

# Energy Efficiency and Energy Generation in Historic Housing

## Report



Canolfan Tywi Centre

## Energy Efficiency and Energy Generation in Historic Housing.

### Executive Summary

The topic of energy generation and energy saving is an extremely pertinent issue in meeting Zero Carbon targets of Wales. One in three of all domestic homes are 'historic', ie built before 1919, equating to half a million homes. Currently the majority are misunderstood and repaired and maintained using inappropriate materials which not only makes them energy inefficient but actually serves to significantly damage their structure.

There are a number of misconceptions about the negative impact the historic housing stock plays on meeting Zero Carbon targets.

1. It is more efficient to knock down an old building and build a new, more energy efficient one.
2. Historic buildings are necessarily cold, draughty, mouldy and hard to heat.
3. Statutory protection of buildings is a real hinderance to installing energy efficiency and energy generation measures in the Country.

Contrary to these misconceptions, many working in the field of historic building maintenance recognise the important positive contribution old buildings make to meeting our zero carbon targets. The Tywi Centre, which is part of the Place and Sustainability team in Carmarthenshire County Council, is a UK-wide authority on the appropriate care, repair and adaptation of old buildings which makes Carmarthenshire a lead in this area delivering training and education to support to the construction industry, colleges, homeowners and architects & surveyors.

### Introduction

One in three of all domestic homes are 'historic', ie built before 1919, equating to half a million homes and these historic buildings of Wales are an extremely valuable resource. Intrinsically they make an extremely important contribution to meeting the goals of the Wellbeing of Future Generations (2015) Act.

However, their inherent value alone, as they currently stand, is not enough to ensure that they meet the needs of future generations. Appropriate maintenance, repair, and energy-saving and energy-generation adaptation needs to be supported in order that they fulfil their potential.

In order to appreciate this potential their full value as they stand needs to be appreciated.

## The value of historic buildings to the Country

### **Economic Value**

- For tourism, where there are castles and country houses (Llandeilo) which are tourist attractions in themselves, but also pretty, old town centres (Laugharne) which draw tourists to a town for a longer stay.
- For businesses. It has been shown that many businesses benefit economically from working out of historic properties or in historic town centres – as the structures give feelings of solidity, durability and character. (Historic England’s Heritage Counts: <https://historicengland.org.uk/research/heritage-counts/heritage-and-economy/> ). Consider the benefits that a business like The Cofio Lounge has had from establishing itself in the Grade I listed Guildhall in Carmarthen, however, the ‘wow’ factor is likely to have contributed to its choice of venue.

### **Cultural Value**

Our old buildings tell the story of our nation – how industry, power and culture has evolved over time and influenced the development of our identity, our way of living and our settlements. Some are protected by the nation for the benefit of the nation, others give us a sense of place and tell our local stories.

### **Social Value**

Benefits stem from the feelings that historic buildings in themselves can convey. They add character to a place and illustrate a shared community feeling. Consider the local interest when a chapel, school or a pub is proposed to be changed to private housing. To many people old buildings are aesthetically pleasing; to others they are homes which have been passed down through generations.

### **Personal Value**

Each one of these historic homes is unique: a product of their locality and their history and furthermore, they are probably the most valuable asset that people own.

### **Environmental Value**

The majority of our historic buildings are durable and are already over 100 years old: many modern homes are considered to have a much shorter shelf-life. Furthermore, many of our historic buildings were built of materials and in locations which were suited to the impacts of challenging weather and as a consequence need less adaptation to respond to the challenges of climate change.

This final value directly contributes to one of the misconceptions about historic buildings:

*It is more environmentally friendly to knock down an old building and build a new, more energy efficient one.*

The more durable a building and adaptable to climate change the more it can contribute to our Zero Carbon contributions: the energy spent in a building's construction, adaptation, extension and demolition is far greater than any operational energy that might be saved in their use. Carl Elefante, President of the American Institute of Architects stated that 'the greenest building is the one that already exists'. Therefore, there is an extremely strong argument to retain our historic buildings simply from saving the carbon they have embedded in them.

