

# Net Zero Programme: Retrofit of Heritage Buildings

*Published on 21 July 2022*

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# Net Zero Programme: Retrofit of Heritage Buildings

As part of the Net Zero programme, this resource explores key retrofit interventions for heritage buildings and builds an understanding of:

1. Retrofitting heritage buildings as a way to reach Net Zero across existing housing stock
2. Before you retrofit, what you need to consider
3. Methods of retrofitting your building
4. Common pitfalls to consider when approaching heritage projects

## 1. Retrofitting heritage buildings: as a way to reach Net Zero across existing housing stock

The construction and building sectors are responsible for a noted proportion of the total global carbon emissions. In order for the UK to reach Net Zero by 2050, the sector will play a prominent role in reducing carbon generation – and retrofitting buildings (in this case, heritage buildings) is key to this. There are a number of actions that can achieve this in terms of operation, building materials and products. However, more immediate outcomes can be achieved through improving the energy efficiency of our buildings. This can include improved insulation, glazing and controls, as well as a shift from gas heating to low carbon heat supply. In respect of energy supply, the [UKGBC Net Zero Whole Life Carbon Roadmap](#) suggests that in order to meet our national commitments, no new boilers should be installed after 2030 and 80% of homes should have heat pumps by 2040.

### Why do we need to retrofit heritage buildings to meet Net Zero targets?

Recent targets include achieving Net Zero by 2050 and a 78% Greenhouse Gas reduction by 2035. The act of retrofitting heritage buildings is key to meeting these targets.

*But what is the impact of heritage buildings on the UK property sector?*

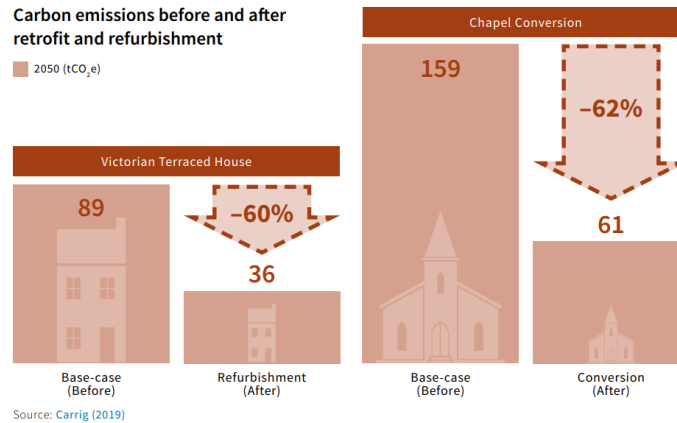
- Overall, the entire building stock in the UK contributes almost a fifth (17%) of the country's carbon emissions.
- In relation to heritage buildings, the UK has the oldest housing stock in Europe, with 38% of England's homes dating back pre-1946 and 21% pre-1919.
- Homes are the most significant contributor to building emissions.
- 142,000 businesses operate in listed buildings in England, which is an 18% increase since 2012.
- There are around 370k listed buildings in England.

These figures highlight the substantial presence heritage buildings have in the UK property market. By retrofitting these buildings in the most energy and carbon-efficient way, we can see a corresponding positive impact in lowering the carbon emissions of the UK housing stock as a whole.

Because we have a huge share of historic buildings, it is important to understand the necessity of planning when this work can commence. We recommend integrating these Net Zero considerations into renovation plans, which will save on both time and overall project costs.

Although towns might face a challenge when retrofitting their heritage buildings to reduce carbon emissions for example, typically, with heritage buildings, there is a lower starting point in terms of energy efficiency of historic buildings. There are still significant improvements you can make and important carbon-saving opportunities for a historic property. **From energy efficiency measures alone, such as insulation and glazing, you can create 60% emissions savings –** without even changing heat supply.

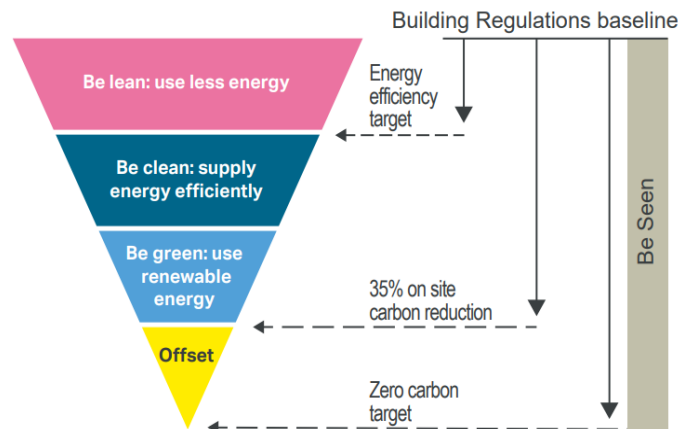
The key is to strike the balance between conservation and change.



Source: Carrig (2019)  
 Figure 1 [Benefits of retrofitting heritage buildings](#). (Historic England, 2019)

## Understanding the design process to retrofit heritage buildings

There are a set of rules to guide the design process, set out by the London Plan 2021. If you follow these steps, you will have a greater chance of achieving higher overall carbon reductions. Our '[Accelerating Net Zero building retrofit](#)' blog explains this in more detail.



Source: Greater London Authority

Figure 2 [Energy hierarchy and associated targets](#). (Greater London Authority, March 2021)

## 2. Before you retrofit, what you need to consider:

### Consideration of legal protection of heritage buildings

Before the retrofitting of your project commences, it's important to take into account that heritage projects take time to both develop and deliver. Technology is developing in response to that, but each project must be approached as its own unique set of circumstances and cannot apply a one-size-fits-all approach. For example, there are different materials involved, as well as different performance conditions and requirements – and different solutions to upgrade them. The response therefore needs to be specific to the building type, the materials used, the location and the climatic conditions around the building.

