SALTAIRE

RETROFIT REIMAGINED

A HANDBOOK FOR IMPROVING THE COMFORT AND ENERGY EFFICIENCY OF YOUR SALTAIRE HOME

REIMAGINING HERITAGE

This handbook has emerged out of the Saltaire Retrofit Reimagined project which aims to enhance the energy efficiency and comfort of Saltaire homes.

Initiated in January 2023, the project started by listening to over 200 Saltaire community members to understand their living experiences, harness their knowledge and explore barriers to heating their homes and reducing energy use.

Our guidance has been developed combining insights from local residents with professional energy and condensation risk modelling. Through the commissioning of these experts and the creation of this handbook, we aim to democratise access to expert advice for the Saltaire community. The engagement insights that have informed this handbook are available at:

https://www.above-ground.co.uk/saltaire-retrofit-reimagined

Acting in response to the climate emergency the project initially focused on reducing energy use and achieving decarbonisation. However, after listening to community feedback we shifted the focus to residents' comfort and well-being.

Our survey results indicate 75% of respondents struggle to heat their homes adequately. One resident told us:

"When the temperature dropped below freezing in December, I had the heating on for 3 hours and my living room temperature got to 10.2 degrees. The government have told us our home should be at a minimum of 18 degrees for our health, but this seems impossible to achieve"

Since the project's inception, we have heard a wide range of perspectives on best practices for improving the energy efficiency of heritage homes. These opinions span from conservative approaches requiring lifestyle changes to maximising energy efficiency despite high costs and technical challenges. Our guidance strikes a middle ground, informed by community feedback, building trades and stakeholders. It aims to engage with the reality of people's lives and the challenges they encounter when doing this work to create possible and sustainable solutions.

A no-conflict approach to heritage

Our guidance also works within Saltaire's conservation restrictions, providing useful information and resources for both authorities and residents.

We know that work is carried out in Saltaire regardless, much of this work is internal and unrestricted and most is not done in accordance with best practice for heritage buildings. To accept this status quo is also a heritage risk.

Our engagement has shown that many people take great pride in the unique character of Saltaire streetscapes. We want to demonstrate how these can be maintained and protected while getting Saltaire ready for another 100 years of change in how we live in, heat and power our homes.

CONTENTS

SUPPORTING DOCUMENTS

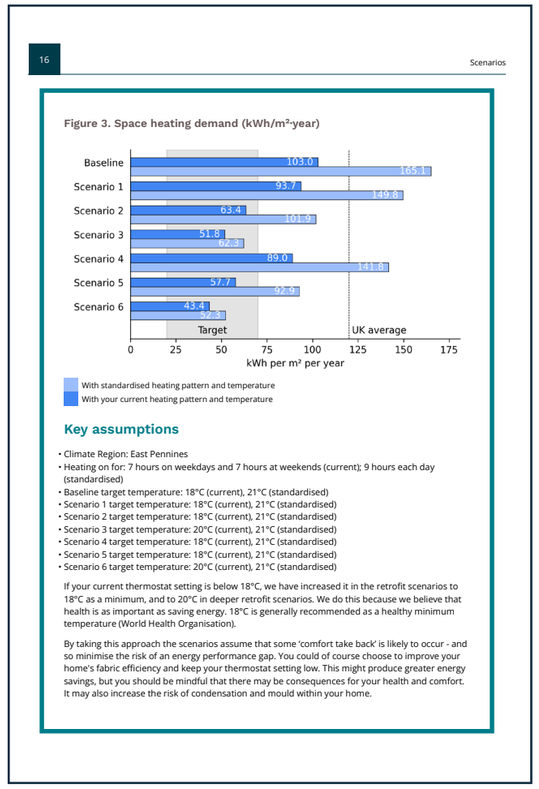
This symbol indicates that you can find out more information on a topic. This handbook is supported by an additional document, the 'Home Retrofit Scenarios' created by People Powered Retrofit. It can be found here:

https://www.above-ground.co.uk/saltaire-retrofit-reimagined

This document goes into detail on both the heat loss, energy modelling and construction specifications that have informed this handbook. It is a useful tool when briefing contractors or carrying out DIY work.

Please contact info@above-ground.co.uk for 'Appendix A' which also gives very detailed specifications.

This handbook was first published in August 2024.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Scenarios

Figure 3. Space heating demand (kWh/m²·year)

Key assumptions

- Climate Region: East Pennines
- Heating on for: 7 hours on weekdays and 7 hours at weekends (current); 9 hours each day (standardised)
- Baseline target temperature: 18°C (current), 21°C (standardised)
- Scenario 1 target temperature: 18°C (current), 21°C (standardised)
- Scenario 2 target temperature: 18°C (current), 21°C (standardised)
- Scenario 3 target temperature: 20°C (current), 21°C (standardised)
- Scenario 4 target temperature: 18°C (current), 21°C (standardised)
- Scenario 5 target temperature: 18°C (current), 21°C (standardised)
- Scenario 6 target temperature: 20°C (current), 21°C (standardised)

If your current thermostat setting is below 18°C, we have increased it in the retrofit scenarios to 18°C as a minimum, and to 20°C in deeper retrofit scenarios. We do this because we believe that health is as important as saving energy. 18°C is generally recommended as a healthy minimum temperature (World Health Organisation).

By taking this approach the scenarios assume that some 'comfort take back' is likely to occur - and so minimise the risk of an energy performance gap. You could of course choose to improve your home's fabric efficiency and keep your thermostat setting low. This might produce greater energy savings, but you should be mindful that there may be consequences for your health and comfort. It may also increase the risk of condensation and mould within your home.

CHAPTER 01

A TYPICAL SALTAIRE HOUSE

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A TYPICAL SALTAIRE HOUSE

Our energy modelling is based around a ‘typical’ Saltaire house rather than a particular property.

The image shows the streets with houses most similar to our baseline property.

We used a mid-terrace on Jane Street for the layout of the spaces and existing construction. Other assumptions about heating systems, energy efficiency measures already installed and common problems have been informed by responses to our engagement with Saltaire residents.

For example, we were told that 60% of lofts already have some insulation but that this has often not been installed in accordance with best practice. Our energy modelling uses this as the base case rather than no loft insulation.

The exact figures given for energy saving will be most relevant to houses with the same dimensions, layout and north / south orientation, but the advice on approach, materials and details will be very relevant to most Saltaire homes. In future it may be feasible to expand the energy modelling to look at other typical Saltaire house types, smaller 1 and 2 bed terraces with frontages facing east and west are another very common type.

Existing problems
Problems with damp and mould. The exact nature and cause of these will vary from house to house but damp in chimney breasts, cellars, cold areas/ corners in rooms, window condensation and mouldy bathrooms are all common.

Loft & Roof
Insulated with ~200mm of typical (mineral wool) insulation but unevenly laid and no insulation in hard to reach tight or hidden spaces. No intentional approach to either sealing from the living spaces or ventilating the loft itself.

Draught proofing
A high level of air leakage much of which is uncontrolled and/or from hidden sources. See pages 11-13 to learn where we found air leaks in a property.

Walls
450mm thick ‘solid’ sandstone with an inner and outer layer of cut stone and a rubble core. Mix of plaster types applied to visible areas of walls.

Windows
Timber single glazed in an accepted heritage style (sliding sash) and subject to current restrictions on replacement.

Ground Floor
Floor finishes over thick stone slabs laid over a mix of solid ground and cellar.

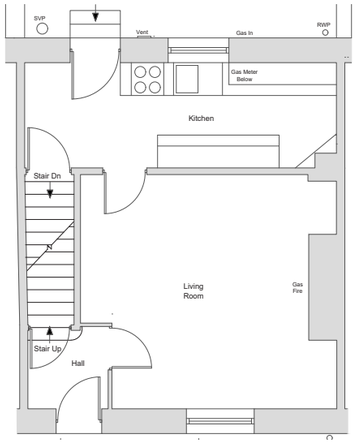
Cellar
Under about 1/3 of the ground floor with inadequate ventilation and some damp.

Doors
Timber in the heritage style which varies from street to street.

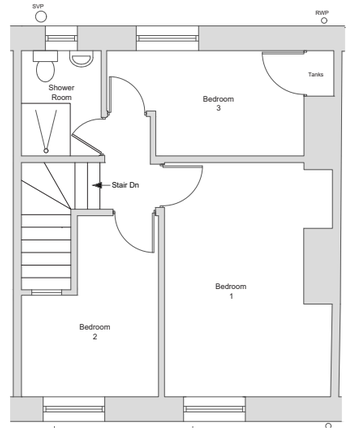
Heating System
Central heating with a combi boiler.

Ventilation
Basic extractor fan in bathroom only.

Ground Floor Plan



First Floor Plan



CHAPTER 02

A HOUSE PARTY WITH A DIFFERENCE

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HOUSE PARTY WITH A DIFFERENCE

In February 2024, we used a fan to draw air out of a warm Saltaire house and invited residents and stakeholders to explore with thermal imaging cameras. This demonstration aimed to reveal the houses' hidden workings and identify key areas of cold air entering the property and warm air escaping!

With an inside/outside temperature difference exceeding 10°C and the pressure difference from the fan, we created optimal conditions for using thermal cameras. Cold air entered the house through unintended gaps and travelled through hidden spaces towards the fan.

