



BATH
PRESERVATION
TRUST

Retrofit for older homes

Alex Sherman, CEO



About Bath Preservation Trust (BPT)

Bath Preservation Trust **campaigns** for and **promotes** the **conservation, sustainable enhancement** and celebration of the unique **historic built environment** and amenity, green setting and global contributions of the City of Bath as a World Heritage Site.

At our heart are the principles of **informed advocacy, learning for all,** and the provision of **authentic heritage experiences** at our four museums, through partnership working and online.

We believe Bath deserves **excellence in design** and **contemporary sustainable development** which is inclusive of all people, and improves social and economic opportunities without compromising our unparalleled built heritage and natural environment.

Retrofit – what is it and why do it?

Retrofit is the term used to describe the installation of insulation and energy saving measures post-build. It can apply to any non-new house, although appropriate interventions will differ according to age.

- Reduce your carbon footprint
- Save money
- Be warm
- Future-proof your house
- Stay cooler in the summer – avoid over-heating
- Avoid condensation
- As fuel prices rise, relative retrofit costs become more economic
- If / when moving, buyers will increasingly expect retrofit and energy efficiency measures to be in place
- Over time, fewer homes will rely on gas, so gas prices will start to rise more rapidly

Whole house

The RIBA view:

“Whether a building is an old, traditional solid-walled structure or a postwar home, they both face **common enemies** when it comes to energy efficiency: **moisture and poor insulation** being first and foremost. An architect carrying out a retrofit to improve its operational efficiency needs to understand the essential principles.

Architects [*and assessors or builders*] should take a **holistic approach**. They should assess the **building fabric and services** but also understand its occupants and their **behavioural impacts**. All of this should take into account a building’s situation (just as any new-build design would) with regard to **orientation, sunlight, and wind and rain exposure**.

This ‘whole house’ approach very much mirrors the thorough guidance published by LETI, and endorsed by the RIBA in the Climate Emergency Retrofit Guide.”

Whole house assessment

Accredited assessor

- Environmental Performance Certificate
- Retrofit assessment
- Starts at around £300

Expect a recommended list of works required to improve the thermal performance of your home.

An architect can also provide a similar function.

A sequential plan should be possible in most cases, identifying the interventions with the greatest impact.

Listed Building Consent

Essential for works with a material intervention, which may cause a short, medium or long-term harm to heritage. Reversible changes are preferable and can make applications more straightforward. A case for non-reversible changes will be harder to make and may be contested.

