your plumber can test this and advise you. It does have a pressurised hot water cylinder and there are different sizes available depending on how many bathrooms you have and what space is available.*

Altering the settings on your boiler could save energy and detailed guides are available online.

7. Alternative renewable energy sources

Heat pumps can extract the thermal energy from a local environmental source and convert it into heating and hot water. They can work in low temperatures and have been widely used in Sweden for well over a decade. The most common domestic installation is an Air Source Heat Pump (ASHP) which can be fitted to the outside of your house and used to provide either warm air or hot water. A Ground Source Heat Pump (GSHP) uses a metal coil that is embedded into the ground either as a borehole system or a ground array. Heat pumps require electricity to power them and this energy can be supplemented by photovoltaic panels or your mains supply. ASHP's are increasing in popularity as they are compact, reasonably affordable and are compatible with existing radiators and underfloor heating.

Mechanical Ventilation with Heat Recovery (MVHR) is another alternative that can be installed in any building but works best with a good level of insulation and airtightness. It works by extracting the air from kitchens, bathrooms and utility rooms, passing it through a heat exchanger which recovers some of the heat, and supplying clean air to bedrooms and living rooms etc. This type of installation requires advice from a qualified engineer or certified installer who can survey your property, carry out an air-tightness test and advise you on insulation and draughtproofing.

Installing an Air Source Heat Pump?

Contact your Local Authority planning team for advice. To comply with the Scheme of Management the unit should not generate sound levels that cause a nuisance to neighbouring properties. It should be sized and sited to minimise its impact on amenity. An application is required if the unit is visible from beyond the property boundaries at ground level. Separate guidance is available for mechanical plant installations.

GSHP ground array installation at Bell House, Dulwich.

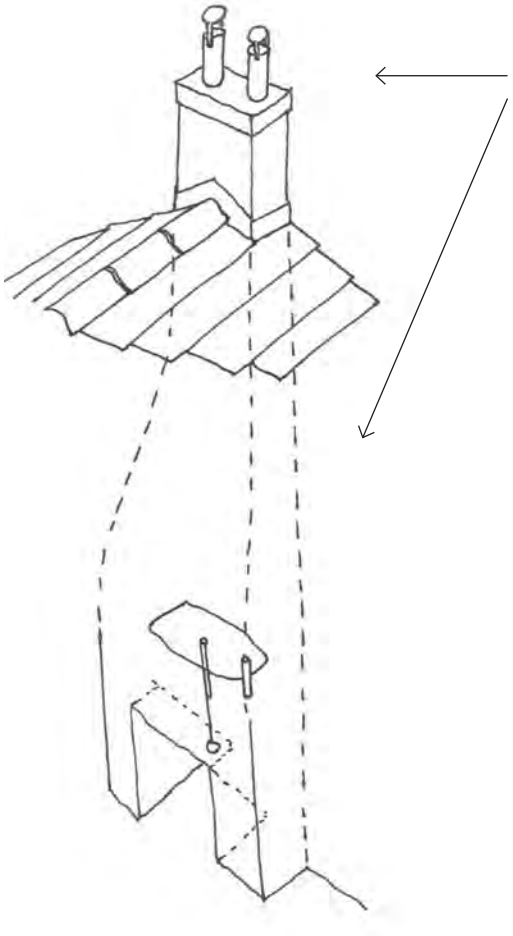
Further information on making a licence application is included in the solar panels guideline published by the Scheme of Management.

8. Chimneys

Chimneys can contribute to the significance and character of an individual house or group of houses. A Scheme of Management licence is needed if you want to remove or alter a chimney but removal of architecturally significant chimneys is not permitted.

Chimneys are very exposed to wind and rain and are prone to water penetration. Ventilated caps or cowels, fitted to your chimney pots, made of clay, metal or plastic, will prevent water ingress but allow ventilation. You should choose a cowel that looks in keeping with your house. A chimney for an open fire will cause significant draughts when it is not in use. A damper can be professionally installed to remedy this, or you could consider fitting a draught excluder.

If you have concerns about the structural integrity or water-tightness of your chimney, a structural engineer, surveyor or architect should be consulted. Depending on the nature and condition of the chimney, it may be possible to re-use it for space ventilation, or for solid fuel, oil or gas fires, or for wood burners. Many chimneys need to be re-lined to meet the Building Regulations. Burning solid fuels is an environmental concern due to air pollutants and the impact on human health. Ensure that you use a registered qualified installer who can advise you on the Ecodesign Regulations. Further information on the governments Clean Air Strategy can be found online.



Roof cowels on your chimney pots can reduce water getting into your chimney, and prevent nesting birds.

Install a draught excluder, chimney umbrella or a flue balloon, available in various sizes. Take care not to block the flue completely, a tube can be trapped at the edge to create airflow. Ensure you remove any installation before using the fireplace. An alternative is a permanent damper fitted by a specialist.

9. Sustainable materials

When you repair or replace materials inside or outside your home there are a range of sustainable materials and building products you could consider using. It is often worth enquiring about the alternatives and if the product you choose can be recycled in the future.

Timber from FSC managed forests is a renewable material, that is non-toxic and can be recycled. FSC certified timber is more sustainable for replacement windows and doors than aluminium or UPVC products. Timber can be very durable if you maintain it.

Recycled materials such as salvaged bricks, tiles, flooring etc can be an appropriate choice, aesthetically as well as containing embodied carbon.