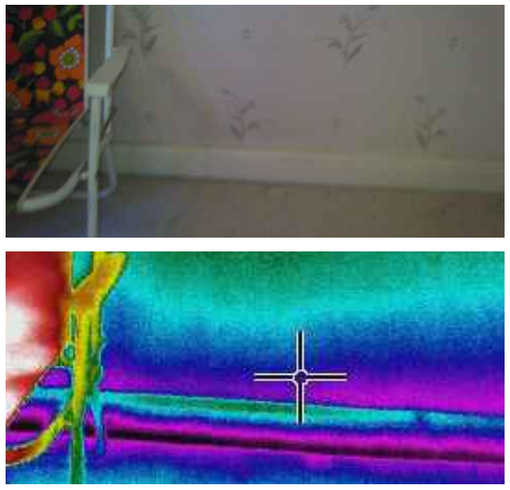
We captured detailed thermal images of specific areas in the house and measured the air tightness performance. We found that the house's performance was poor but typical for its type with a AP50 rating of **9.4** m3/m2.h. This rating is much higher than current building regulations which require a value of less than **5.0**, a passive house typically has a value of less than **1.0**.

Saltaire houses vary significantly in terms of the exact causes of air leakage, this one had well-sealed windows and doors but open holes into the loft at the backs of cupboards due to ceiling damage.

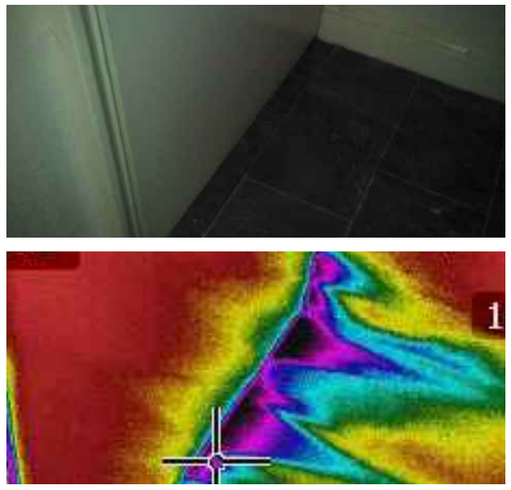
The interpretation of overall performance and other evidence from the day informed our modelling and guidance.

THERMAL IMAGING

Exposed floor slabs showed colder temperatures and more air leakage than those with floor coverings.

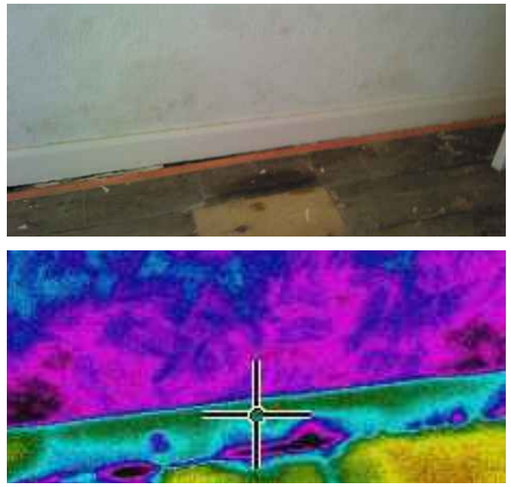


Air leakage was present at all the edges of the ground floor.

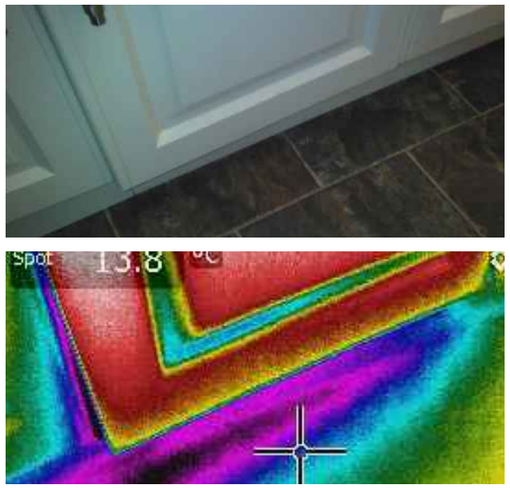


The doors and windows were well sealed but an open gap was present under the door to the cellar stairs.

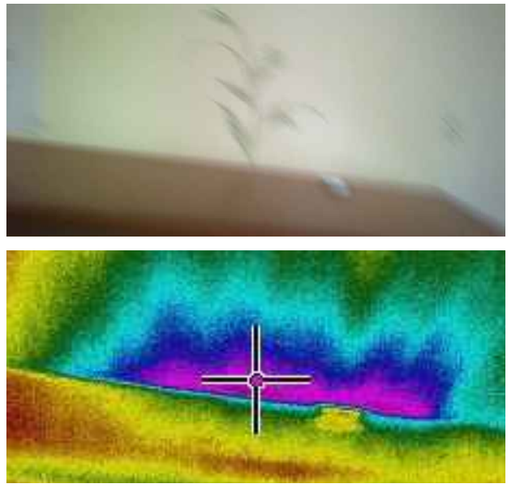
The loft is insulated but the loft hatch is just a piece of timber with no sealing at the edges.



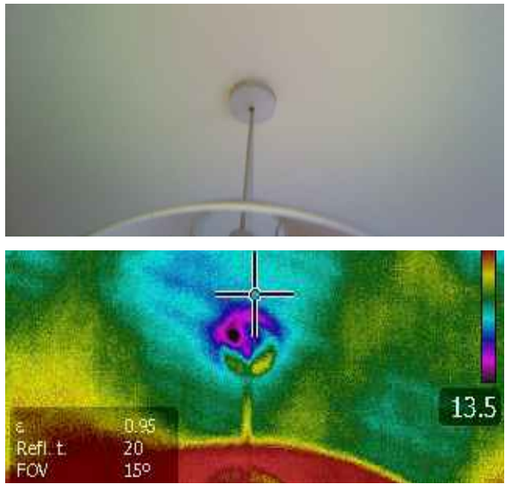
The area of wall hidden between the ground floor ceiling and first floor boards has no plaster and is missing blocks. Cold air enters here and comes up through the upstairs floor boards.



The areas of wall concealed behind kitchen units also often have missing plaster and pipes penetrating the walls. Here cold air enters from under the kitchen units.



The fireplace mantelpiece looked sealed but gaps to the cold air in the chimney were revealed by drawing the air under pressure.



Small details like light fittings provide a route for cold air to enter. The plastic cover is hiding a small unsealed hole in the plaster ceiling.

CHAPTER 03

A LONG TERM PLAN

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LONG TERM PLANS

A common approach to home retrofit is known as ‘fabric first’. This means that the building enclosure (walls, windows, roof etc.) is improved to reduce the energy needed to heat and power it, before the technology needed to provide the heat and power is installed. A typical sequence looks like this:

1. **Fixing faults**
2. **Reducing draughts and improving insulation**
3. **Modernising heating and ventilation systems**
4. **Changing how homes are heated and powered**

The advantage of this approach is that by dealing with problems and reducing energy requirements, less work and expense will be needed for the later stages. For example the heating system needed would be smaller and simpler and the required power output of a heat pump would be lower, meaning a smaller unit could be used.

We think that this approach makes even more sense in Saltaire as while the building fabric improvements described here are mostly invisible and in many cases will help to protect the houses; the kind of technology needed to provide clean heat and power is often intrusive. Many solutions, like an air source heat pump or a new energy centre will have some impact on the World Heritage Site. By taking a fabric first approach the impact of integrating the chosen technology will be lessened.

CONTEXT AND CLIMATE

Building regulations acknowledge the need for context and climate specific measures for heritage buildings. One aim of this project is to pick up where regulations stop and carry out some of this analysis.

A lot of home insulation nightmare stories relate to problems caused by moisture leading to damp and mould. Our engagement has shown that these are already problems in Saltaire houses and adding insulation needs to improve things rather than make problems worse!

This is a complex topic but all the information here has been informed by the best modelling and analysis available.

Dehumidifiers

About half of Saltaire residents use dehumidifiers. They can work for drying clothes **but...**

Saltaire is in a wet and humid area and it is impossible to dehumidify Yorkshire!

A well ventilated house is by definition connected to the outside so if your dehumidifier seems to work, your house might not have adequate ventilation.

A short introduction to humidity and moisture in Saltaire.

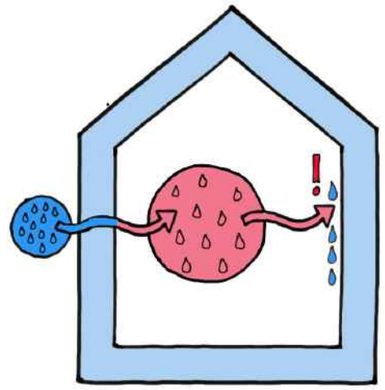
1. When cold humid air enters a house and warms up it expands, this means that there is more space for the water molecules so the relative humidity drops. A warm house is better in this respect.

2. But when the air and water vapour then reaches places in the house that are still cold the moisture condenses, if this happens in the wrong places it can cause problems.

3. Moisture produced internally makes these problems worse. This is one reason why good ventilation is so important, in a well ventilated house you will only be dealing with the moisture that is naturally present in the air that enters the house.