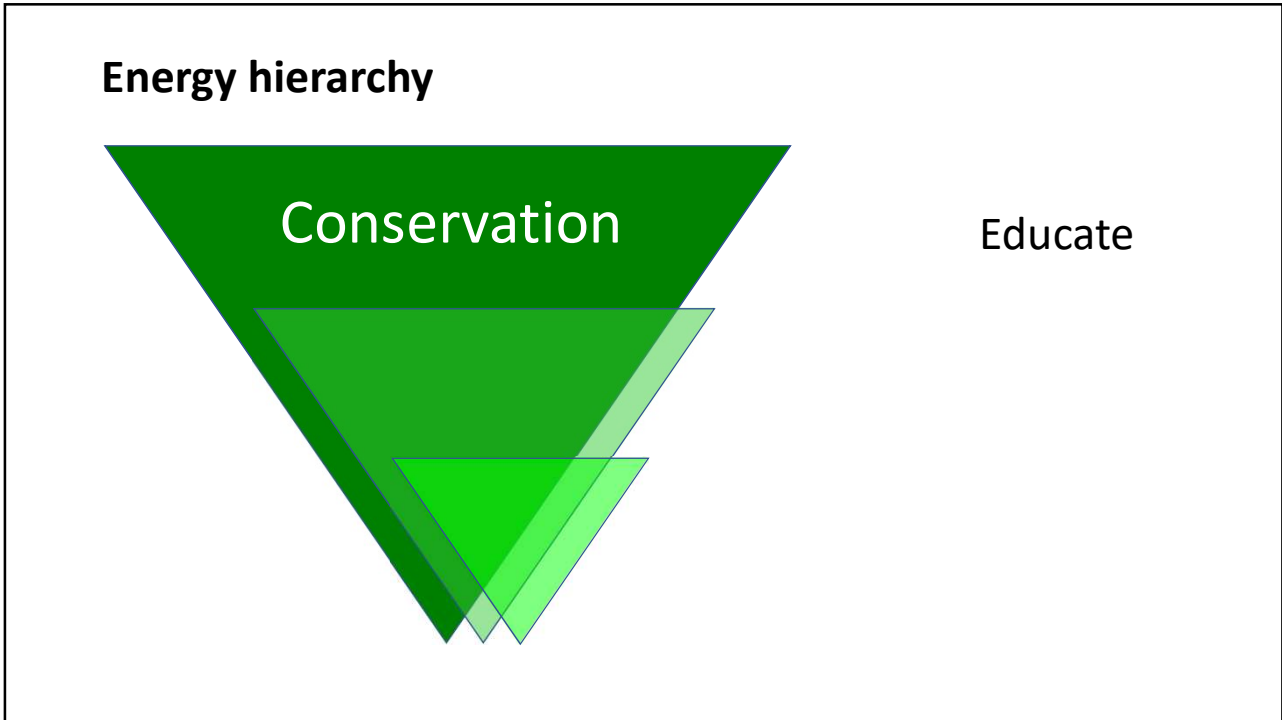
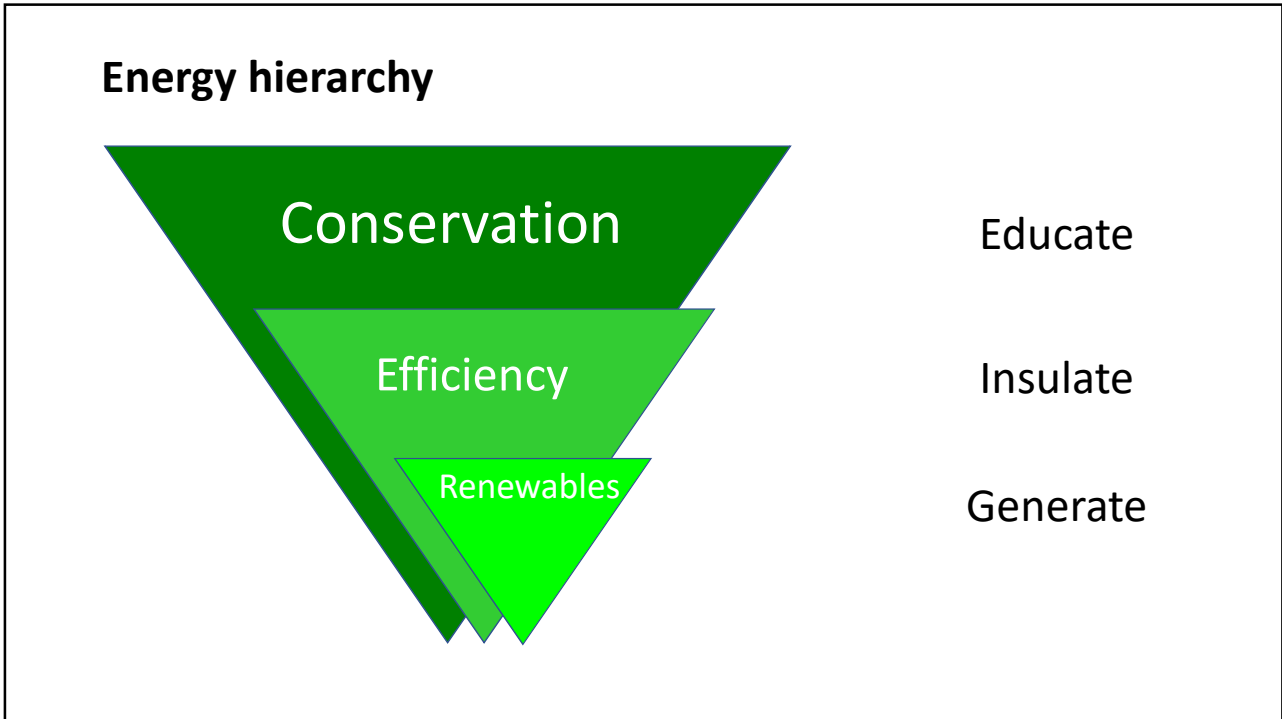
Every historic house is different, so each application is assessed case by case.

Speak to Bath and North East Somerset Council

- 01225 394041
- conservation_andplanning@bathnes.gov.uk

If LBC is required, you will need to submit:

- A brief application form
- 1:50 or 1:100 scale drawing of your entire property (not just the room affected)
- Technical detail of your proposed scheme of works, including measurements and materials, if applicable (which should be available from your installer)



Energy consumption – appliances and fittings

A-rated (or better) appliances

Fit LED lightbulbs wherever possible. 80% + more efficient than filament (incandescent) bulbs and are considerably cheaper / hour lifespan