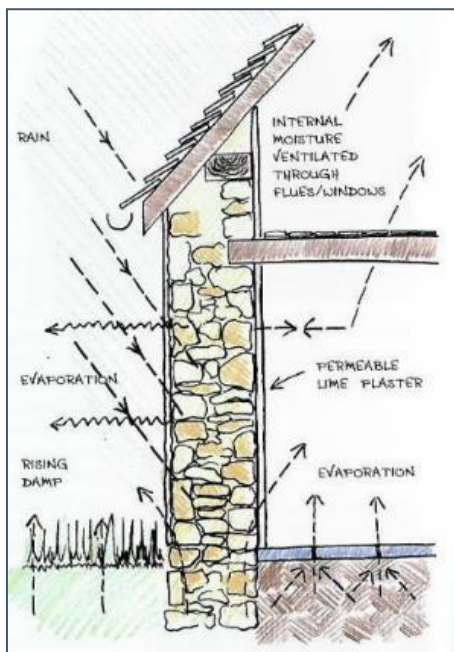
## Sustainability

If we are confident that retaining historic buildings is environmentally beneficial, then it is important that we consider how to ensure that they are sustained for the long term. This will require that they are appropriately maintained and serve as a healthy environment in which people can live.

And so, to the second commonly held misconception:

*Historic buildings are necessarily cold, draughty, mouldy and hard to heat.*

Historic houses traditionally rely on the thickness of the wall to keep inhabitants warm and dry, rather than any waterproofing render or paints.



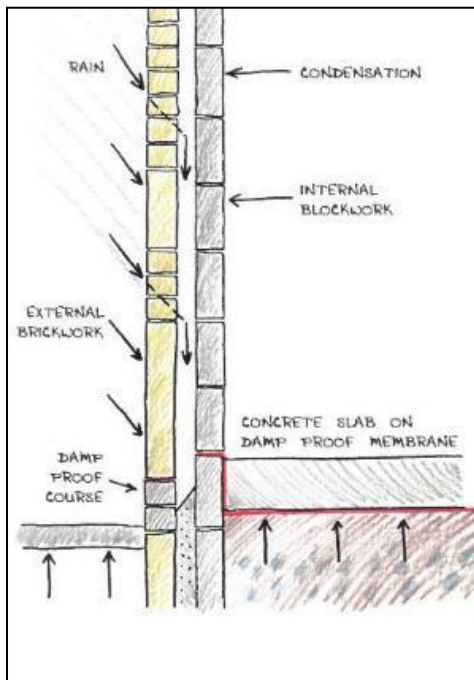
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Typical features of a solid wall constructed building include:

- Shallow foundations
- Stone buildings often having mud or shale infill between the outer and inner wall faces
- Timber embedded in the walls eg, window lintels and floor joists
- Originally built with a breathable lime mortar
- Often rendered, plastered and limewashed with a breathable lime

This is compared to buildings whose external walls are made up of two 'skins' with a cavity between them: Cavity wall construction. These 'skins' can be brick, block or timber, but the common feature is

that they have a gap between the 'skins'. The gap is present to prevent moisture travelling from the outer 'skin' to the inside of the building and it is this physical barrier which keeps the inhabitants of the building dry.



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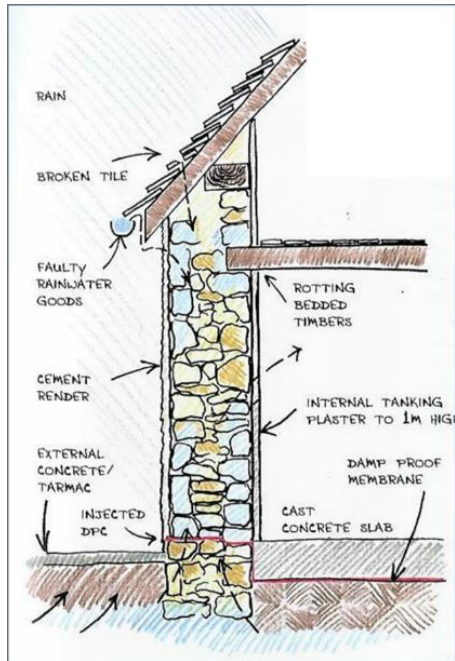
Typical features of a cavity wall constructed building include:

- Deep Foundations – in accordance with Building Regulations
- Damp proof course to ensure that any water running down the cavity exits the building rather than pooling at the bottom of the cavity
- Originally built with rigid, non-breathable mortars, such as cement.