4. Raising the surface temperature of these cold places prevents condensation from forming. Adding internal wall insulation is one way of doing this.

5. But you can have too much internal insulation. Areas of the walls outside of it will get colder and at greater risk of condensation and damp. Our recommendations for insulation type and thickness are based on condensation risk modelling done specifically for Saltaire walls and climate.



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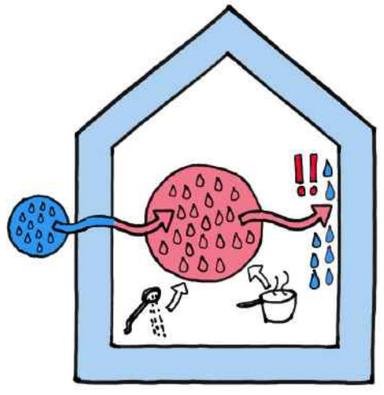

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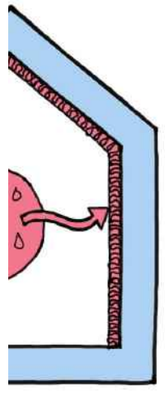

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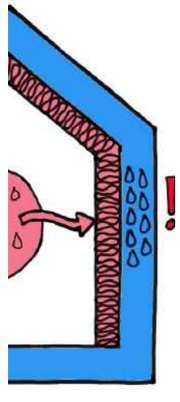

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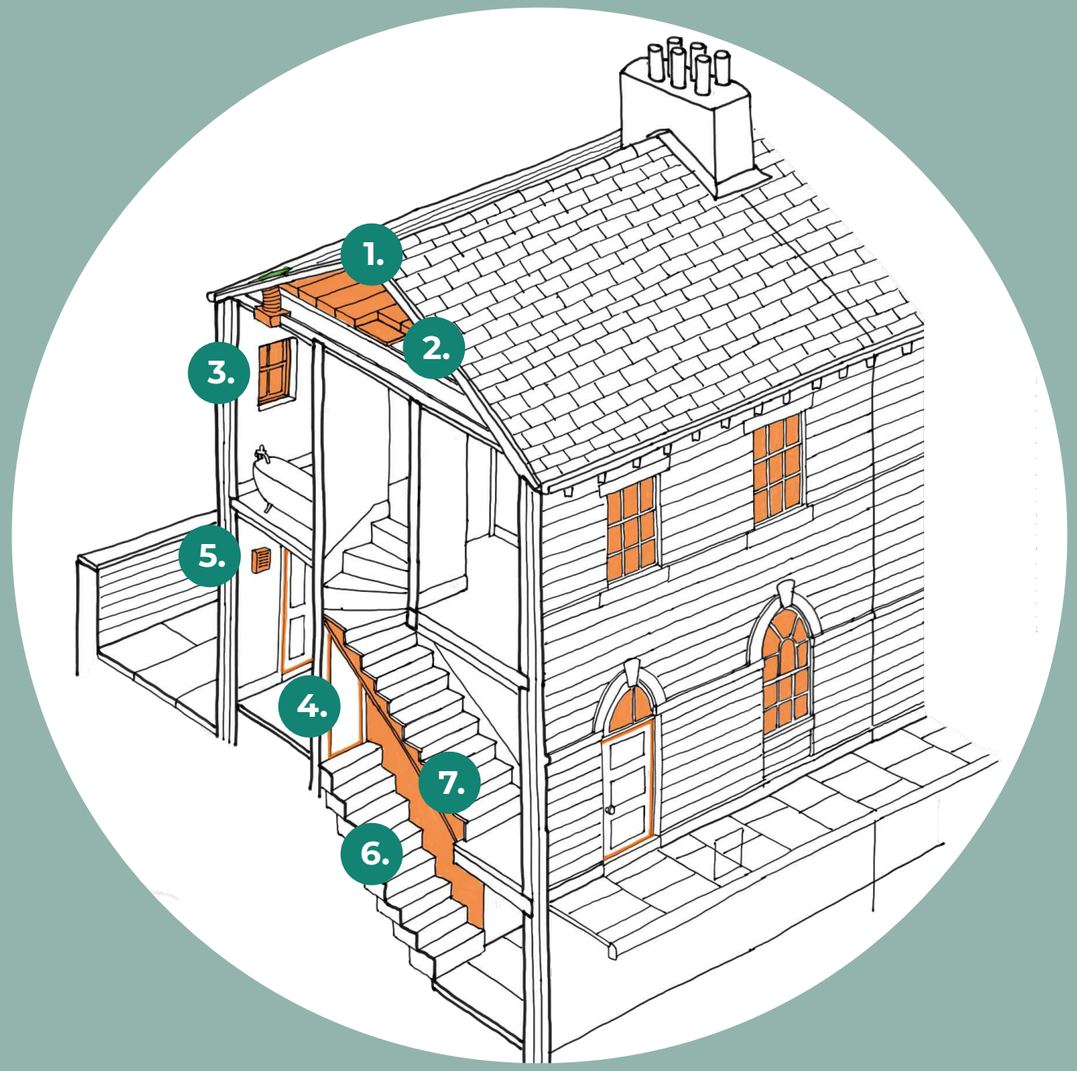
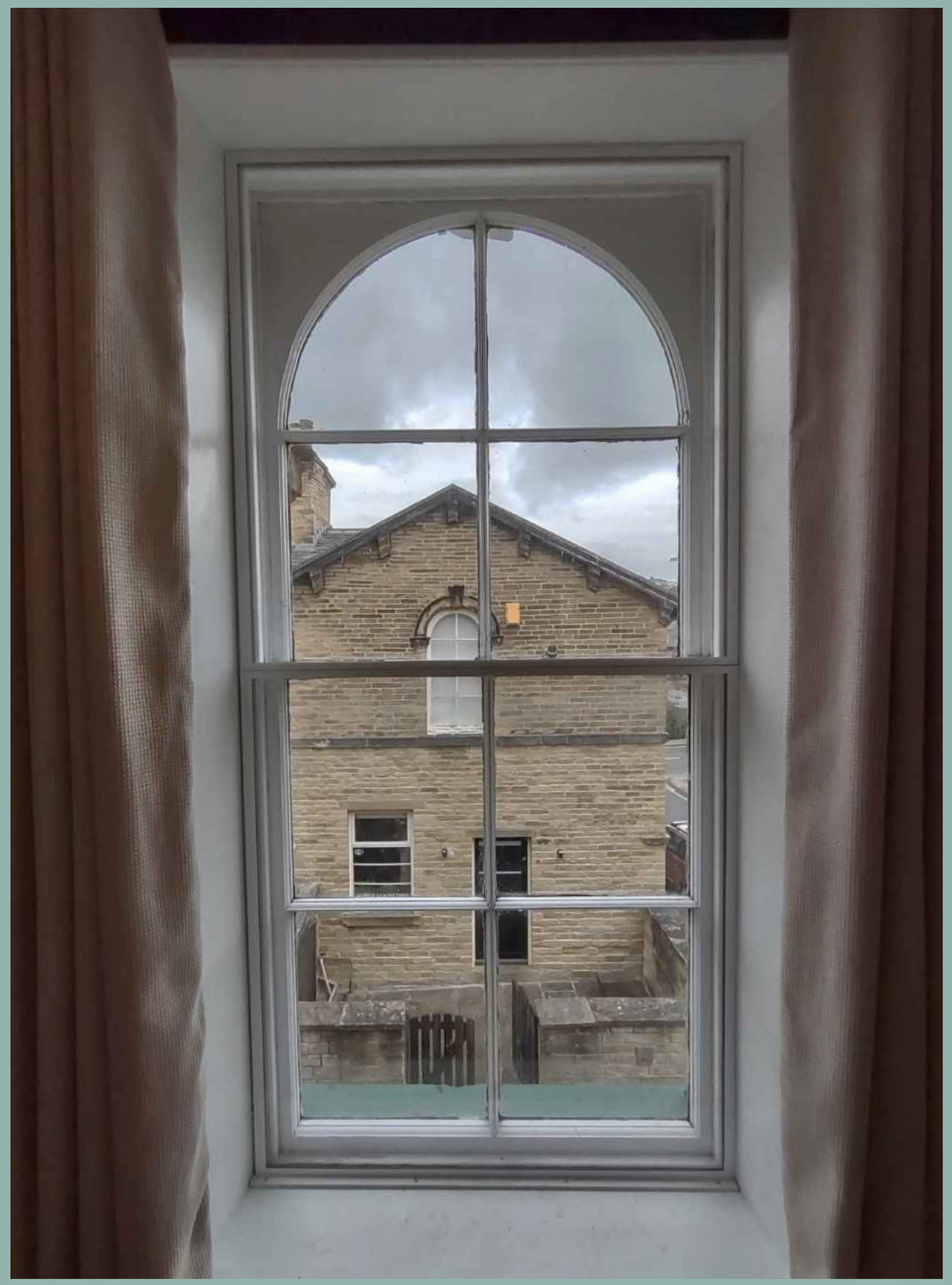
LOW HANGING FRUIT

Low hanging fruit is the term used in the retrofit world for changes that are relatively easy to make at a relatively low budget. Much of the work described can be carried out on a DIY basis. These measures both deliver immediate benefits to energy efficiency and comfort, and are a potential first step that takes into account a long-term plan for energy efficiency improvement. Money spent will not be wasted if further improvements are made in the future.