Upgrade heating controls and install TRVs to locally manage heating

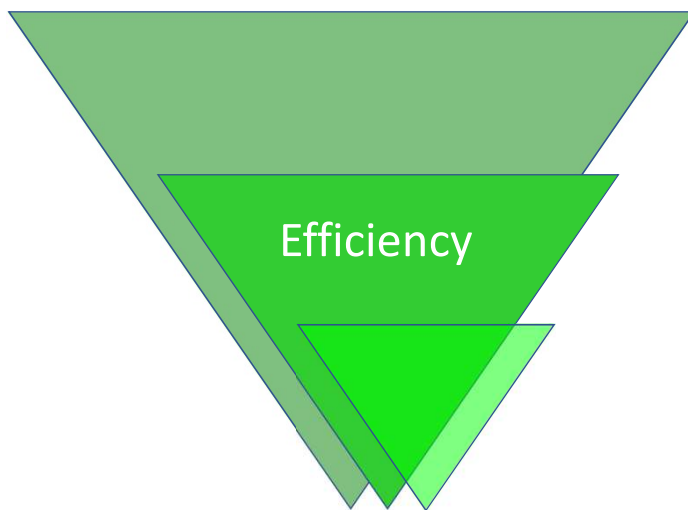
Check average room temperature

Behaviour change

- Switch lights and appliances off when not in use
- Make sure energy is used wisely – full loads of washing, boil water which is needed
- Keep internal doors shut - no heating of corridors or unused space
- Keep shutters closed unless sun on windows
- Open windows in the warmest part of the day (even in winter)
- Wear more clothes
- Use heavy curtains to stop draughts
- Use draught excluders and heavy rugs

Beware of vampire energy!

Energy hierarchy



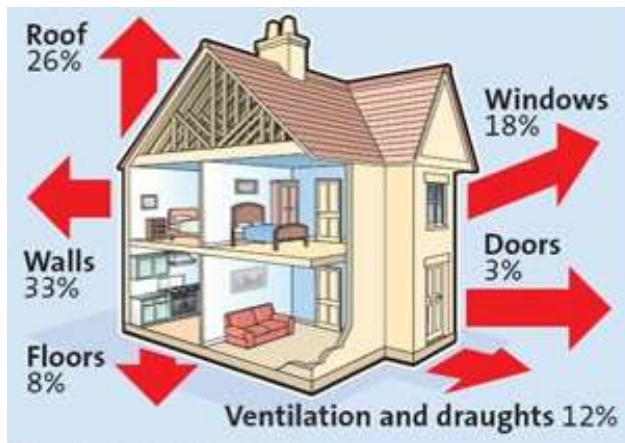
Insulate

Heat loss in homes

Cavity wall insulation
External render
Internal render
Internal dry-lining

Bold indicates the need for Listed Building Consent if building listed

Loft insulation



Suspended floor insulation – cautiously
Rugs, floor covering, underlay, draughts

Maintenance
Shutters
Brushes
Double glaze
Secondary glaze

Insulate
Fit
Door furniture

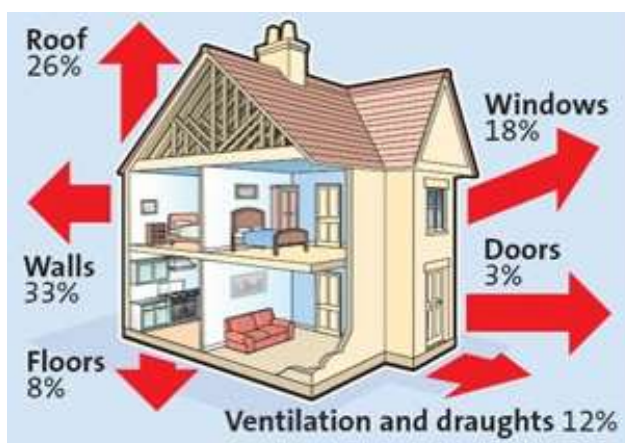
Chimney
Under doors
Windows
Floors
Holes

Heat loss in homes

Cavity wall insulation
External render
Internal render
Internal dry-lining

Bold indicates the need for Listed Building Consent if building listed

Loft insulation



Suspended floor insulation – cautiously
Rugs, floor covering, underlay, draughts

Maintenance
Shutters
Brushes
Double glaze
Secondary glaze

Insulate
Fit
Door furniture

Chimney
Under doors
Windows
Floors
Holes

Roof / loft – up to 26% heat loss

Standard insulation – LBC *may* be required

Best option:

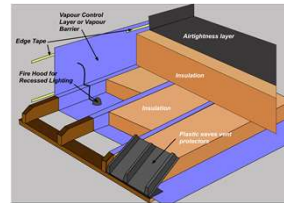
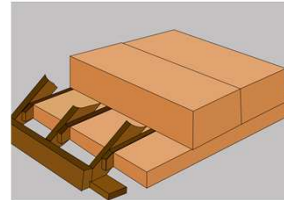
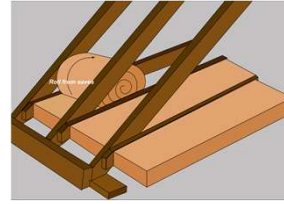
- Rock wool / fibreglass on a roll, with a minimum recommended depth of 270mm

Other options:

- Loose fill fibreglass / vermiculite
- Solid foam insulation board (very useful to insulate between rafters in vaulted ceiling)

