GUIDE TO IMPROVING ENERGY EFFICIENCY IN SEFTON'S HISTORIC HOMES

Sefton Council

Contents

Made possible with Heritage Fund

Southport Townscape Heritage Project

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1 Introduction

Reusing existing building materials or retrofitting an old building is one of the most sustainable things we can do today. Re-using the existing building fabric, rather than importing new and extracted components required for the construction, means the embodied carbon in the building will remain as it is. This is in addition to the historical and townscape value of older buildings that can be appreciated for generations to come.

Rising energy costs have brought concerns about energy efficiency to the forefront.

However, knowing how to maintain such buildings in an energy efficient way can be daunting and confusing. This guidance aims to introduce potential options to help create a more environmentally friendly home in your historic property. These approaches will be divided up into short term and long term.

Short Term recommendations are simple and cheap additions to your home which can be done in a short space of time.

Long Term approaches have a higher upfront cost and are more permanent investments, some of which may require consent from the Council. However, they will yield better results and save money with time.

What the most appropriate options are will depend on the individual character and age of your property, as well as personal preferences.

The NPPF (National Planning Policy Framework) provides a framework for assessing heritage significance and weighing the degree of harm to it against the public benefit of reducing energy consumption. Every effort should be made to minimize harm. This means that the scale, type and location of work to improve energy efficiency should be appropriate to the heritage significance of the building in question.

Improving your home's performance is likely to be a gradual process punctuated by minor interventions such as replacing a window, or medium-scale interventions such as updating heating controls when replacing an old boiler. Regardless of the scale of intervention you are planning, it makes sense to establish an energy efficiency retrofit plan for your home. Section 14 provides a template to create your own plan.

2 How Traditional Buildings Work

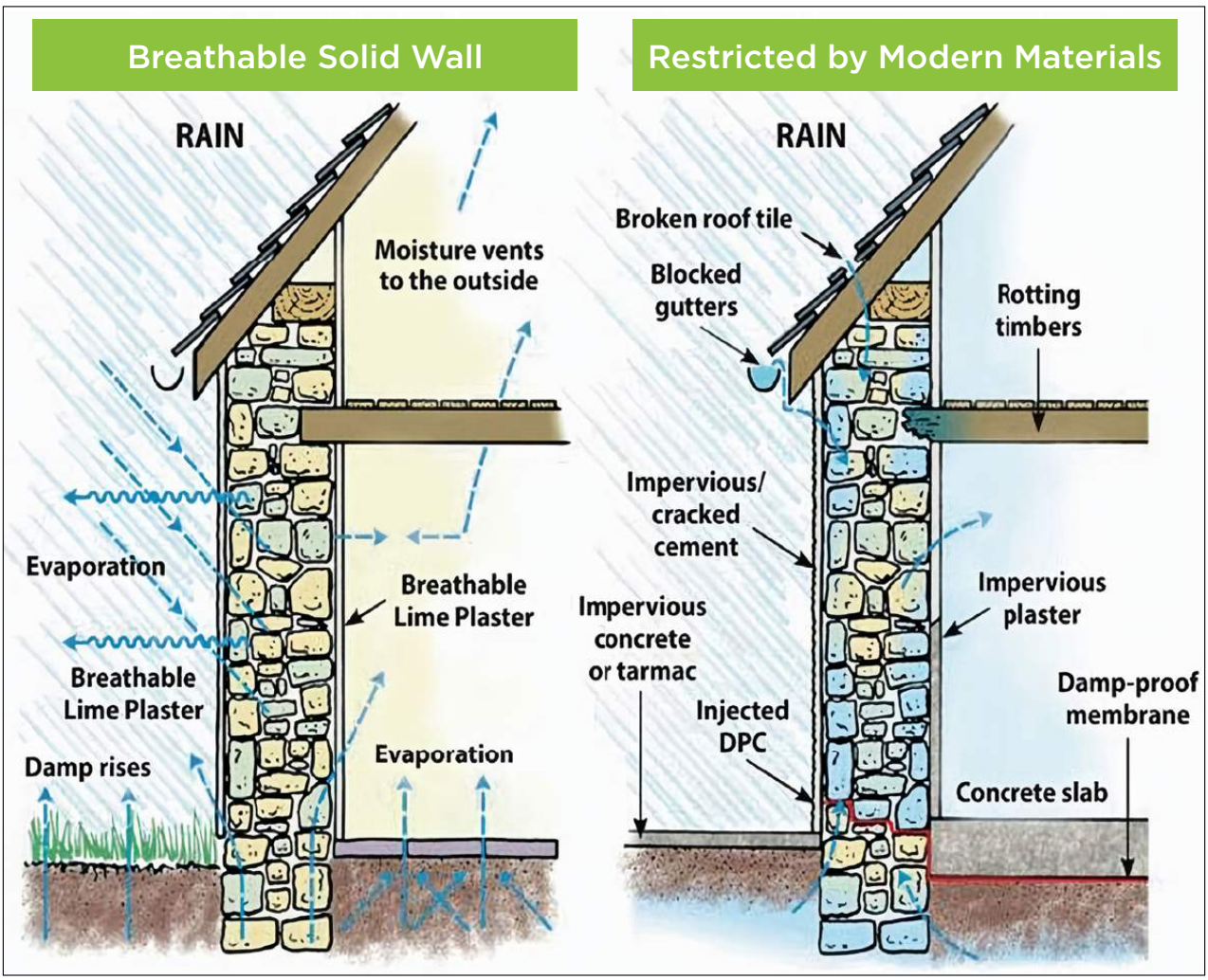
It is important to understand how traditional buildings are constructed in order to heat them efficiently and effectively.