1. **Top up and improvement of loft insulation**
2. **Loft hatch sealing and insulation**
3. **Basic DIY secondary glazing**
4. **Basic DIY draught proofing**
5. **Continuous extract fans in kitchen and bathrooms**
6. **Wall insulation to the cellar side of the stair wall next to the living area**
7. **Insulation and airtightness work to the underside of the first floor stairs over the cellar area.**





Pre-cut to measure and self applied magnetic secondary glazing reduces heat loss with no condensation on this window since installing.

LOW HANGING FRUIT

Benefits

- An approximate 10% reduction in space heating load.
- Improved ventilation with benefits for indoor air quality and lower humidity.
- Reduced window condensation without the expense of double glazing.

Bright Ideas

The existence of cellar stairs in Saltaire homes allows for an introduction to more extensive retrofit and insulation techniques while avoiding impact on the main living spaces. We think the cellar stair areas can be a testing and training area for both residents and trades who are new to some of the techniques and materials.

Heritage

Of the measures described only installation of external vents for extract fans would require listed building consent to confirm their type, colour and location. If suitable vents already exist installing a different type of fan would not need consent. The low cost secondary glazing described protects original windows by preventing condensation rotting the timbers.

Find out more

For more information about these measures, refer to ‘Scenario 1: Simple Improvements’ in the ‘Home Retrofit Scenarios’ and ‘Appendix A Scenario 1’ for construction and specification details.

CLIMBING TO HIGHER BRANCHES

We think it is perfectly feasible for Saltaire houses to have energy use and living conditions like those built in the 21st century with no negative impact on their character. In some cases, this work could be done all at once but for the majority we think a reset is needed in what is considered normal when any work is carried out. In this case the benefits are achieved incrementally by one owner or multiple owners over many years.

1. **Replace existing plaster with lime based insulating plaster including below floorboards.**

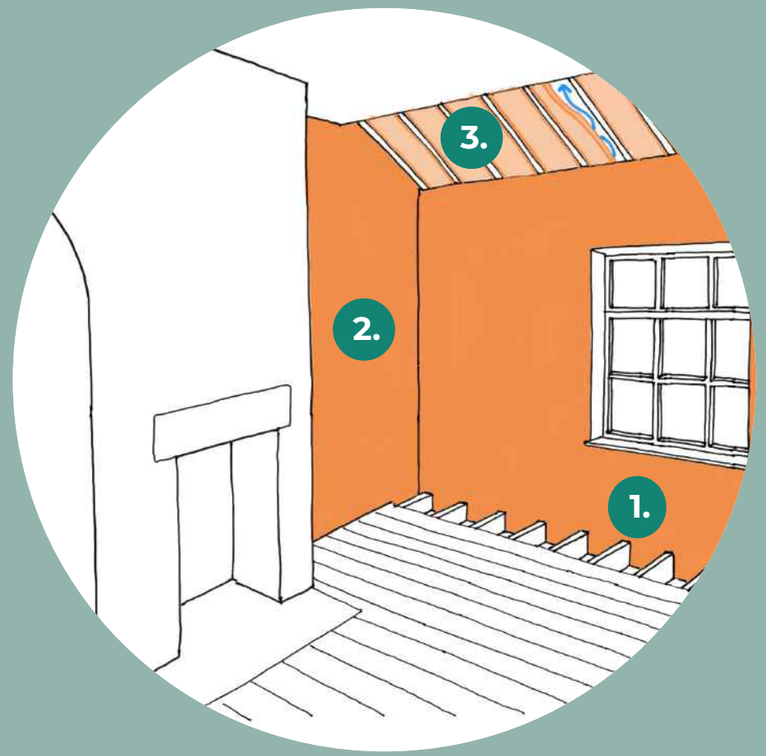
2. **Continue insulating plaster onto the party walls to avoid cold areas and improve acoustics.**

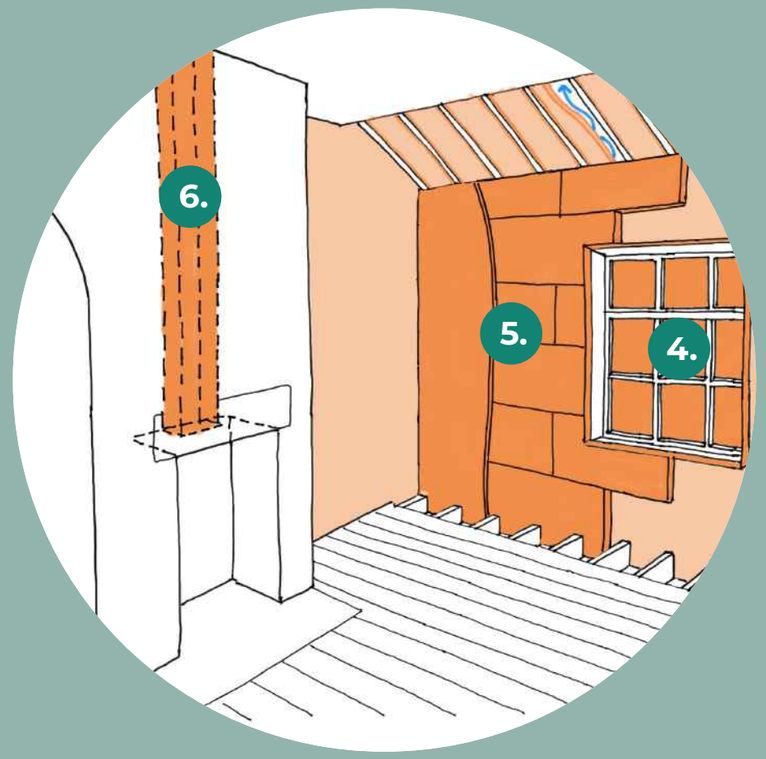
3. **Insulate any areas of sloping ceiling while maintaining an air gap between the rafters.**

4. **Improve windows and doors as much as is feasible within existing restrictions including good detailing connecting to the wall insulation.**

5. **Add up to 60mm of 'breathable' wood fibre or similar insulation over the base plaster coat.**

6. **Permanently deal with heat loss and damp through chimneys by capping and filling them.**





Stripped back Saltaire bedrooms with original partition wall ready for internal insulation.

CLIMBING TO HIGHER BRANCHES

Benefits

- Reduction in heating load of up to 55% depending on the extent of the work.
- These changes show how to make a Saltaire home perform like a 21st century home while also protecting the historic fabric and unique character.

Bright Ideas

Breaking down the amount of work that needs to be done will make it more feasible while living in your home.

We think a room by room approach is well suited to Saltaire and a reset is needed in how general maintenance and decoration work is done so that improved insulation, draught proofing and airtightness becomes the new normal when working on any room.

Heritage

The vast majority of the work described is internal however we would recommend checking with the council conservation team if any consents are required.

The insulation products and thickness suggested are informed by modelling that minimises the risk of damage to the structure through damp and condensation.

Find out more

For more information about these measures, refer to ‘Scenarios 2-3’ in the ‘Home Retrofit Scenarios’ and ‘Appendix A Scenarios 2-3’ for construction and specification details.

THE IMPORTANCE OF FRESH AIR

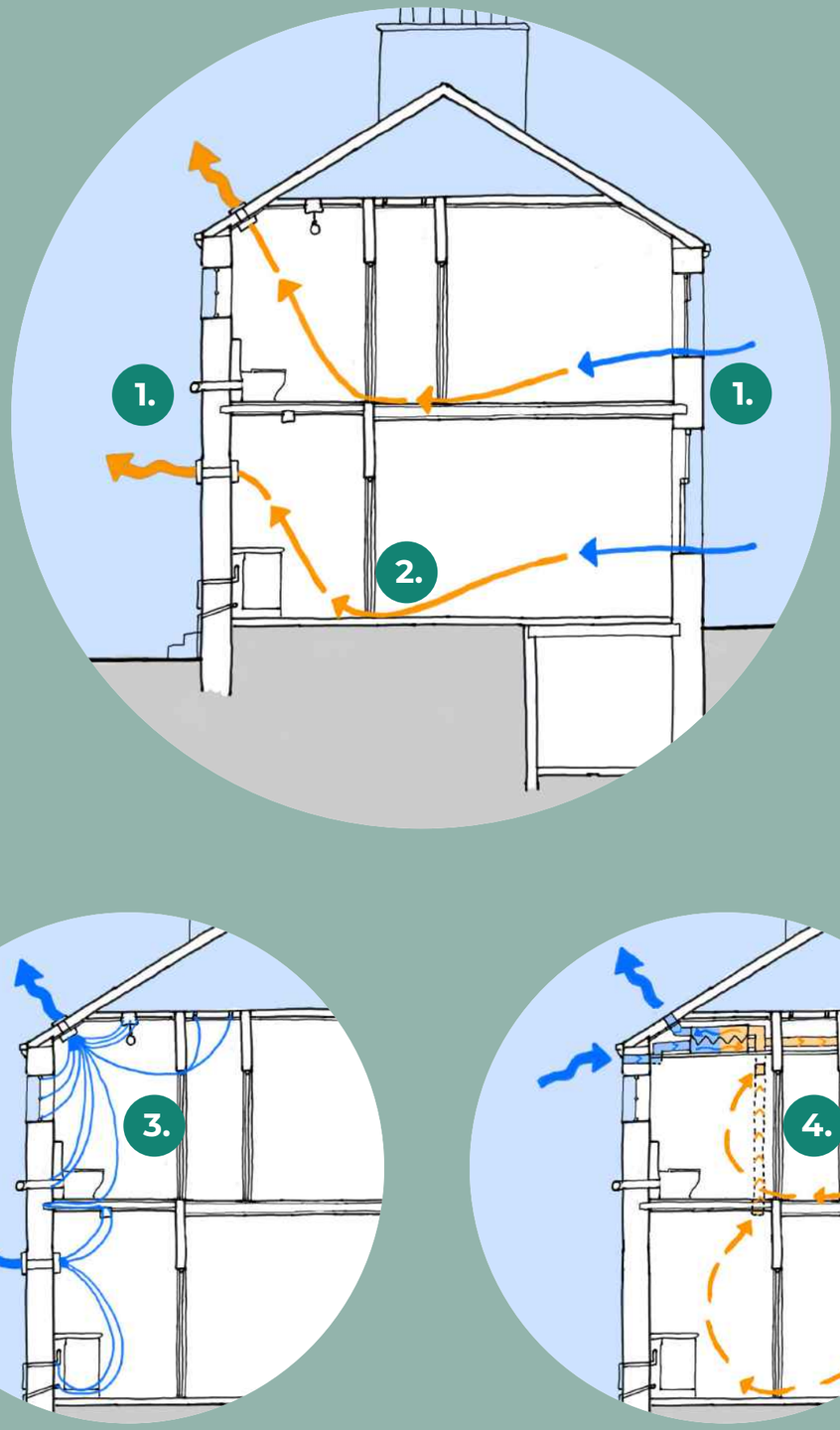
Many Saltaire houses are draughty and much of the work described aims to reduce this. It can seem illogical to seal a house then try to better ventilate it but a draughty house is not the same as a well-ventilated one – the right amount of air needs to get to the right places regardless of if it is a windy day.