Watch out for:

- Ventilation is essential so ensure vents are fitted to allow airflow
- Avoid spray on options, which are not easily reversible, can cause condensation issues and would be unlikely to be approved
- Insulation getting wet from condensation, ingress, moisture bridging. It must be removed or may cause long-term, possibly structural damage

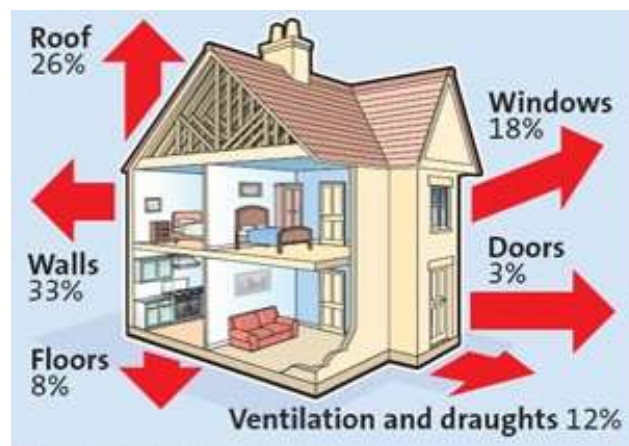


Heat loss in homes

Cavity wall insulation
External render
Internal re-plaster
Internal dry-lining

Bold indicates the need for Listed Building Consent if building listed

Loft insulation



Suspended floor insulation – cautiously
Rugs, floor covering, underlay, draughts

Maintenance
Shutters
Brushes
Double glaze
Secondary glaze

Insulate
Fit
Door furniture

Chimney
Under doors
Windows
Floors
Holes

Walls – up to 33% heat loss

Cavity wall insulation – LBC *will* be required

Needs professional installation and may cause minor harm to heritage if property is listed. Only works where Portland cement / non-permeable external walls exist

External render – LBC *will* be required

Determined on a case by case basis but unlikely to be considered if curtilage is visible from a public highway or a protected view. Can cause issues with lime mortar and stop a wall from 'breathing'. Condensation can be a problem and the installation is unusual in Bath. An expensive but potentially effective option to consider.

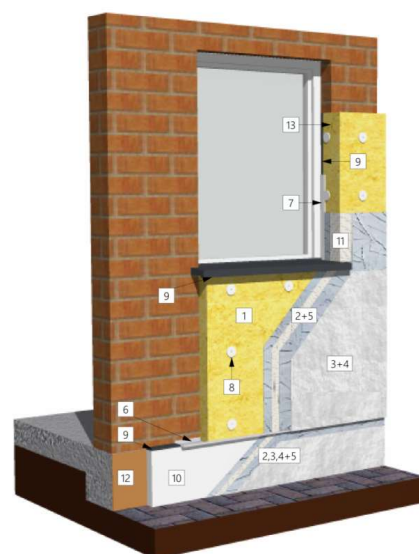
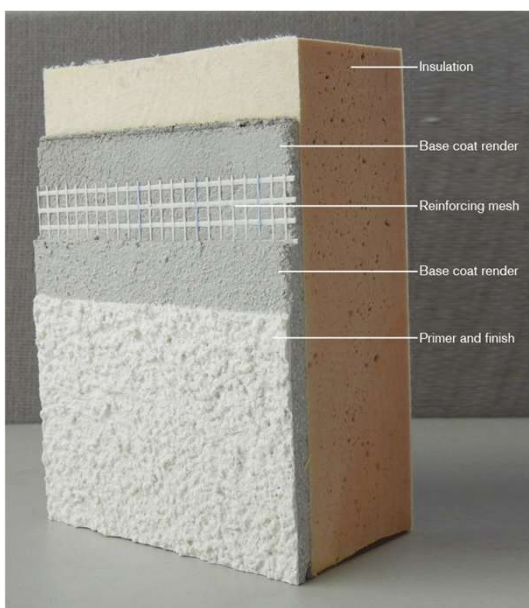
Internal re-plaster – LBC *will* be required

Existing material in a listed building must not be removed. A re-plaster, using an appropriate lime plaster containing insulating glass microbeads may be possible. Relatively inexpensive option, and public benefit to be emphasised, with no loss of historic fabric.

Internal dry-lining – LBC *will* be required

Involves creating a cavity by adding a raised layer of plaster board to a wall. Cavity can be filled with insulating board or soft fill insulation. Reduces room size, must resolve condensation risks and risks compromising room details. No loss of fabric can occur to facilitate.