Traditional buildings are generally defined as those built before 1919. Those that survive today, regardless of size or status, uniquely reflect local social and cultural history. Being in ownership of or living in a traditional building offers the opportunity to care for a small but irreplaceable piece of history. However, knowing how to maintain and efficiently heat such a building can be daunting and confusing.

The main difference between a traditional building compared to a modern building is that it has solid walls. Modern construction uses cavity walls and impermeable materials like cement renders, damp-proof membranes, and synthetic paints. These form a barrier that prevents moisture entering the fabric of the building. Traditional buildings with solid walls rely on the physical thickness of the walls for insulation and use permeable materials to allow moisture to circulate.

Essentially this means traditional buildings need to 'breathe' and must be well ventilated. Cutting off this ventilation completely will lead to issues of damp, mould growth and rot.

Ensuring a traditional building is well ventilated and carrying out proper maintenance can preserve a house's historic character. Any alterations to a property that prevent the house from 'breathing' are counter-productive and costly in the long term.



The importance of 'breathability' in traditional buildings

3 The 'Whole Building' Approach

The 'whole building' approach uses an understanding of the building to find balanced and informed solutions to save energy.

Working with the unique qualities of your home means money and time is more efficiently spent making changes that are suitable and sustainable.

The most important factors to consider are the following:

1. **Location**

   The orientation of your house, local climate, exposure to the elements (wind, rain, sun)

2. **Building Fabric**

   Materials used, condition of the materials, design

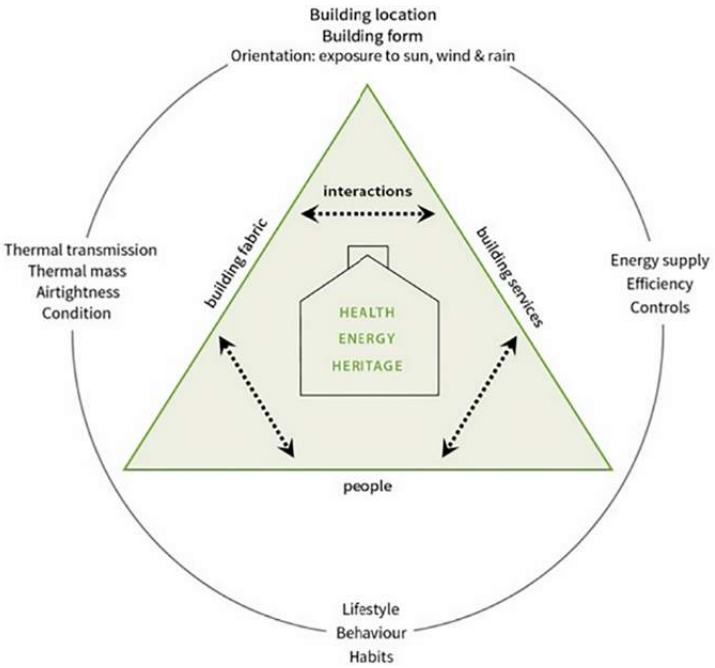
3. **Services**

   Heating, lighting, ventilation and appliances for cooking and entertainment

4. **People**

   How many people are in the house, how much electricity is used, what activities are undertaken in the house

All 4 factors interact with each other and therefore having a full understanding of them all can help create energy efficient measures to suit individual properties and needs. How they link is summarised in the below diagram.



4 How To Improve The Energy Efficiency of Windows

Windows can make a significant contribution to the historic and aesthetic value of an older property, especially if they are original. Historic windows are incredibly resilient and, in most cases, can be repaired.

Reinstating windows rather than replacing them is also the most environmentally friendly option. There are several methods to improve the energy efficiency of windows without a full replacement.

In addition, windows themselves are not designed to be great insulators due to the need for openings and use of glass. Money spent on completely replacing windows for the purposes of energy efficiency would be much better spent elsewhere on balance.