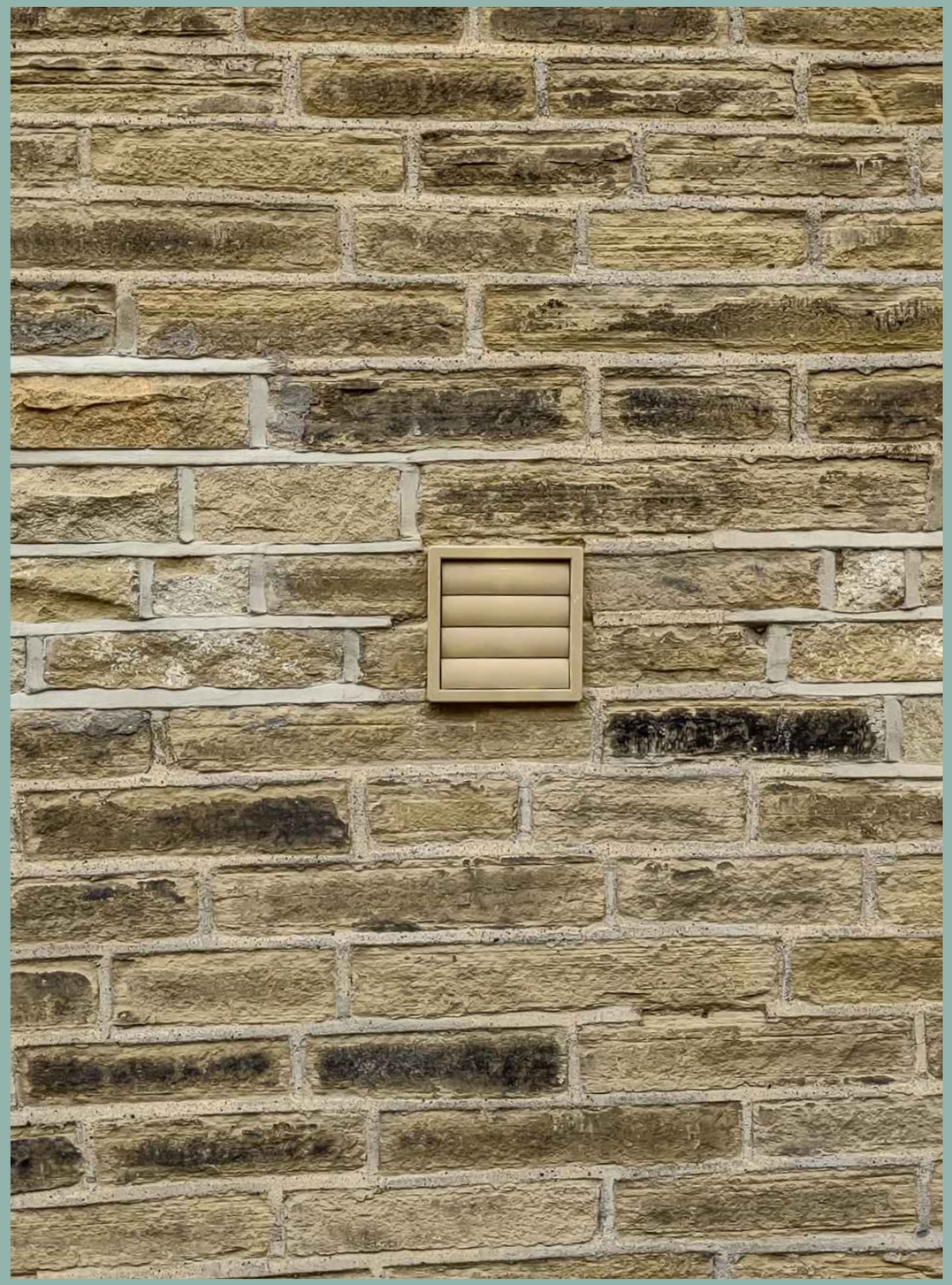
1. **Saltaire houses can be well ventilated with two quiet, low energy, continuously running extract fans located in the kitchen and bathroom. These can draw air through the house from very slightly open front windows.**

2. **For this simple approach to work air paths are needed to allow the air to circulate properly through the house. The main way of achieving this is to have a gap under all the internal doors**

3. **If the kinds of gaps to the outside that were revealed during our home energy house party are not properly sealed the fans will draw air from whichever of these are closest. This prevents them from properly ventilating the house.**

4. **We think there is potential for more complex ducted ventilation systems in Saltaire houses including those that recover heat from internal air. This would give the best air quality by controlling both the intake and extract. These systems still require steps 2&3 to work well.**





Two small vents to the rear can give good ventilation for a Saltaire house if the right types of fan are used.

THE IMPORTANCE OF FRESH AIR

Benefits

A properly considered ventilation strategy will mean that fresh air gets to all rooms all of the time. Excess humidity that causes condensation and mould, carbon dioxide from breathing and other contaminants from cooking etc. will be removed.

Bright Ideas

Many Saltaire houses already have extract fans in the kitchen and bathroom. Replacing these with a continuously running type will improve ventilation without needing any new openings in the outside walls.

A different approach would be to use a ducted system to make sure that both the intake and extract points are properly designed. This would need careful consideration but does have the advantage of letting all the grilles be located on the less prominent rear of the houses while still supplying air to the front rooms.

Heritage

New openings for extractor fans will require listed building consent. Most Saltaire kitchens are to the rear of the house and wall mounted grilles in heritage sensitive colours can be used, for bathrooms and upper floors ventilation slates are a discreet option that avoids new holes in the stonework.

Find out more

For more information about ventilation, refer to the 'Home Retrofit Scenarios' section 4.5 and 'Appendix A'. Scenario 1 uses a simple system, scenarios 4 and 5 show more complex ducted heat recovery systems, these would need to be worked through with a specialist supplier.

DECARBONISING HEAT

We are working on the assumption that the source of heat for most UK houses will change from gas to electricity over the coming decades. The most energy efficient way of turning this electricity into heat is currently heat pumps (air or ground source). How this kind of technology could be sensitively integrated into Saltaire is unclear, but steps can be taken to get ready regardless of what form it finally takes.