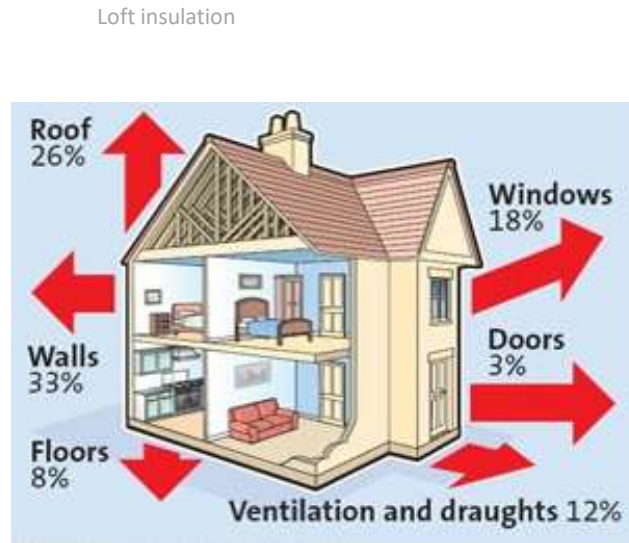
Examples of external insulation installation



Heat loss in homes

Cavity wall insulation
External render
Internal render
Internal dry-lining

Bold indicates the need for Listed Building Consent if building listed



Suspended floor insulation – cautiously
Rugs, floor covering, underlay, draughts

Maintenance
Shutters
Brushes
Double glaze
Secondary glaze

Insulate
Fit
Door furniture

Chimney
Under doors
Windows
Floors
Holes

Windows 1 – up to 18% heat loss

Maintenance

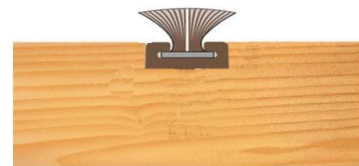
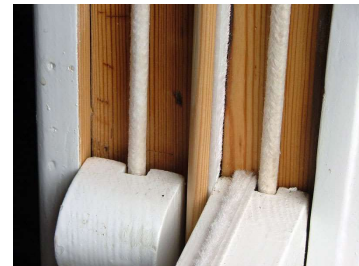
Keeping windows well maintained is essential to avoid draughts, so they fit and work as they should. Regular painting, maintain putty, re-sash, beading should fit well. Repair any rotting / wet wood with hard-wood.

Shutters

A barrier to keep the cold out and if present they should be well maintained and used. Adjust to ensure best fit.

Brushes

Retrofit brushes can do a lot to reduce draughts and improve the fit and feel of sash windows. Options include self adhesive strips (temporary) to rebated brushes (permanent). Also help with rattling!

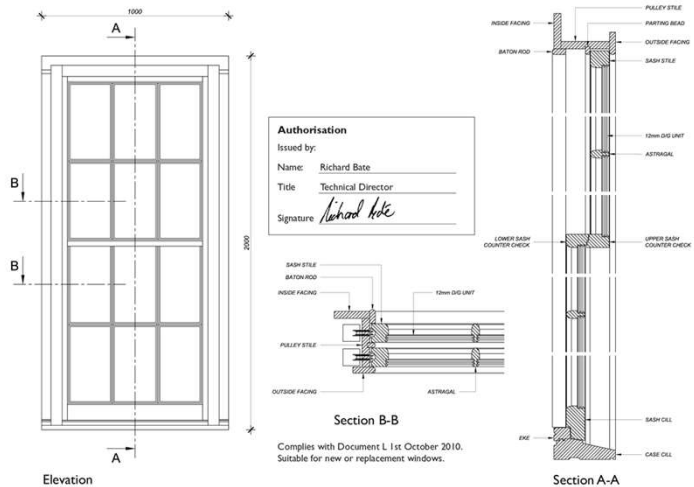
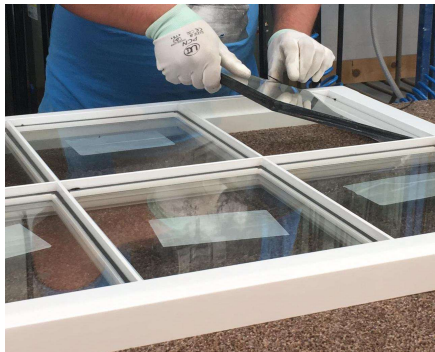
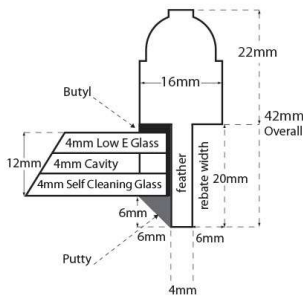


Windows 2 – up to 18% heat loss

Double glaze – referring to the replacement of single glazed window panes

General points to consider:

- Slim-lite double glazed units are the only real option and may not be suitable for all sash windows
- Need at least 2cm depth in glazing bar, which will need to be modified
- Must not lose crown glass or glazing bars
- More than doubles the weight of the window, so heavier counter-weights are essential
- May compromise the structural integrity of the frame
- Lifespan – only as long as the integrity of the seal (10 to 30 years)
- Pointless without also draughtproofing and may not provide the outcome wanted



THIS DRAWING IS THE PROPERTY OF SLIMLITE DOUBLE GLAZING CO. LTD. AND ANY UNAUTHORIZED DISTRIBUTION TO A THIRD PARTY IS STRICTLY FORBIDDEN. NOT TO SCALE.