Short Term

Repairs and Maintenance

Much of the energy wasted in buildings is a result of overdue maintenance works.

Repairing window frames by filling cracks, repainting exposed wood once dried out and replacing rotten timbers will prevent air leakage, in addition to enhancing the building's character.

Draught Proofing

Draught proofing will reduce air leakages by up to 80% and will not have a negative impact on the aesthetic quality of the property. This can be done by installing brush or foam strips.

Traditional Methods

The installation of timber shutters (internally or externally) can reduce heat loss by up to 51% and is in keeping with the historic character.

Victorian blinds and heavy curtains can also reduce heat loss and are effective at night when temperatures are lowest and there is the greatest heat loss.

Lost putty around glazing and a lack of repainting can lead to air leakages

Long Term

Secondary Glazing

This can be installed to fit an existing window and does not harm the visual appearance of the original windows. It is highly effective and can reduce heat loss by 63%. Plastic or aluminium secondary glazing would be acceptable in most circumstances. In some cases, secondary glazing can be reversible, with the option of the secondary glazing held in place by magnets on non-opening windows.

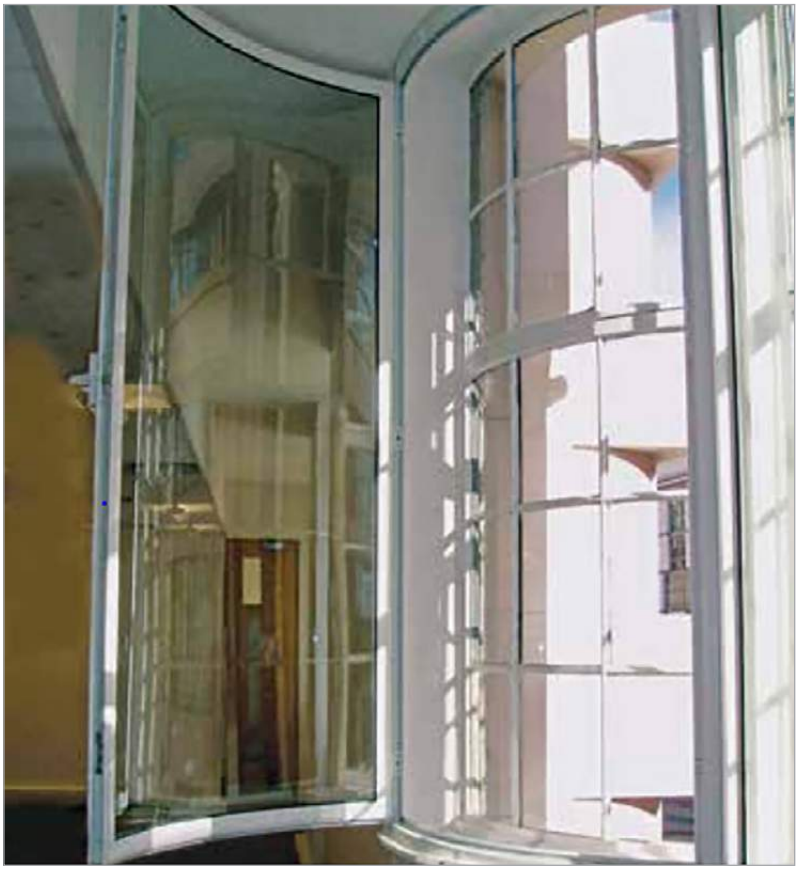
Double Glazing Refurbishment

Advances in technology allow an additional thin layer of glass to be installed in original slimline frames. This does not unbalance the weight of sash windows due to the slim design and can be detailed enough to replicate cylinder glass.

If Windows Need Replacing

While uPVC can be cheaper upfront, the lifecycle from its production to disposal is costly to the planet. The artificial nature of uPVC windows means their manufacture requires 8 times the amount of energy in comparison to timber windows, and only has a lifespan of 18 years due to the plastic degrading with sunlight exposure. Recycling uPVC is also difficult, so 82% of windows end up in landfill and incineration of windows releases toxic chemicals.

In addition, traditional houses are built to have natural ventilation to prevent moisture build-up internally. Impermeable plastic windows can unbalance the moisture management and cause issues such as damp and condensation within the home if it is not ventilated correctly.



Secondary glazing can be made to fit unique windows so there is minimal harm to original features

Please note

It should be noted that Listed Building Consent is required for any replacement windows in a Listed Building as they change the character of the property. Consent for uPVC windows would not be given in a Listed property, because the different finish is not in keeping with a historic property.

Flat or a maisonette

If you live in a flat or a maisonette, planning permission is required for replacing windows. This helps ensure that the character of the building as a whole is not lost as a result of unsympathetic changes.