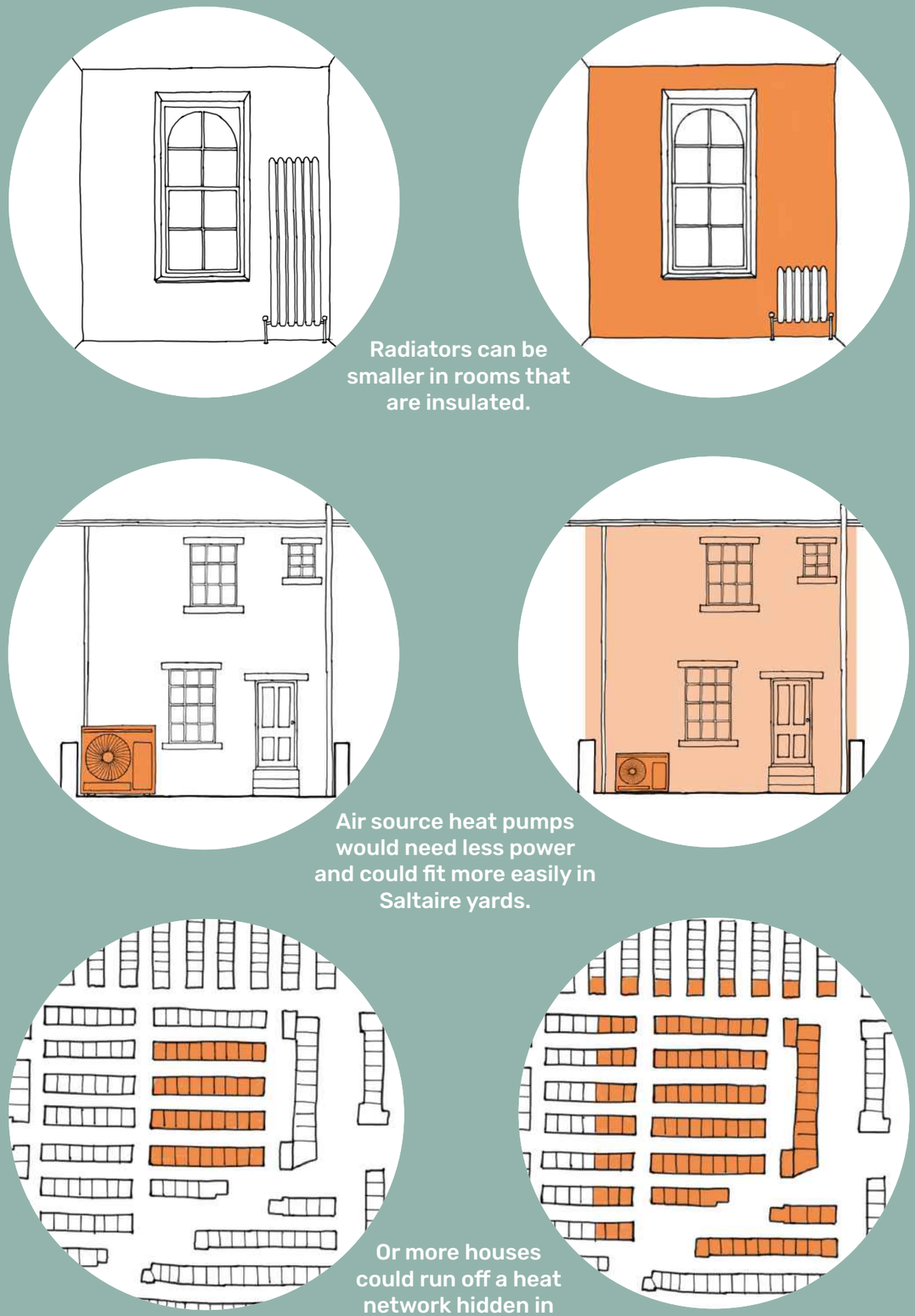
1. **A water filled central heating system is considered the most efficient way of heating these houses and maintaining a good quality environment.**

2. **We don't think electric radiators make sense from a cost perspective in these houses. They are easier to install but are much less efficient than a heat pump and most Saltaire houses already have wet central heating.**

3. **Radiant panels or even electric blankets may have some benefits but we think it is better and healthier to heat all of the house properly to ensure air quality, damp and mould are also dealt with.**

4. **To be ready for a heat pump the heating system needs to work at a lower temperature. We recommend considering this when buying radiators which will need to be larger or have more panels.**

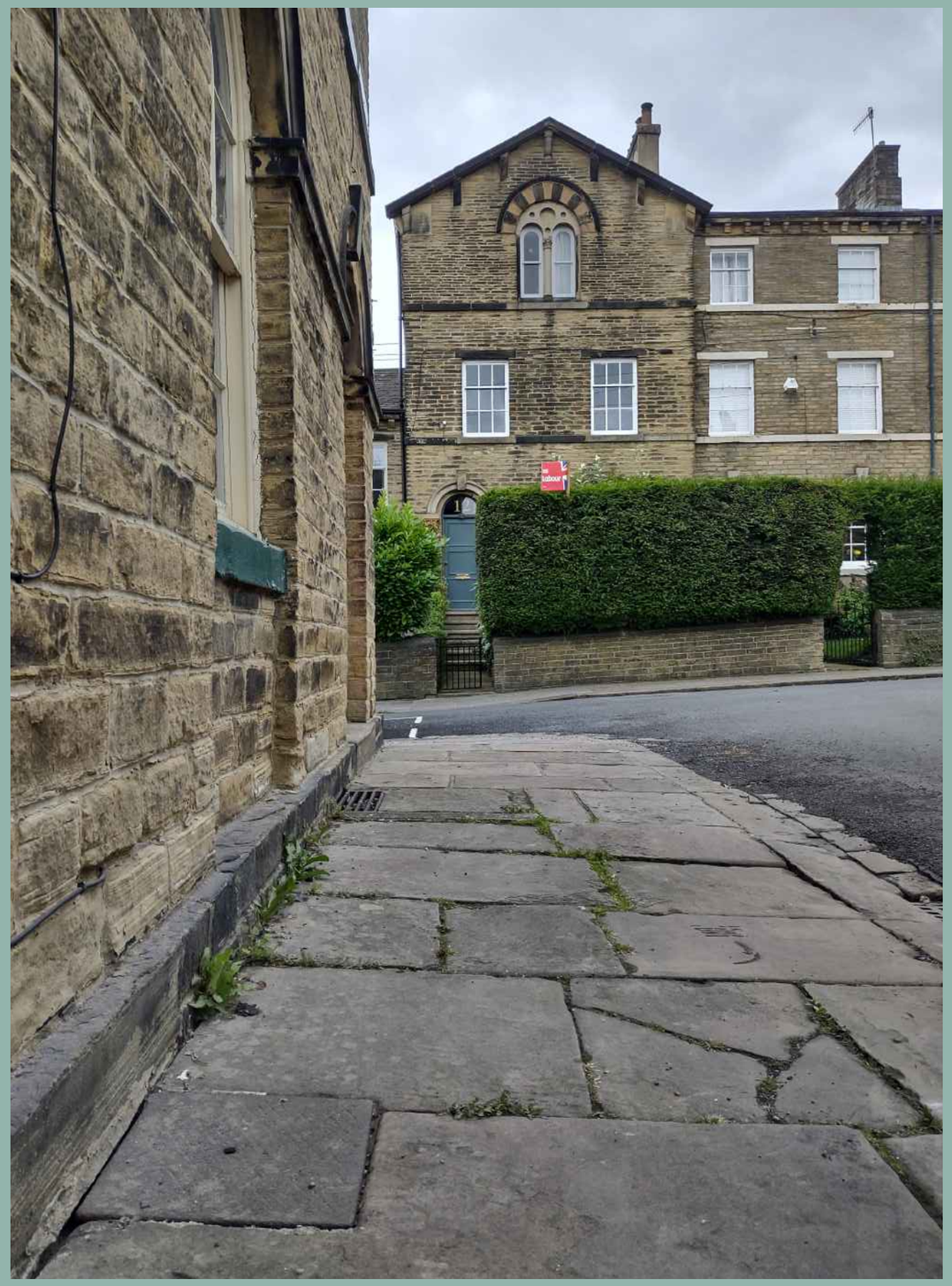
The advantage of a 'fabric first' approach to retrofit is that this stage of the work will require less or smaller equipment as insulated houses will need less energy. **This means that...**



Radiators can be smaller in rooms that are insulated.

Air source heat pumps would need less power and could fit more easily in Saltaire yards.

Or more houses could run off a heat network hidden in the ground.



Victorian coal chute on Jane Street... could cellars help provide for the future of Saltaire heating?

DECARBONISING HEAT

Benefits

Being able to run the heating system at a lower water temperature allows condensing gas boilers to operate more efficiently.

Taking the steps described so far will leave the houses more ready for future heating technology, reducing the size and cost of these systems.

Bright Ideas

By insulating rooms first it may be feasible to run the current heating system and radiators at a lower temperature saving on the expense of upgrading.

Air source heat pumps might not be the best option for the small closely spaced yards of Saltaire while installing district heating could be disruptive to the streetscape. Could the linked cellars of the terraces provide an alternative location to run water pipes for a communal ground source heating system?

Heritage

How the decarbonisation of heating and power is integrated into Saltaire will require a great deal of consideration to ensure it is done in a way that is sensitive to the unique character.

By adopting a ‘fabric first’ approach - fixing faults - insulating - improving airtightness - preparing the heating system, the size and heritage impacts of new heating technology will be reduced making it easier to integrate in a sensitive way.

Find out more

For more information about decarbonising heat, refer to the ‘Home Retrofit Scenarios’ document section 2.2, which includes information on peak heat loads and what this means for the power and size of heat pump systems

CHAPTER 04

HOW TO DO THIS WORK IN SALTAIRE

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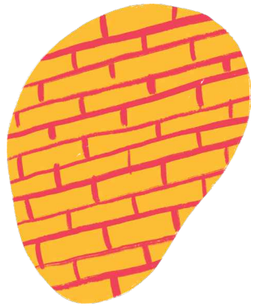
Saltaire room with internal insulation applied to the outside wall and chimney breast.

WALLS



Where to insulate?

On the inside. Being a listed building with no wall cavity makes some decisions easier!

How much insulation?