Most traditional buildings have shallow foundations and tend to move slightly though the year as the ground gets wet and dry, and hot and cold. If a building is covered in a rigid mortar such as cement or gypsum plaster, this movement causes the renders to crack and moisture inevitably enters the wall.

There are some significant negative consequences of using an inappropriate render ie a non-breathable lime mortar on a historic, solid walled building.

1. **Rotting Timber.** Once water gets into a wall, it tends to get trapped there. It is easier for water to enter through a small crack than exit through it. If water is held in a wall by a non-breathable render and plaster, any timbers embedded in that wall are extremely likely to rot.



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2. **Heat Loss.** If water is trapped in a solid wall in the mortar between the stone or the brick, the thermal capacity of the wall drops - which results in that wall conducting heat more effectively and heat loss occurs more quickly. It is therefore more expensive to heat a damp solid walled building.
3. **Mould Growth.** If the external walls of a building are damp and cold, any heat and moisture generated inside by inhabitants (eg, by cooking, or showering) is likely to condense on the cold walls and attract mould growth.
4. **Water trapped above DPC.** Solutions to try to prevent water entering solid walls are often misplaced. Injected Damp Proof Courses (DPC's) cannot be successfully installed due to the voids in the walls and the porosity of many historic mortars, bricks and stone. It is virtually impossible to form a continuous impermeable layer at the foot of a historic wall to prevent moisture from rising up a wall from the ground, and therefore the result of attempts to inject a DPC lead to a layer punctuated with gaps, which tends to have the opposite of the intended effect by trapping water above the DPC in the wall.
5. **Tanking exacerbates the problem.** Tanking an internal wall surface adds a further impermeable layer to a historic wall and serves to trap moisture in a wall, much the same way as a cement render, exacerbating the issues of heat loss, rotting timbers and mould growth.

It is largely the lack of ongoing maintenance and the use of inappropriate materials and methods of repair, that causes historic buildings to be uncomfortable and unhealthy to live in. When inappropriate renders and plasters are applied to traditionally constructed buildings they result in the deterioration of the living conditions for the inhabitants and a deterioration of the building itself.

It can therefore be concluded that with the right care and repair traditional buildings need not be cold, draughty, mouldy and hard to heat.

## Improving Energy Efficiency

Consideration of the larger picture of ensuring that our national obligations to Carbon reduction are met through sustaining our historic buildings is critical. However, there still needs to be a commitment to improving the energy efficiency of all of our buildings: to meet our Zero Carbon targets; to reduce fuel poverty; and to improve people's health.

In understanding the way that historic buildings with a solid stone or brick wall are constructed, and the way that they are designed to keep inhabitants warm and dry, the first consideration must be to ensure the building is operating optimally. It is argued that by replacing a cement render with a breathable lime render, and in so doing, drying out a building's walls, will reduce the energy required to keep inhabitants warm. Simple actions such as repairing rainwater goods and draught proofing will also make a significant improvement to conserving energy.

Using breathable building materials such as hemp or cork lime, wood fibre boards or sheeps wool insulation are the most appropriate for the building if internal and external insulation is considered of value. Furthermore, natural building materials have the benefit of sequestering carbon, tying it up and storing it in the building.

The use of non-breathable insulation materials internally and externally on a building of traditional construction are wholly inappropriate and will exacerbate the decline of our buildings and the ill-health of inhabitants within the relatively short term.

## Energy Generation

Heat Pumps, Solar PV and Solar Thermal technologies are a valuable and largely appropriate way to reduce the cost of energy for businesses and households in traditional buildings. Draught proofing and managing ventilation are important considerations in order to reduce the demand for heat – again requiring that a building be maintained.