Single family dwelling

If you live in a single family dwelling house and the materials and features of the replacement windows match the original, planning permission is not required.

Secondary glazing keeps the historic character of the windows while providing additional warmth to your home. In addition, modern timber sash windows are high quality so there are minimal draughts in your home.

5 How To Improve The Energy Efficiency of Roofs and Attics

Roof maintenance is one of the most effective things you can do to improve energy efficiency in your home.

Short Term

Maintenance

Much of the energy wasted in buildings is a result of overdue maintenance works.

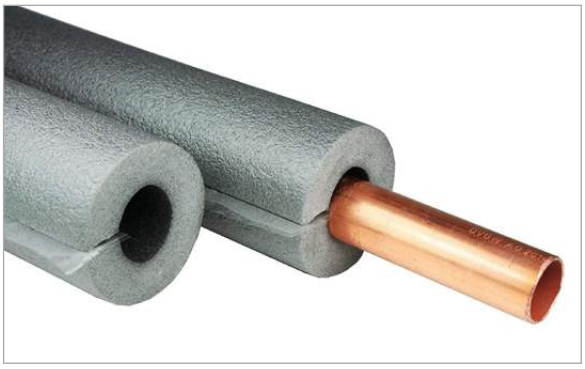
Replacing broken tiles and clearing gutters will prevent damp and excess moisture entering your home, as well as preventing warm air escaping.

Insulating Pipes in the Attic

Insulated heating pipes will help direct heat to where it is needed and not waste heat in spaces that are not used. These thermal covers are widely available online and in hardware stores.

Draught Proofing

Attic covers over the entrance hatch can help keep draughts out of the house and are a relatively cheap addition.



Even small and simple additions in the attic can prevent energy wastage

Natural insulation can be the most cost-effective method of energy efficiency

Long Term

Insulation

Insulating a loft can be one of the most important improvements to a property as up to 25% of heat is lost through the roof.

Even if roof insulation has been installed it is worth checking the condition of the insulation to make sure there are no gaps that have occurred over time.

Insulating a roof is usually cheaper than other methods of insulation and in turn, the most cost-effective option overall. Natural insulation materials, such as sheep's wool, should be used to help manage moisture movement and be at least 270mm thick. Any loft insulation should also maintain a 40mm gap between the top of the insulation and the sarking boards to allow for ventilation.

In some historic properties bats can live in the roof space. If this is the case in your property seek specialist advice from the Bat Conservation Trust before starting any works.

Repurposed Slates

Missing or slipped slates can allow water ingress into the home and should be replaced as soon as possible. When slates on historic properties do need replacing it is recommended that reclaimed and historic slates should be sourced, rather than using new slates. Slates have a long life expectancy and recycling an existing tile is more environmentally friendly. In addition, repurposed slate will maintain the historic character of the building.

6 How To Improve The Energy Efficiency of Floors

What would work best for your property will depend on the unique quality of your home and the type of flooring that is already in place.

Short Term

Over-floor Insulation

The quickest way to help insulate your historic property is having rugs or floor coverings to reduce radiant heat loss and help keep feet warm. The higher the knot count on rugs, the more insulating they will be due to the denser material used.

Anything laid onto the flooring also has the benefit of being reversible and would not damage any original features.

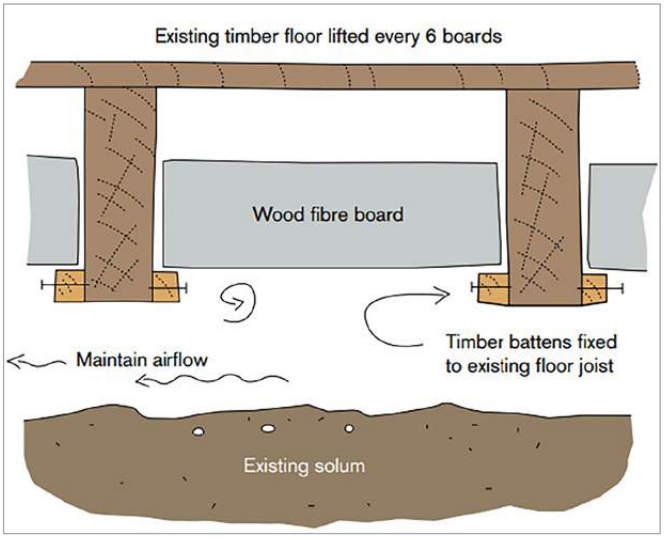
Long Term

Suspended Floor Insulation

This includes timber flooring with a gap between the floorboards and foundations of the house.

Draught-sealing gaps between the skirting and plugging openings will help reduce air leakages. This is beneficial if you have delicate or valuable floorboards that cannot be lifted.