You can use a range of insulation thicknesses from 25mm to 80mm thick:

- 25mm provides an alternative for when general plastering work is carried out or if more insulation is not achievable spatially.
- Above 80mm the risk of the external walls becoming too cold increases. This is a potential cause of damp and damage to the structure.

For more information refer to the 'Home Retrofit Scenarios, Appendix A'. Scenarios 1-3 for internal wall insulation specifications.

What type of insulation?

The term 'breathable' is used a lot to describe materials that are suitable for solid stone walled buildings, a more technically correct term is vapour open. These materials allow moisture to move through the wall rather than trying to block it.

A combination of lime and cork based insulating plaster and wood fibre board is a common type that meets this requirement although cork board is an alternative.

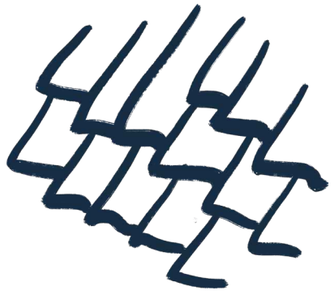
In practice we have found that using boards rather than wet plaster for thicker insulation gives advantages in reliably estimating quantity and speed of installation.

All systems described are stuck directly to the wall with an even coat of vapour open adhesive with no framing or 'dot and dab' which creates an air void. This is both more efficient space wise and avoids creating an unintended cold space in the wall where moisture can condense, and cold air circulate.

Step by step

1. The walls to which insulation is being applied should be in good condition externally and free from penetrating damp caused by damaged gutters or downpipes.
2. If insulation thicker than the current plaster coat is being applied the window reveal and sill should be extended, these new extended reveals can be insulated with thin high performance foam.
3. Some thought to location of heavy fixtures and fittings is needed. If possible, avoiding excessive radiators and sockets on the externals walls makes the work simpler. Mounting timbers and high-density foam pads can be provided for before plastering.
4. A complete 'parge' coat of plaster is applied, this is essential for airtightness and should extend below the floorboards. This plaster can be either insulating type or standard lime plaster if more insulation is being added over the top.
5. Airtightness tape is applied around all the joists, window reveals and at junctions with stud walls and ceilings
6. Further insulation can then be applied. In this case expanded cork is being used, wood fibre is a popular alternative. This can then receive a final coat of lime plaster.
7. We suggest using vapour open paint such as clay paint as a finish.

LOFT AND ROOF



Where to insulate?

Above the ceiling as the loft spaces in Saltaire are generally not suitable for creating living space.

Insulating will create a 'cold roof' space that needs to be ventilated and we think any roof repair or replacement work in Saltaire needs to consider this with ventilation slates and low resistance membranes.

How much insulation?

A (~100mm) layer between the joists and a thicker (200mm+) layer over is easily achievable. We think laying it evenly and getting the details right at tight spots is as important as getting greater thickness.

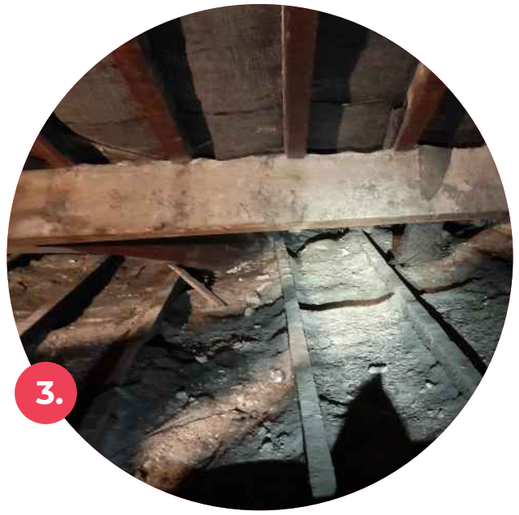
For more information refer to the 'Home Retrofit Scenarios, Appendix A'. Scenarios 1-3 for loft insulation options and specifications.

What type of insulation?

Standard mineral wool is fine. Natural products such as wool or hemp have wider sustainability benefits and we have used them successfully but greater care is needed with cleaning the space to avoid the risk of infestation. Some insulation types have a greater mass which can help avoid overheating in summer and give acoustic benefits, more research could be done on this in Saltaire.

The 'Home Retrofit Scenarios' describe the use of membranes to enhance the performance of loft insulation. A vapour control layer can be laid below (to stop moisture condensing in the loft) and a breather membrane above (to stop heat loss by air movement through the insulation). It is very important to use the right type of membrane in the right place!

When working on rooms with areas of sloping ceiling, foam board or natural insulation board can be added between and over the joists. It is important to maintain some air gap above the insulation.



3.

4.

Step by step

1. All the following assumes work is done from above. If the ceiling is in poor condition it might be easier to take it down and replace with new vapour control membrane and plasterboard. This will be very messy but quicker than cleaning from above.
2. Access and safety is an important part of this work. Most Saltaire loft hatches need to be bigger and making them wider without cutting into any of the ceiling joists is a way to do this. The new hatch can be both better sealed and insulated. Getting the right ladder is also important - a high step ladder can work well.
3. Cleaning the loft can be a big job. We have used a vacuum located in the loft (bigger hatch helps) and bagged the soot up there. An alternative is to board over the entire loft to give a flat clean base for laying insulation.
4. Laying insulation and membranes is relatively straight forward compared to the previous steps. At tight spots we used a pole to push insulation in while maintaining an air gap. Try to get at least one layer of insulation to reach either the wall or the point where sloping ceilings start in the rooms below to avoid a gap where condensation can form.
5. Any area of sloping ceiling will generally need to be insulated from below and this work may be best combined with insulating the walls. Re-roofing also gives an opportunity to add insulation.

FLOORS AND STAIRS

Where to insulate?

Insulation and airtightness work to the underside of stairs over the cellar is a relatively easy win.

Ground floors in Saltaire are much more tricky. Insulating the cellar ceiling may have some benefits but it is impossible to do all the details to best practice. In some cases we have managed to add a thin layer of foam between stone slabs and the floor finish as part of floor levelling work.

How much?

Anything that fits! The benefits in terms of heat loss are relatively small but comfort underfoot can be greatly improved by even a 10mm layer.

For more information refer to the 'Home Retrofit Scenarios' Appendix A'. Scenario 1 for the cellar stair and scenario 3 for the ground floor.

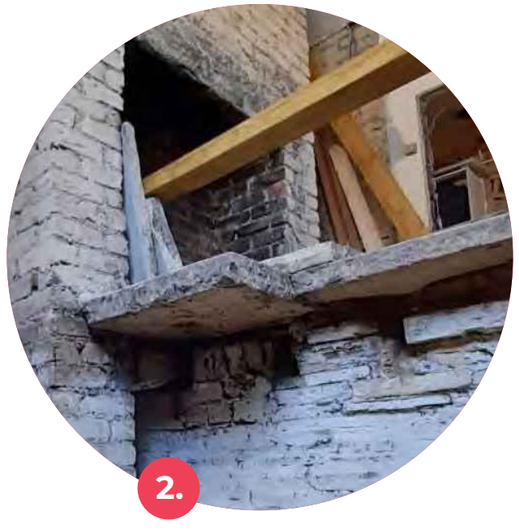
What type?

Saltaire stone floors are a protected feature and the amount of depth available over them (if any) will be limited. There is also a risk that adding membranes and insulation forces any moisture from damp floors and cellars into the walls.

Any foam boarding used should be higher load rating type designed for floors and membranes should be heavy duty.

Adding insulation at the edges (which we have often observed to be lower) and trying to trap heat in the middle of the floor is a potential strategy. We think this area has potential for further research into how a terrace of houses could work together.

The underside of stairs can be treated as an upside down loft! Vapour control layer against the stair, tightly fitted insulation boards then an option of an additional breathable membrane to the underside.



Some practical tips

1. Floors are not a big contributor to heat loss in Saltaire homes (around 10% in our base case). So we suggest keeping things in perspective given the challenges.
2. Strip floors back to stone slabs (or otherwise) when the opportunity arises. Many Saltaire floors have 20th century levelling layers applied over them. This will reveal any opportunities to add thin insulation and membranes before reapplying finishes or you may just like the look of the slabs!
3. We are aware that some Saltaire houses have areas of suspended timber floor without slabs. These are much more draughty and we strongly recommend using a well sealed vapour control membrane if doing any work under them.
4. Stairs over cellars should be stripped back before insulating to reveal the underside of the treads and risers.
5. Insulation can also be added to the wall against the living room in the same way as described in the walls section.
6. The underside of stairs are a good test place for robust retrofit detailing! Try drawing a section through what you see. You are trying to get a complete airtightness layer - then insulation with no gaps between the warm and cold spaces. In this case both the stair structure and the wall to the living room are 'warm'.

WINDOWS AND DOORS

What?

This will depend on budget and any heritage restrictions on a particular house.

We have found the basic DIY secondary glazing in the 'low hanging fruit' measures works well in some rooms but needs very careful measuring. More expensive systems will perform better and some allow opening.

We think a window by window approach is good. Do you open it often, seasonally, never? Is keeping a full depth sill important for ornaments? Could you ever need to escape through the window during a fire?

For more information refer to the 'Home Retrofit Scenarios, Appendix A'. Scenario 1 uses basic secondary glazing, scenario 3 shows double glazing.