Delivery of low, slow heat such as through a Heat Pump is ideal in an old building, mimicking a fire being kept burning. A historic building with solid walls acts like a storage heater, evening out extreme temperature fluctuations through the day making them cooler in summer and easier to heat with a low, slow heat source.

## Legislative Frameworks

When making changes to all types of buildings, legislative and policy frameworks need to be considered. Installation of energy saving and energy generation measures necessarily requires the consideration of the relevant guidance considering the potential impact, both positive and negative, on our built environment. Development and changes in the historic built environment need to reference to the following:

1. (Carmarthenshire Only) - Carmarthenshire Local Development Plan (2006-2021) (Appendix 1)  
Provisions 'A' and 'I' of Policy GP1 Sustainability and High Quality Design  
Strategic Policy 13 for the Protection and Enhancement of the Built and Historic Environment  
Specific Policy EQ1 Protection of Buildings, Landscapes and Features of Historic Importance
2. Part L of the Building Regulations. Volume 1 – Dwellings. Conservation of Fuel and Power (Appendix 2)  
0.8 – 0.15 Exemptions for Historic and Traditional Buildings & Historic and Traditional Dwellings where Special Considerations Apply.
3. Planning (Listed Building and Conservation Areas) Act 1990 (Appendix 3)
4. Town and Country Planning (General Permitted Development) Order 1995 (Appendix 4)

Other policy and guidance documents will need to be considered depending upon the type of development proposal.

This leads to a discussion of a further misconception:

*Statutory protection of buildings is a real hinderance to installing energy efficiency and energy generation measures in the County.*

### **Listed Buildings**

In a building that is Listed any changes to a building, for example the installation of solar panels or external wall insulation, would need to ensure that the character of the building was not compromised. This would include any visual or material impact on the building which might exacerbate its physical deterioration, remove historic fabric or damage its appearance.

Considering the value that all historic buildings have in Wales it can easily be argued that to cause physical deterioration or compromise their operational ability would not meet our long-term Wellbeing of Future Generation objectives. When looking specifically at Listed Buildings it can be considered that their value is even greater to the overall wellbeing of our nation and that assessment of any potential harm caused by the introduction of energy generation or energy saving measures needs greater assessment and justification.

This is the rationale for the requirement for an application for Listed Building Consent. It ensures that a historic building professional can assess the impact of any intervention to a Listed Building. Where the impact is negligible or justified from the perspective of ensuring that that historic building retains its significance, integrity and character, then applications are supported.

It is clear that greater scrutiny is applied to developing Listed Buildings, however, of the 500,000 historic houses in Wales, only 13,350 are listed, pre-1919 listed buildings in domestic/residential use. Listed dwellings therefore only make up approximately 2.67% of historic homes in Wales. There are many



easier buildings to develop, and the argument is that the focus be on these other buildings in the first instance.

### **Conservation Areas**

The legal definition of conservation areas as stated in Section 69 of the Planning (Listed Buildings and Conservation Areas) Act 1990 is:

‘... areas of special architectural or historical interest the character or appearance of which it is desirable to preserve or enhance.’

A conservation area is an area that is usually historic in character and is special or attractive enough to warrant protection. The historic centre of Carmarthen is an obvious example where there are a very great number of historic buildings laid out on an ancient Roman street pattern. Carmarthenshire County Council, as the local planning authority, has a statutory duty to preserve and enhance the special character of a conservation area as enshrined in primary legislation (Appendix 3).

The proportion of homes located in Conservation Areas across Wales is 13%, equating to 189,000, and it can be assumed that the majority of buildings in Conservation Areas are historic. It could be suggested, as with Listed Buildings, that the focus of development be on buildings the remaining 1,311,000 without any statutory protection. However, the broad range of Values that Conservation Areas offers outlined above does need to be considered with any development proposal.

Conservation Areas as a whole are considered less significant than Listed Buildings and the statutory protection is generally less robust.