If the floorboards can be lifted and relaid then natural materials should be used for insulation (such as sheep's wool or natural fibres) to allow air and moisture permeability, with plywood board and fixed battens installed to the floor joists underneath to support the insulation. There should still be a void for ventilation and air movement.



Air flow should be maintained to prevent moisture build up and rotting

Solid Floor Insulation

Due to the high risk of damage to the historic fabric, and the high costs of intervention, it is recommended that any original solid floor, such as flagstone flooring, is left in situ.

For concrete flooring, insulation boards can be fixed to the top and a new floor covering laid on top. However, this would raise the floor levels so internal doors would have to be trimmed and skirting board removed. A balanced assessment should be undertaken depending on your property's most significant historic features and the costs.

For lime concrete floors a much more invasive approach of laying an insulating mixture of hemp/lime concrete or lightweight expanding clay aggregate would be required. This would require an excavation of 300mm depth and professional advice from a reputable contractor should be sought.

If the floor can be lifted or historical flooring has been lost, then underfloor heating can be beneficial for evenly and consistently drying out solid floors in historic properties. This is an efficient way of maintaining your home.

7 How To Improve The Energy Efficiency of External Walls

This is not an appropriate method of insulation if your property has aesthetic or historical significance on the external elevations. For example, there is original brickwork or decorative mouldings. This approach is only recommended where the property has already been rendered or harled.

Short Term

Maintenance

Cracks in walls or damaged bricks can allow heat to escape.

Appropriate repairs with a lime-based mortar or special tape will improve airtightness as well as preventing water penetration, which can cause dampness.

Repairing cracks will prevent heat loss

Long Term

Rendering

Re-instating a lime-wash render, or vertical tiling, can help prevent water penetration and further insulate your home.

> If the property is a listed building, then Listed Building Consent should be requested as it may change the appearance of the building.

External Solid Wall Insulation (ESWI)

Wood fibreboard attached to the external walls and covered in a lime-wash render can also provide protection from moisture and have thermal improvements.

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

ESWI needs planning permission in Conservation Areas. It is unlikely to be acceptable on the front elevation of a building. It may be acceptable on the side elevation if it is considered not to be highly visible from the street. On rear elevations it is likely to be acceptable if the building does not form part of a decorative or uniform architectural composition.

If the property is a Listed Building, then Listed Building Consent should be requested as it will change the appearance of the building. It is unlikely to be considered acceptable as it will change the character of the heritage asset.

8 How To Improve The Energy Efficiency of Internal Walls

Wall insulation can significantly reduce energy consumption but can involve significant intervention to the property.

Short Term

Tapestries or Wall-hangings

The thick fabric can help warm your home, is reversible and can double as decoration. The thicker the material the more warmth they will provide. However, care should be given to proper ventilation in their installation to prevent mould growth behind them.

Long Term

Installing Panelling

Lining walls with thicker and permeable materials will help reduce radiant heat loss. However, this use in historic buildings may be restricted where there are important and original decorations. Panelling should be reversible and easy to open up to check the condition of the wall behind and monitor damp.

Insulation between existing and historic timbers would not damage the overall character of the property

Breathable materials should be used such as wood fibre, hemp board or sheep's wool. The thermal improvement would be dependent on the thickness and type of the material used and how appropriate this would be is dependent on the existing condition of the historic walls.

9 How To Improve The Energy Efficiency of Chimneys

Traditional houses needed ventilation to allow the building fabric to 'breathe'. Functioning with a fire a chimney would be able to contribute to the ventilation as well as heating the home.

Today it is possible for some chimneys to be put back into use. However, if left redundant they can let in unnecessary draughts or if they are poorly capped can prevent the appropriate ventilation, leading to damp.

Short Term

Draught Proofing

A chimney balloon is not a permanent feature and helps prevent heat loss

If the flue is open, then a chimney balloon can stop warm air escaping and act like double glazing for the chimney. It is relatively cheap, reversable, and does not harm the historic character or appearance of the chimney.

If there is a permanent cap in place check the air tightness of the seal and if there are issues of damp.

Maintenance

Cracks should be inspected for regularly and repaired with appropriate and permeable materials to prevent cold air entering the room. Caulking around the fireplace hearth can also help keep heat in.

Long Term

Have Chimney Put Back Into Use

This would provide a renewable source of heating and reinstates its original function in the house. This option is dependant on its existing condition and specialist advice should be sought.

Cap The Chimney

If the chimney is no longer in use, installing a permanent cap will improve air tightness. Professional advice should be sought to prevent poor ventilation.

10 How To Improve The Energy Efficiency of Doors

Insulation for doors is primarily required on external doors due to the difference in temperatures inside and outside.