'Performance' vs Details

Better windows and doors improve both heat loss through the materials (known as U value) but also improve airtightness. All our retrofit scenarios put figures on the former but this can be undermined by not paying attention to details that give airtightness.

We also know that Saltaire windows and doors are very expensive but not thinking about quality of timber and how water drains away from vulnerable areas can make them a poor investment.

We think that more attention needs to be given to quality of materials and detailing of Saltaire windows and doors including how they interface with the walls and any wall insulation that is added. This approach is needed to allow them to be properly integrated into long term plans for both each window, each house and Saltaire as a whole. Some form of government support is likely to be needed for this to happen!

Some practical tips

Have a long term plan for the windows possibly including the following.

- What is the current condition of each window? We are aware that it is hard to get impartial advice on this and suggest asking several different suppliers, and observing them actually testing the soundness of the wood before recommending replacement.
- Are any windows in non-original style? These could be replaced with double glazing.
- What sort of secondary glazing would work best on the others depending on how they are used?

We think that the internal reveals and sills of Saltaire windows are one area that needs to be considered more when work is done to windows. These act as the link between any internal wall insulation and the window itself.

1. Most of the side reveals we have seen have an air gap between the opening in the stone wall and the timber reveal, insulation can be easily added here. Sills and top reveals often have less space and only the very thinnest insulation such as aerogel will fit.
2. If insulating plaster is then added to the walls this can connect with the window reveal insulation to avoid cold areas.
3. Use airtightness tape to seal the wall to the window. Some types of this tape have a felt backing that can be plastered over.

VENTILATION

What types of system?

Small ventilation grilles located at low level and to the rear of the houses are most likely to be acceptable from a conservation perspective. For first floor rooms ventilation slates that avoid new holes in the wall are preferable.

How the whole house can be well ventilated with a minimal number of these grilles is something we only have a partial answer to.

In our simple 'low hanging fruit' scenario two constant running fans at the rear ventilate the whole house but this relies on slightly open front windows which might not be suitable for all rooms.

For more information refer to 'Home Retrofit Scenarios, Appendix A'. Scenario 1 for a simple system, scenarios 4-5 for MVHR.

For the more complex ducted MVHR (mechanical ventilation with heat recovery) systems specific types of external grille are required and duct routes within the house need to be coordinated. We are investigating how all this might work.

For any of these systems to work well all airflow in the house needs to be controlled, and this requires both airtightness and airflow to be considered whenever any work is done.

Limitations of other types

Positive Input Ventilation (PIV) systems draw air in through the loft then assume it exits via each room, ventilating the whole house. In reality it is unlikely that fresh air will reach all areas, Saltaire lofts are often dirty and badly ventilated so not a great place to get fresh air from and filters will need regular checking. Forcing warm damp internal air into all the gaps in the outside walls can also cause problems.

Some practical tips

Behaviour (like drying clothes indoors) does contribute towards condensation and poor indoor air quality but we think Saltaire houses can be made to work harder to mitigate this.

1. Whenever any work is done on the house think about how it contributes to the ventilation strategy.
2. Running plaster below the floor boards and sealing around any pipes running through external walls will stop air being drawn into the house from these hidden areas which are probably in the wrong place to give good ventilation.
3. Ensure external doors, the cellar door, loft hatch and fireplaces are well sealed.
4. Internal doors should have a ~1cm gap under them to allow air to flow between rooms.

Taking the above steps will mean that whatever ventilation strategy you choose will be more effective.

- With simple continuously running fans in the wet rooms air will be extracted from these and drawn through the house from considered places in each room. At the most basic this means the letter box and slightly opened windows.
- More complex ducted ventilation systems also rely on air being able to move between rooms. Gaps under internal doors are a feature of passive house design for this reason.

CHAPTER 05

NEXT STEPS

SALTAIRE
RETROFIT
REIMAGINED

NEXT STEPS

We have developed the Saltaire Retrofit Reimagined project as a pilot and demonstrator of how the home retrofit agenda can be better integrated with communities. This document is part of a suite of information that shows Saltaire homeowners what best practice information looks like for their homes. Does it replace the need to consider houses individually? We don't think so, but it does give a useful reference for how many common issues could be dealt with.

One aim of the project has been to address issues of trust in home retrofit. There are a lot of home insulation nightmare stories out there, sometimes due to the wrong information being used but the commercial interests of installers are also a big problem. All the advice here is impartial, the team has no agenda beyond giving the best advice that is available. We are also locally based, have done some of this work on our own homes, have seen the benefits and understand the problems and barriers encountered.

Another question is can this information be part of a monitoring, evaluation and quality assurance process for government backed (loan or grant) work? This is not in our control but we welcome any feedback from relevant authorities.

In terms of specific next steps there are numerous technical studies that we don't fully have an answer to and we are seeking further funding to consider some of these points.

- How can adequate ventilation be provided to insulated Saltaire lofts?
- If a simple ventilation system is used how can trickle vents or similar be provided on the front of the houses?
- How can more complex ducted MVHR ventilation systems be sensitively integrated both externally and internally?
- Whether double or single glazed, what does a 'best practice' Saltaire window that will last for decades and consider all the details and interfaces look like?
- What can be done about the overheating of Saltaire homes in summer?
- What technologies will de-carbonised home heating use in Saltaire?

A question we came across during our engagement is who can do this work? It is beyond our resources to fully answer this, but we are also seeking further funding to arrange workshops for some key skills.

Follow us **@saltaire_retrofit_reimagined** or request to join the mailing list **info@above-ground.co.uk** to stay informed.

CHAPTER 06

NOTES FOR POTENTIAL FUNDERS

SALTAIRE
RETROFIT
REIMAGINED

NOTES FOR POTENTIAL FUNDERS

Separate to the funding of the project itself we think there is potential for projects like this to connect with grant or loan schemes that support homeowners in carrying out the work. This kind of funding often lands in communities without the necessary context specific guidance, leading to problems both in defining what is technically the correct approach, but also with resident trust of the process and potential benefits.
We are happy to receive feedback from providers of this support and to present our thinking around potential models. A few points relating to funding of the work that have emerged during the project are below.

- **The most appropriate work for support might not be the most obvious.** The accessing, cleaning and ventilating of Saltaire lofts is far more specialised work than laying insulation, but it is essential in order for insulation to be done to best practice. How could this kind of work be supported?
- **Low hanging fruit that gives a taste for higher...** We have identified insulation and airtightness work to the cellar stair areas of these houses as an area that could allow for skills, understanding and trust to be developed at relatively low risk and disruption. How could this work be carried out at scale in Saltaire?
- **The most appropriate products might not be certified.** Our condensation risk analysis shows that vapour open products better meet the requirements of these buildings. Often these products do not have the correct certification to be eligible for support. How could this be addressed?
- **How similar do houses need to be for area wide guidance to be used for quality assurance and verification of built work?** About one third of Saltaire homes are very similar to our typical house and details and construction are shared with the remainder. Is there a middle ground between individual house assessment and generic guidance?
- **Who can do the work?** We don't think there is any technical, aesthetic or aspirational conflict in getting this work done on heritage properties in Saltaire. The issues are funding to get the work done in the best way and finding people to do it. How can a locally integrated supply chain be developed and connected to funding for the work?
- **Making retrofit fun and accessible.** Community led initiatives such as 'house party' type events or similar practical workshops in local venues could support peer to peer learning and skills development, a loft hatch workshop would be one potential example. How could these events be funded and connected to mainstream initiatives?

To discuss this and related projects please contact **info@above-ground.co.uk**

PROJECT TEAM

This project has been brought to you by:

- **Above Ground**
- **Street Space**
- **People Powered Retrofit**
- **Waxwing Energy**

It has been funded by the **Footwork Trust** and **UK Shared Prosperity Funding Cost of Living Support** received via **Bradford Council Shipley Area Committee**.

Thank you to the following organisations who have also supported the project:

- **Shipley Ward Councillors**
- **Shipley Town Council**
- **Bradford Council Department of Place**
- **Saltaire World Heritage Site Steering Group**
- **Bradford Civic Society**
- **Saltaire Village Society**
- **Saltaire History Club**
- **Saltaire Collections**
- **Ecological Building Systems**
- **Civic Square**

Local designers and makers

- Graphics by **Ben Holden**
- Custom engagement stand by **James Whittam**
- Engagement and house party photos credit **Alex Fisher**

footwork People P&P Place Fund

Funded by UK Government

ABOVE GROUND

Designers and practical problem solvers based in Bradford. Architect Andrew Gardner set up Above Ground to explore how infrastructure and public funding can better integrate with the communities that it serves.

Saltaire Retrofit Reimagined project lead and initiator. Local knowledge and technical / heritage expertise, project management and assembly of project team and stakeholders.

STREET SPACE

Street Space is a social enterprise working with people to reimagine their streets & spaces to make them feel safer, bring joy and social connection.

Project engagement strategy and support for events and pop-ups.

PEOPLE POWERED RETROFIT

Retrofit One Stop Shop providers who's work covers everything from the details of individual house plans to community wide projects and helping to shape retrofit policy.

Technical modelling of different home retrofit scenarios that support this handbook. Project advice and delivery of the home energy house party event.

waxwing energy

Expert in low energy domestic refurbishment assessment, consultancy and implementation.

Provision of specialist airtightness fan services and thermal imagery at the home energy event.

ABOVE GROUND

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