Windows 3 – up to 18% heat loss

Secondary glaze

Several options including:

- Magnetic, fitted to adhesive magnetic strips fixed to frames as a fully reversible option. Limits opening of windows and units require storage in the summer
- Magnetic fitted direct to metal casements – Crittal
- Wood framed avoiding loss of original fabric – fit to wooden frame or to recess

The secondary units may be temporary (seasonal) or permanent and with ability to open
When fitting to listed property, any divisions must match window frame – e.g. replicate sash window layout and opening

This can be the most efficient option
Avoids significant damage (harm to heritage)
Allows installation of single or double glaze secondary units
Allows outer window to breathe
Relatively easy and inexpensive to fit



Windows 4 – up to 18% heat loss

Replace

For many, the least favourite and most expensive option in listed buildings – loss of historic fabric

Less problematic in more modern, non-listed buildings

Only limited benefit unless whole house approach is taken

Short lifespan – duration of double-glazed seal

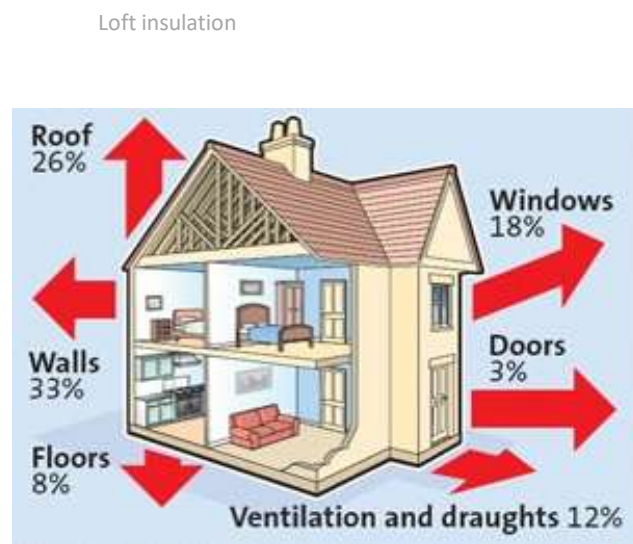
Ventrolia system very popular for replacement sash windows

Installer must be FENSA registered

Heat loss in homes

Cavity wall insulation
External render
Internal render
Internal dry-lining

Bold indicates the need for Listed Building Consent if building listed



Suspended floor insulation – cautiously
Rugs, floor covering, underlay, draughts

Maintenance
Shutters
Brushes
Double glaze
Secondary glaze

Insulate
Fit
Door furniture

Chimney
Under doors
Windows
Floors
Holes

Draughts – up to 12% heat loss

Chimney

Chimney balloons are quick and easy to install to stop warm air escaping, where a fireplace is no longer actively used.

Under doors

Draught excluders for doors are quick and easy to install and can be matched to soft furnishings and décor and are removable. Door brushes are effective.

Windows

As well as fitting brushes and keeping windows maintained, small draught excluders, sash wedges and even masking tape can significantly reduce draughts.

Floors

Rubber strips fitted between floor boards help to reduce draughts as an inexpensive option. Rugs, carpets and underlay are also effective.

Holes and gaps

Fix any broken panes of glass, fill holes in walls (e.g. where copper pipes or wiring has been fitted), fill plaster cracks in stud walls

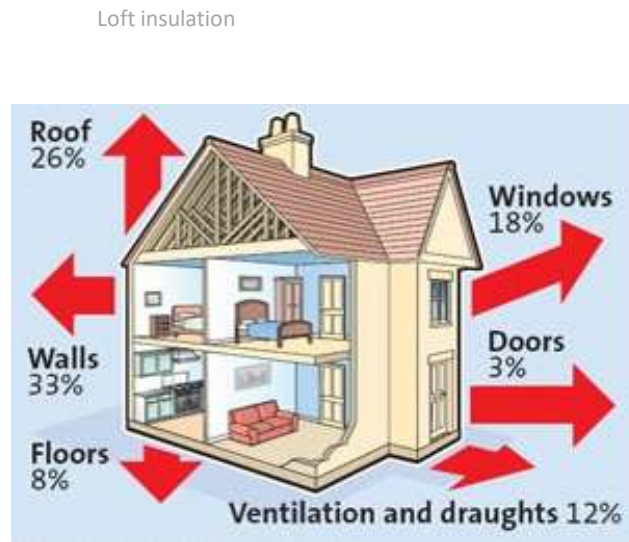
Draught excluders – low cost, no permissions required