Short Term

Draught Proofing

Draught proofing strips or brush strips can be installed around the door frame to reduce heat loss. Draught excluders can also be applied to the letterbox to prevent excess cold air entering the building.

Insulating panels that integrate with the original design and repairs to cracks do not harm the historic character of the door

Insulation Panels

The existing panels of historic doors are often made of thinner wood and therefore, there is an opportunity to insulate. An appropriate material should be used and should be flush with the door frame to not look out of place.

Repairs and Maintenance

Much of the energy wasted in buildings is a result of overdue maintenance works. Repairing wooden doors and frames by filling cracks, repainting exposed dry wood, and replacing rotten timbers will prevent air leakage, in addition to enhancing the building's character.

Long Term

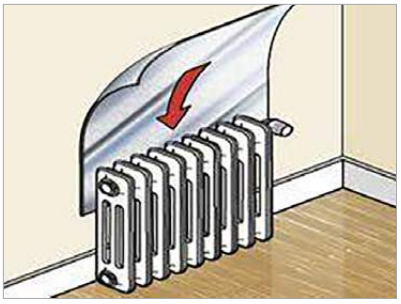
Door Replacement

Much like windows, if doors have deteriorated to the point of replacement, then wooden doors rather than uPVC should be used to conserve the historic character. These should be properly fitted and include a draught proofing system.

11 How To Improve The Energy Efficiency of Services

Short Term

Radiators



Cutting the foil to size will mean it is not visible in the room

Reflective foil insulators can be installed behind the back of convection radiators. These are relatively cheap, removable, and reduce energy waste by reflecting heat back into the room rather than it seeping through the wall.

Moving furniture away from radiators can help them efficiently heat the whole room.

Long Term

Upgrading Boilers

Modern condensing boilers are more energy efficient than they were previously.

Solar Panels

Historic buildings can host solar panels in a way that is sympathetic to their heritage setting and provides the property with a much-needed renewable option. A balance between preserving the significant heritage and modern environmental improvements must be met.

Photovoltaic cells are used to convert sunlight into electrical energy. It is preferable that these panels are installed on an ancillary building or are sited away from the building. Panels on the primary elevation would not be acceptable as they impose on the historic character. If the roof is no longer original then consideration can be given to photovoltaic cells in the shape and colour of tiles to be used.

Planning permission and Listed Building Consent would be necessary for the installation of any solar panels in Listed Buildings.

As long as the panels are not placed on any elevation facing the road, the panels are considered a permitted development in Conservation Areas without Article 4 directions. They should be installed as discreetly as possible and installed flush with the plane of the roof. Permitted development rights are only allowed for single residential properties.

Examples of solar panels away from the historic building and discrete solar tiles that do not harm the historic character

Biomass Heating Systems and Combined Heat and Power Systems

These do not need planning permission provided the external elements meet certain conditions. These conditions are stated on the planning portal.

New or altered flues and chimneys may be highly visible in conservation areas and where possible, existing chimneys should be used to flow biomass heating appliances. New flues should not be located on the principal or side elevations, so they are not visible from the street. They should be constructed with finishing materials that complement the existing building.

12 How To Improve the Energy Efficiency of Everyday Living

Small changes to how you use services and electricity in the home can have a significant impact on your energy bills. This applies if you live in a historic or a modern home.

Install a Smart Meter – These can be useful for tracking how much energy you use in real time and can be installed for free.

Light Bulbs – Replace incandescent and halogen bulbs with LED ones. LED bulbs can use up to 75% less energy and last 25 times longer, although the initial upfront cost is more.

Turning Down the Thermostat – Nearly 50% of money spent on energy bills is absorbed by heating and hot water costs. Therefore, wearing extra jumpers does pay off.

Turning Off Electrics – Almost 75% of energy used for electronics occurs while they are turned off. Unplugging and switching off televisions, chargers, computers, and lamps when they are not in use will contribute greatly to savings on your bills.

Buying Efficient Appliances – Buying a new appliance if the existing is still working will not save much money in bills and contributes to overconsumption. However, when the time comes to replace them with new models be mindful of the energy efficiency rating which can reduce your bills in the long run.

Wash Clothes on a Low Temperature – Up to 90% of the energy used in a washing cycle is for the heating of water. Therefore, washing on a lower temperature saves money and reduces the damage to clothing.

Be Water Conscious – Heating water costs are a big contributor to energy bills. Reducing these can be done by installing a shower timer, using a washing-up bowl rather than a running tap and considering a more efficient shower head to reduce water.

Cooking Smarter – Enhancing your kitchen energy efficiency with simple changes will save on expenses. Using lids on pots and pans will preserve heat, ceramic or glass oven dishes will reduce cooking times and temperatures, defrosting in advance to limit cooking time and cleaning the stove to conduct and reflect heat more efficiently will all contribute to savings.