Buildings within a curtilage (an area of land attached to a house and forming one enclosure with it) are also considered part of the listed buildings and protected.

Listed buildings are classified into three grades:

- Grade I - Exceptional national, architectural or historical significance. These form 2.5% of UK listed buildings.
- Grade II\* - Particularly interesting to preserve. These form 5.8% of UK listed buildings.
- Grade II - Special interest warranting every effort to preserve them. These are the

overwhelming majority of listed buildings in the UK, comprising over 90% of listed buildings.

The stakeholders to consider when undertaking any consultation for buildings with listed status include:

- Historic England
- National amenity societies
- Victorian society
- Georgian group
- Civic society
- Local historical organisations
- Community groups

### **Importance of considering significance of heritage building**

'Significance' is a key metric of a heritage practice. Demonstrating that you understand the significance of the building that you are applying to change is a legal requirement as part of your listing building consent application. More information on assessing significance can be found via Historic England - [advice on conservation principles](#).

To improve the chances of success in your approach, you should:

- Demonstrate why the impact of the proposed alterations will avoid or minimise harm to listed building – particularly in relation to the parts identified as more significant.
- Focus proposed changes on parts that are less significant. This will make the application less controversial.
- Consider carrying out impact assessment and use this to inform both points above.

### **Importance of considering effects of new work on old buildings**

Try to consider how to keep the building going in its original usage (i.e. not working *against* the building, but working *with* it). You need to understand what the proposed usage is, and whether the building can accommodate these uses.

For example, you need to consider space; flexibility; internal conditions; and fabric performance.

## **3. Methods of retrofitting your building**

Before starting your retrofit project, it is important to understand the condition and performance of the building from an energy perspective.

The following ways to objectively understand how energy works in building are:

- Carrying out surveys.
- Handling measurement.
- Diagnostic measurement.
- Testing and data monitoring.

### **Existing performance of the building**

The following factors *are important to consider* when researching the history of the building, the materials used and the level of carbon emissions. In turn, this provides insight into how much work needs to be done, and what is necessary to ensure carbon emissions are the lowest they can possibly be.

### **Traditional versus modern approaches**

There is a fundamental difference between traditional and modern buildings, so you must ensure you have the correct fabrics to carry work out effectively.

There will be a fundamental shift in the way fabrics will be used in the building (i.e., within wall fabrics and rooms).

I.e. replacing thick porous walls with no insulation with thin walls, impervious and insulated. Or replacing draughtier heating 'system' generally – often fires with open chimneys with airtight spaces with controlled heating and ventilation.

### **Breathability**

It is important to understand how materials are compatible with the old ones. A common issue with old buildings is the movement of moisture, which comes in different forms like rainwater. The moisture that gets absorbed into porous materials, stones and bricks need be controlled.

To avoid this, implement cement-based renders, gypsum plaster or damp proofing. This in turn will inhibit movement of liquid and water vapour.

### **U-value**

This is a measure of the thermal conductivity of the layers that make up an entire building element (such as a roof, wall, or floor). The lower the U-value, the better insulated the building element. It is extremely important as there are certain standards that should be reached according to Building Regulations/Standards.

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There are various ways you can put these methods into action. Here are some considerations to take into account for each method:

### **Wall Insulation**

These measures can make a significant uprating to a properties U-value, though risk seeing the movement of moisture based on incompatibility with the old traditional materials.

### **Insulated Glazing (Double Glazing)**

This is a great way to improve U-value, because it is significantly thicker and better insulated than single-glazing. You will need to ensure that you insulate 'tiny' gaps when changing the structure of these windows (i.e. with aluminium materials). However, you will need more space for framing which may require the property's historic fabrics being removed to achieve this. This will impact the historic provenance of the property and possibly impact the appearance of the property between the original and new materials used.

When undergoing these performance upgrades, try to maintain what you can, as large-scale replacements have substantial carbon impact.

### **Heat Supply**

When it comes to considering heat supply in building, avoid using gas boilers. If available, connect to a district heat network and if not, consider building this for future connectivity. If appropriate, take the opportunity to change heating distribution within the building.

### **On-site renewables**

There is a growing interest in PV panels on heritage buildings, which are possible to install given the right roof structure. However, these must face the right direction and be easily accessible for cleaning.

## **4. Common pitfalls to consider when approaching heritage projects**

## **Carbon savings from heritage buildings: the challenges**

The following points explain the challenges towns might face when retrofitting their heritage building to reduce carbon emissions:

- Typically, with heritage buildings there is a lower starting point in terms of energy efficiency of historic buildings.
- Heritage buildings' unique features make retrofitting technically challenging.
- Through this work, it is important to retain the significance of a building; meaning that it must ensure the original historic bricks and woodwork is set to be preserved, will not be damaged or replaced by modern materials.
- The difficulties in navigating the legal and planning framework for approval to undertake any renovation works to a historic building. It is important to demonstrate that you understand the significance of the building that you are applying to change is a legal requirement as part of your listing building consent application. More information on assessing significance can be found via Historic England - [advice on conservation principles](#).

## **Conclusion**

Retrofitting heritage buildings is both an appropriate and necessary requirement to meet the legislative deadlines over the coming decades, on the path to becoming Net Zero by 2050. By understanding the legal requirements and significance of the building, the materials that can be preserved and the ones that need to be changed, towns can retrofit their heritage buildings in most energy and carbon efficient way. It's important to continue this dialogue and share your stories so far to best understand the lessons learned and combat any challenges you might find along the way.

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