Making a material change to the appearance of a building in a Conservation Area may require Planning Permission, unless the change is considered to be Permitted Development. Dwellings usually have greater permitted development rights than commercial properties. The exception is where an area has an ‘Article 4’ which removes the permitted development rights of householders and they are then required to apply for planning permission to make a material change to the appearance of their property

### **Solar Panels**

- Planning Permission is required in a commercial property or any property in an area with an Article 4 in a Conservation Area for Installing Solar Panels
- Planning Permission may be required in dwelling houses subject to certain conditions. Some of the conditions required for installing a Solar Panel are that it cannot be on the side of a building, above the roof line or more than 200mm from the roof or wall surface. Further information can be found on the planning portal - <https://www.gov.wales/planning-permission-common-projects>

### **Cladding - including external wall insulation**

- Planning Permission is required for Cladding, including external wall insulation on all properties (commercial and domestic) in a Conservation Area in most cases, unless repairing or renewing an existing surface.

In all cases where the change in the appearance of a building in a Conservation Area is proposed as part of an application for Planning Permission, the Built Heritage Officer will be consulted as to whether the



proposal preserves or enhances the Conservation Area and based on the proposal the impact on the Architectural and Historic value will be assessed and a consultation response provided.

Based on the figures above and regular consideration and approval of appropriate energy generation and saving measures in Listed Buildings and in Conservation Areas it is suggested that the statutory protection of buildings is not a significant hinderance to installing energy efficiency and energy generation measures in the County.

## Conclusion

Historic buildings need to be considered as part of the long-term solution to meeting the Zero Carbon targets of the Country whilst being respected for the significant value that they bring. There is enormous potential to improve the energy saving and energy generation of historic buildings to the benefit of businesses and homeowners but these need to continue to be appropriate to ensure that the building are sustained for current and future generations.

The Tywi Centre is in a position to play a pivotal role in this fast-developing area and take a lead in meeting the Zero Carbon targets of Wales within the construction and retrofit industry.

Nell Hellier  
Carmarthenshire County Council  
nhellier@carmarthenshire.gov.uk

Canolfan Tywi  
Fferm Dinefwr  
Llandeilo  
Sir Gar  
SA32 7LJ

01558 824271 / 07929 770743  
canolfantywicentre@sirgar.gov.uk  
canolfantywi.org.uk

Tywi Centre  
Dinefwr Farm  
Llandeilo  
Carmarthenshire  
SA32 7LJ

01558 824271 / 07929 770743  
canolfantywicentre@carmarthenshire.gov.uk  
tywicentre.org.uk

## APPENDICES

### Appendix I

Carmarthenshire Local Development Plan – of specific relevance to Historic Buildings

1. Provisions 'A' and 'I' of **Policy GP1 Sustainability and High Quality Design** of the Carmarthenshire Local Development Plan. This details of Policy GP1 state:  
Development proposals will be permitted where they accord with the following:
  - A. It conforms with and enhances the character and appearance of the site, building or area in terms of siting, appearance, scale, height, massing, elevation treatment, and detailing.**
  - B. It incorporates existing landscape or other features, takes account of site contours and changes in levels and prominent skylines or ridges.
  - C. Utilises materials appropriate to the area within which it is located.
  - D. It would not have a significant impact on the amenity of adjacent land uses, properties, residents, or the community.
  - E. Includes an integrated mixture of uses appropriate to the scale of the development.
  - F. It retains, and where appropriate incorporates important local features (including buildings, amenity areas, spaces, trees, woodlands, and hedgerows) and ensures the use of good quality hard and soft landscaping and embraces opportunities to enhance biodiversity and ecological connectivity.
  - G. It achieves and creates attractive, safe places and public spaces, which ensures security through the 'designing-out-crime' principles of Secured by Design (including providing natural surveillance, visibility, well-lit environments, and areas of public movement).
  - H. An appropriate access exists or can be provided which does not give rise to any parking or highway safety concerns on the site or within the locality.
  - I. It protects and enhances the landscape, townscape, historic and cultural heritage of the County and there are no adverse effects on the setting or integrity of the historic environment.**
  - J. It ensures or provides for, the satisfactory generation, treatment, and disposal of both surface and foul water.
  - K. It has regard to the generation, treatment, and disposal of waste.
  - L. It has regard for the safe, effective, and efficient use of the transportation network.
  - M. It provides an integrated network which promotes the interests of pedestrians, cyclists and public transport which ensures ease of access for all.
  - N. It includes, where applicable, provision for the appropriate management and eradication of invasive species. Proposals will also be considered in light of the policies and provisions of this Plan and National Policy (PPW: Edition 7 and TAN12: Design (2014)).
  