Developing Mindful Habits – Being aware and making a habit of conserving energy can save money. These include turning the light off when you leave a room, turning the fan off after it has been used, closing doors to prevent draughts and closing curtains at night.

Only Heat Necessary Rooms – Heating only rooms that are in use instead of the whole house will help save energy.

13 Summary

Roof

7. Insulating Roof
8. Draught Proofing
9. Insulating Pipes
10. Repairing Slates

Chimney

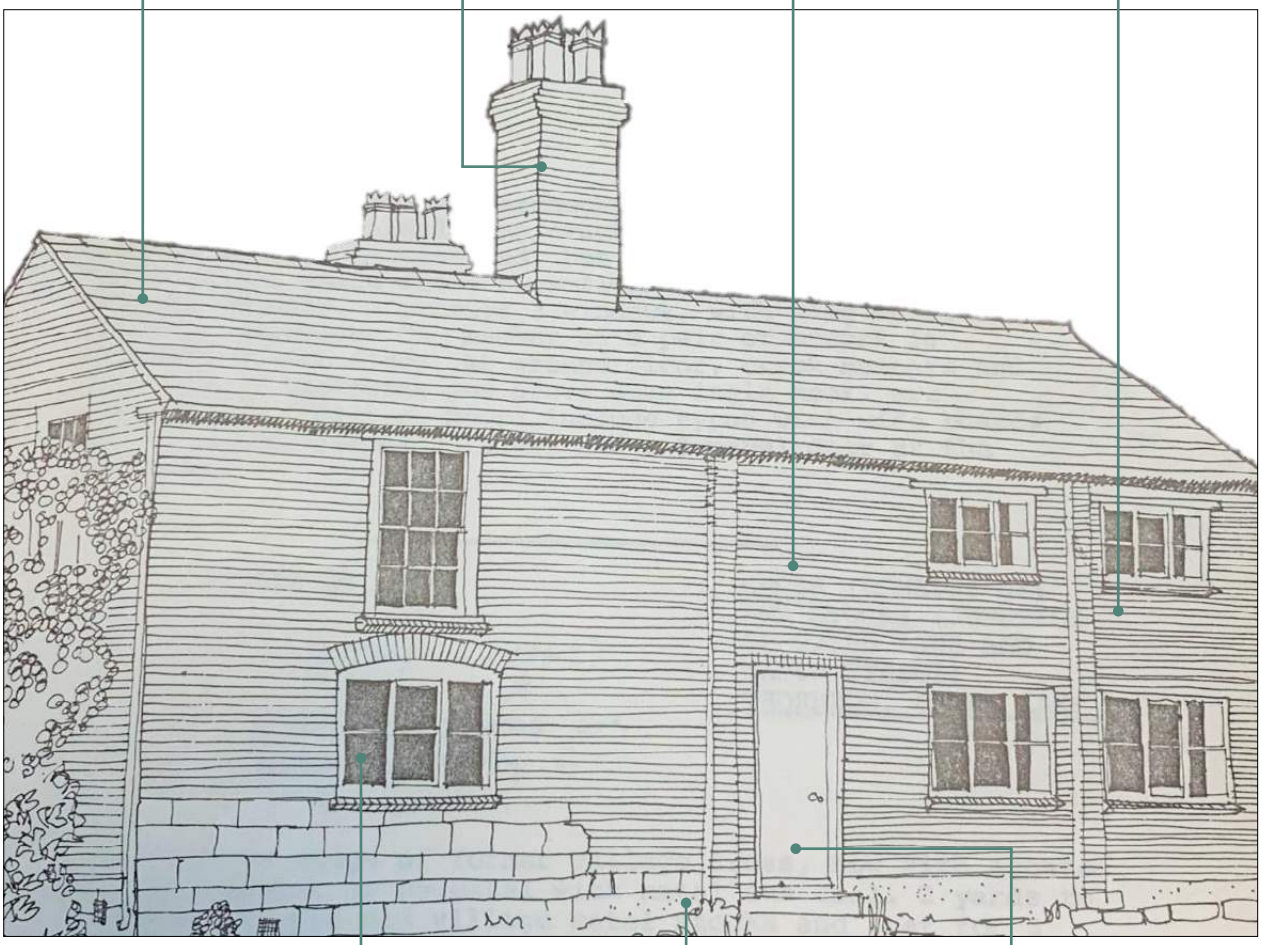
5. Chimney Balloon
6. Inspect and repair permanent caps