Heat loss in homes

Cavity wall insulation
External render
Internal render
Internal dry-lining

Bold indicates the need for Listed Building Consent if building listed



Suspended floor insulation – cautiously
Rugs, floor covering, underlay, draughts

Maintenance
Shutters
Brushes
Double glaze
Secondary glaze

Insulate
Fit
Door furniture

Chimney
Under doors
Windows
Floors
Holes

Floors – up to 8% heat loss

Suspended floor insulation

- Differs depending on construction age
- Solid foam
- Suspended rock wool
- Risks – moisture bridge, ventilation, hard to tell if it gets wet
- Avoid damage to historic floorboards

Above floorboards

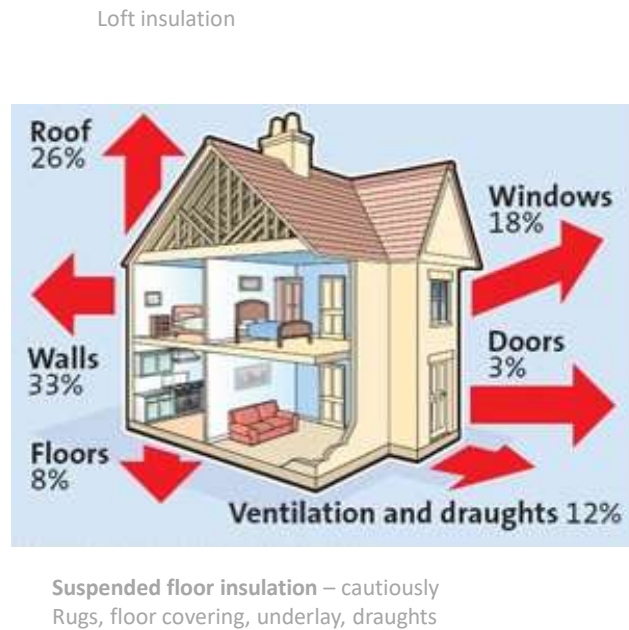
- Rugs and carpets
- Insulating / reflecting underlay
- Resolve draughts



Heat loss in homes

Cavity wall insulation
External render
Internal render
Internal dry-lining

Bold indicates the need for Listed Building Consent if building listed



Maintenance
Shutters
Brushes
Double glaze
Secondary glaze

Insulate
Fit
Door furniture

Chimney
Under doors
Windows
Floors
Holes

Doors – up to 3% heat loss

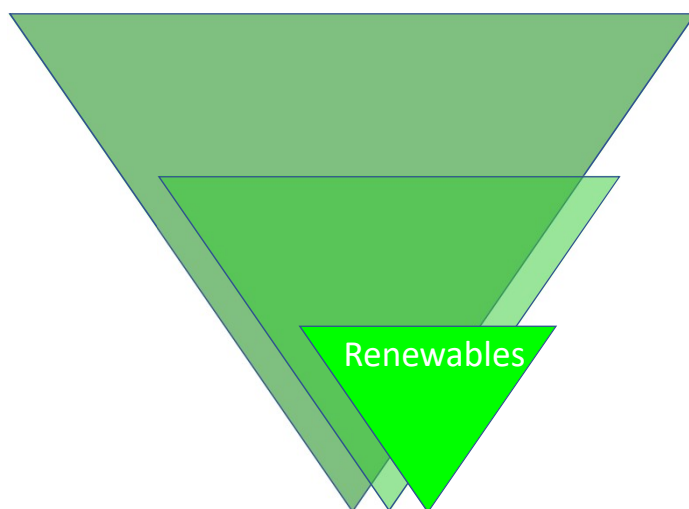
Maintenance and fit

- Make sure doors fit snugly in their frame. Adjust hinges, reduce accumulations of paint, fill any shrinkage gaps
- Consider fitting brushes, foam strips to reduce draughts
- Check the door frame for gaps
- Lining may be an option but a relatively undesirable 'Heath Robinson' approach
- Fit insulation / internal fittings for letterbox and the fit of door furniture
- Secondary glaze windows

Free & low-cost options

- Keep your home well maintained - make sure roof coverings, gutters, stonework/pointing, windows and doors are in a good state of repair
- Place old blankets or duvets between the rafters
- Lag (insulate) hot water pipes and install hot water tank jacket
- Insulate any openings for pipes and wires
- Hang curtains, preferably thick or thermally lined curtains and blinds over draughty windows and doors
- DIY draughtproof letterboxes, chimneys, floors, doors and old windows
- Overhaul sash windows so they fit better and draughtproof
- Use draught excluders at the bottom of doors
- Use rugs on wood floors to help reduce floor draughts
- Make sure your home is naturally ventilated to maintain a constant temperature and avoid trapped moisture
- Make sure the heat from radiators is not obstructed by furniture or curtains
- Close external and internal doors to keep heat in
- Close shutters at sundown if you have them

Energy hierarchy



Generate

Heating options

Air Source Heat Pump (ASHP)

Heat exchange from air, providing consistent temperatures and work differently to 'conventional' boilers – consistent vs reactive. Works in sub-zero temperatures. Mounted outside, modifications are required to provide services inside. Likely to need larger radiators throughout.