Steel is the most recycled material in the world. It uses a lot of carbon to produce, but is a valuable material resource that can be recycled.

Insulation products are available that are made from materials such as recycled plastic. Many can be recycled in the future.

Natural Materials avoid toxic chemicals and are often biodegradable. Natural insulation products include woodfibre (Steico), cork (Diathonite), cellulose fibre (Warmcel), sheep's wool (Thermafleece) and hemp (Hempcrete).

Bamboo is a fast growing sustainable building material and can be used structurally as well as for internal finishes to walls and floors.

Natural stone and slates are long lasting and can be reused.

Tiles are available that are made from recycled glass, stone and industrial waste. Carpets and underlays can be made from materials such as recycled fishing nets, plastic bottles, and industrial waste.

10. Gardens and water conservation

Maintaining and planting new trees and shrubs and building ponds encourages biodiversity and enhances local wildlife habitats. Planting also helps reduce the levels of carbon dioxide in the air. This is called carbon sequestration. Our guideline for front gardens recommends that a minimum of 50% of the area is given to planting and that you use permeable hard-standing materials. These measures help to reduce flood risk and create a cooler, green environment.

Plants need water to survive and as our climate gets drier we should consider how we can we reduce our water consumption in the garden.

The following tips could help you maintain your garden without resorting to using a hose and mains water:

Water conservation in the garden

Improve your soil to increase its ability to retain water.

Increase shade to protect plants and reduce the need for watering.

Install a water butt and re-use some of your kitchen or bathwater.

Use a watering can rather than a hose and water in the morning.

Don't water your lawn as it will recover from a dry spell - leave the grass longer so that it doesn't dry out so much.

Plant drought resistant plants, and trees shrubs and hedges that don't require watering.

Reduce flood risk in gardens with planting and use permeable surfaces that allow rainwater dispersal without the need for mains drainage.

Water conservation in the home

Install a water meter to keep track of what you are using.

Reduce wastewater entering sewers, use 'grey water' on your garden. Install grey water recycling systems for flushing toilets etc.

For new build bathrooms you can install a wastewater heat recovery system which extracts heat from your shower or bath.

Install a dual flush toilet and low flow shower heads.

Install a cistern displacement device (this can save as much as 5000 litres per year).

Fix dripping taps, toilets or washing machines as soon as you are aware.

Take shorter showers and turn of the tap when brushing your teeth.

Only run the dishwasher when it is full and try to use water in the kitchen more than once.

Keep a jug of cold drinking water in the fridge to reduce running the tap.

11. Electric vehicle charging points

The benefits of reduced running costs and low emissions mean that electric vehicles (EV) are a popular alternative to petrol or diesel. Electric car charging points can be installed to front gardens without a licence. The location should be carefully considered, and where possible concealed in a garage or side passageway. The outlet can be wall mounted or installed on a timber up-stand or post located discretely at low level. Try to avoid trailing cables and speak with your neighbours to make sure the installation does not impact them.

If you are considering installing a new hard-standing for your car to be parked off-street, a licence is required.

Consider the location carefully to screen chargers from view and avoid trailing cables.

12. Cycle storage

Cycling rather than using your car can significantly reduce your carbon footprint and storing bikes at the rear or side of your property does not require a licence.

If you wish to install a new cycle store, or a mobility vehicle store in your front or rear garden an application is required. Please refer to the Scheme of Management guidelines which explains how the structure can be designed to be in keeping with the street-scape.

Resources and further reading:

Architects Climate Action Network (ACAN) - *A guide for retrofit in conservation areas - what is possible?*

BRE Trust - *Retrofit for the future guide*

Carbon Trust - *Heat pump retrofit in London*

Green Building Store - *Products and resources, an information hub and a consultancy service*

Hernehillforum.org.uk/retrofit-revolution - *A local engagement project with input from retrofit professionals*

Historic England - *Energy Efficiency in Historic Buildings series - How to improve energy efficiency, Insulating roofs in historic buildings, Insulating walls in historic buildings, Improving thermal performance of windows and doors*

International WELL Building Institute - *WELL Building standard*

London Energy Transformation Initiative LETI - *Climate emergency retrofit guide*

Passive House Trust - *Climate Emergency Retrofit Guide LETI, Passive House Primers*

Retrofit Academy - *What is PAS 2035?*

Royal Institution of Chartered Surveyors (RICS) - *Guide to reducing carbon in your home*

Sustainable and Traditional Buildings Alliance - *has a large knowledge centre and case study projects*

Society for the Protection of Ancient Buildings (SPAB) - *Energy efficiency in old buildings*

Trustmark - *Guide to retrofitting your home*

Books:

EnerPHit: A Step-by-Step Guide to Low Energy Retrofit,
James Traynor, RIBA Publishing 2023

Designing for the Climate Emergency,
Sophie Pelsmakers, Elizabeth Donovan, Aidan Hoggard, Urszula Kozminska,
RIBA Publishing 2022

Old House Eco Handbook A Practical Guide to Retrofitting for energy Efficiency and Sustainability,
Marianne Suhr and Roger Hunt, SPAB 2019

Reference:

British Standard BS 5250:2021 Management of moisture in buildings

WUFI® - Software that models the thermal and moisture conditions of buildings

BREEAM UK Refurbishment Domestic Buildings Technical Manual SD5077

THE Dulwich ESTATE

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