External Walls

12. Repairs
13. Insulation Boards
14. Insulation Between Timbers

Internal

1. Radiator Foil Insulators
2. LED Light Bulbs
3. Turning Off Electrics



Window

15. Draught Proofing
16. Traditional Methods
17. Repairs
18. Double/secondary

Floors

19. Over Floor Insulation
20. Insulation Between Suspended

Door

21. Draught Proofing Gaps in Frame and Letterbox
22. Repairing Splits and Cracks

14 Retrofit Plan

Understand the building

1. Assess and evaluate your home
2. Assess the condition of your home's fabric and services
3. Consider the heritage value and significance
4. Assess the energy performance of the building envelope and its services
5. Think about the behaviour of the building fabric in response to heat and moisture
6. Consider the occupiers' requirements

Identify opportunities and interdependencies with other planned works

1. Refurbishments, repairs and extensions are times of disruption and expense. Using these occasions to carry out energy efficiency works, or renewable energy measures is likely to save your money and time.

Evaluate effectiveness and risks

1. The carbon cost-effectiveness of a measure is the capital cost of the measure, less the lifetime fuel costs savings, divided by the lifetime carbon dioxide emissions savings. Understanding the carbon cost-effectiveness of measures will help you decide which measures to install to achieve the maximum carbon emissions reductions for your money.

2. All energy efficiency improvement plans should follow the 'energy hierarchy'. The energy hierarchy ensures that passive energy efficiency measures, such as draught proofing and insulation are prioritised over higher cost active systems, such as new boilers and renewable energy technologies.
    1. Be lean (use less energy)
    2. Be clean (supply energy efficiently)
    3. Be green (use renewable energy)

3. A common concern when adapting historic buildings is adequate ventilation so that condensation and damp problems are avoided. Older buildings rely on natural ventilation to dissipate air borne moisture. When these routes are blocked moisture generated by day to day household activity is likely to condense on the coldest surface and cause damp and mould. To avoid this, improved and potentially mechanically assisted ventilation may need to be installed.

Assess impact of measures on heritage value and significance

1. Balance the conservation of historic character with the introduction of energy saving methods.

Implementation

1. Carry out a set of appropriate energy efficiency measures. The performance of any measure and its impact on energy efficiency in your property will depend both on the quality of the installation and the effectiveness of materials and equipment. As with any building project we recommend that independent professional advice is sought before any work begins.

My Energy Efficiency Retrofit Plan

Address:

Heritage Assets:

(Conservation Area/Listed Building/Non-designated Heritage Asset/Historic property)

Date:

1. Understand the building

2. Other planned works

3. Evaluate effectiveness and risk

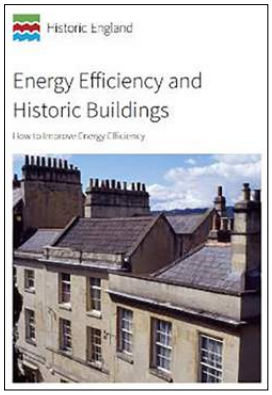
Effectiveness:

Risk:

4. Assess measures against heritage values/significance

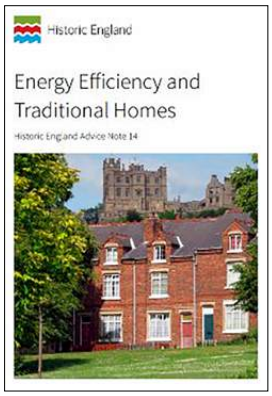
5. Implementation

15 For More Information



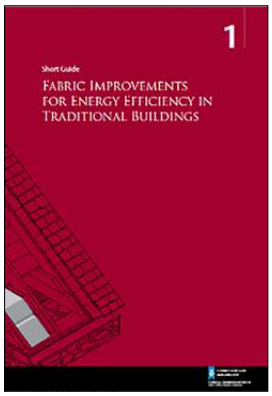
Energy Efficiency and Historic Buildings: How To Improve Energy Efficiency

By Historic England



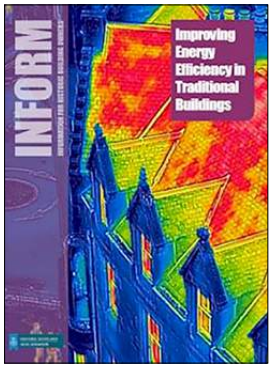
Energy Efficiency and Traditional Homes: Historic England Advice Note 14

By Historic England



Fabric Improvements for Energy Efficiency in Traditional Buildings: Short Guide

By Historic Scotland



INFORM: Improving Energy Efficiency in Traditional Buildings

By Historic Scotland

Sustainable Renovation: Improving Homes For Energy, Health and Environment

By The Pebble Trust

Energy Efficiency Knowledgebase (Website)

By SPAB

https://www.spab.org.uk/advice/energy-efficiency-old-buildings

Responsible Retrofit (Website)

By STBA

https://responsible-retrofit.org/

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