2. **Strategic Policy 13** of the Local Development Plan for the **Protection and Enhancement of the Built and Historic Environment** states that :  
Proposals should preserve or enhance the built and historic environment of the County, it's cultural, townscape and landscape assets and, where appropriate, their setting. Proposals relating to the following will be considered in accordance with national guidance and legislation:
  - Sites and features of recognised Historical and Cultural importance.

- Listed Buildings and their setting.
- Scheduled Ancient Monuments and other sites of recognised archaeological importance.
- Proposals will be expected to promote high quality design that reinforces local character and respects and enhances the local setting and the cultural and historic qualities of the plan area.

### 3. **Specific Policy EQ1 Protection of Buildings, Landscapes and Features of Historic Importance** states that:

Proposals for development affecting landscapes, townscapes buildings and sites or features of historic or archaeological interest which by virtue of their historic importance, character or significance within a group of features make an important contribution to the local character and the interests of the area will only be permitted where it preserves or enhances the built and historic environment.

- EQ1 identifies that historical and cultural features of recognised importance, including Scheduled Ancient Monuments (SAM) will be protected as a reflection of national policy. However, not all nationally important remains which may merit preservation will necessarily be scheduled. Such remains and, in appropriate circumstances, other unscheduled archaeological remains of local importance and their setting may also be worthy of protection (PPW: Edition 7 Para 6.4.2). In this regard, the above policy seeks to reflect their significance either as locally important sites or as currently un-designated sites worthy of potential national designation.
- Reference should be made to the content of PPW: Edition 7 in respect of SAMs. The locations of SAMs are shown on the Proposals Map.
- Listed buildings are determined on the basis of their importance to the nation, either for their architecture or built quality, or for their historic associations. However, there are a large number of other buildings, which whilst not of sufficient quality or importance to be listed, nevertheless make a significant local contribution. In Carmarthenshire, there are potentially large numbers of buildings which could fall into this category. Therefore, whilst it would be inappropriate to afford these buildings the same protection as listed buildings, it is still desirable to afford them some protection, for example when they are within Conservation Areas, or affected by development proposals. In this regard, reference is made to appendix 3 and the commitment to prepare SPG on Locally Important Buildings.
- Proposals for the alteration or extension of a building of local importance will be expected to retain and conserve features of historic or architectural interest. Proposals impacting on, or affecting the setting of a building of local importance will be expected to respect its character. In those instances where demolition is granted the council may seek the recording of architectural features and the re-use and recycling of materials in any new development on the site.
- Due regard should be had to the impact of any proposal on the distinctiveness, integrity or setting of the feature, landscape, townscape or building.

- Regard should be had to paragraph 6.6.20 and the effect of proposals on European protected species.

The full Local Development Plan can be seen at

<https://www.carmarthenshire.gov.wales/home/council-services/planning/planning-policy/>

#### **Appendix 2**

Part L of the Building Regulations. Volume 1 – Dwellings. Conservation of Fuel and Power.

<https://www.gov.wales/sites/default/files/publications/2024-05/building-regulations-approved-document-l-vol-1.pdf>

#### **Appendix 3**

Planning (Listed Building and Conservation Areas) Act 1990

<https://www.legislation.gov.uk/ukpga/1990/9/contents>

#### **Appendix 4**

Town and Country Planning (General Permitted Development) Order 1995

<https://www.legislation.gov.uk/uksi/1995/418/contents/made>