Costs are coming down but lifespan is approximately double that of gas boiler.

Slightly higher electricity burden but zero gas and major carbon reduction.

Ground Source Heat Pump (GSHP)

Heat exchange from the ground, requiring large coils to be buried. Limited inner city options, but a long-term low-maintenance option with land or a large garden.



Heating options

If ASHP / GSHP is installed, alternative water heating options will be required:

Solar water heater

Providing hot water, heated by the sun, in a roof mounted system. Similar planning limitations to PV panels apply.

On demand water heaters

Installed at each tap point, these can be very efficient but have a proportionately high up-front installation cost.

Central electric water boiler

Lower upfront cost but slightly higher operating costs.

Electric combi boiler

Efficiency is improving and installation is straight-forward, although running costs are higher than gas, ASHP or GSHP. Low material impact or modification.



Energy production

Photovoltaic (PV) ‘solar’ panels – planning permission may be needed

Technology continues to evolve and prices continue to fall. If permission to install is granted, considerations include battery storage and the ability to fully disconnect from the grid.

In Bath, options to install PV are limited due to the conservation area, protected views and WHS.

Opportunities exist for homes with a double ridge, with installation in valleys. B&NES Council are working on a Development Order, which is expected to be in place later this year to allow all valleys installations to be permissible.

BPT is also exploring new technology such as simulated historic tiles and transparent PV.



Relative benefits

Key	
£	up to £100
££	£100 - £1,000
£££	£1,000 - £5,000
££££	£5,000 - £10,000
£££££	over £10,000
☺☺☺☺☺	pays for itself
☺☺☺☺	< £10/tonne CO2
☺☺☺	£10-£100/tonne CO2
☺☺	£100-£500/tonne CO2
☺	> £500/tonne CO2
★	you will hardly notice
★★	briefly intrusive
★★★	takes longer but you can live with it
★★★★	very disruptive with installers everywhere
★★★★★	you may have to move out

Measure	Cost	Carbon cost-effectiveness	Disruption
Low energy lights	£	☺☺☺☺☺	★
Draught-proofing	£	☺☺☺☺☺	★★★★
Loft insulation	££	☺☺☺☺☺	★★
Floor insulation	££	☺☺☺☺☺	★★★★★
Internal wall insulation	££££	☺☺☺☺☺	★★★★★
External wall insulation	£££££	☺☺☺☺	★★★★
Upgrading heating controls	££	☺☺☺	★★
Replacement gas boiler	£££	☺☺	★★★★
Low energy appliances	£££	☺☺	★
Replacement windows/doors	££££	☺☺	★★★★
Solar hot water panel	£££	☺	★★
Micro wind turbine	£££	☺	★★
1 kW solar electric panel	££££	☺	★★
Air source heat pump	££££	☺	★★★★
Ground source heat pump	££££	☺	★★★★

Further information

Bath Preservation Trust www.bath-preservation-trust.org.uk

Warmer Bath <http://www.bath-preservation-trust.org.uk/wp-content/uploads/2012/08/Warmer-Bath-PDF-June-2011.pdf>

A Quick Guide to Low Carbon Living in Older Homes <https://www.bath-preservation-trust.org.uk/wp-content/uploads/2022/08/QUICK-WINS-FINAL-BPT-8pp-A5-Final-26-8-22-no-crops-Pdf-for-website.pdf>

Historic England <https://historicengland.org.uk/advice/technical-advice/retrofit-and-energy-efficiency-in-historic-buildings/>

Bath NES Council – Retrofit SPD https://beta.bathnes.gov.uk/sites/default/files/2022-03/BNES.01%20Retrofitting%20and%20Sustainable%20Construction_0.pdf

LETI - Climate Emergency Retrofit <https://www.leti.uk/retrofit>

RIBA <https://www.architecture.com/>

CSE <https://www.cse.org.uk/>

Energy Saving Trust <https://energysavingtrust.org.uk/>

And finally . . .

- Please join BPT (and millions around the world) in recognising Earth Hour 2023, at 8.30 pm on Saturday 25th March
- If you are embarking on a retrofit project, we would love to know about it and include it in our growing library of case studies
- Watch out for future events BPT will be holding, about sustainable architecture and design – the next is a talk by Piers Taylor on 4 May
- Consider joining BPT as a member to support our work – we are 100% independent and receive no government grants or subsidy



BATH
PRESERVATION
TRUST

conservation@bptrust.org.uk



BATH
PRESERVATION
TRUST

Retrofit for older homes
Q&A

