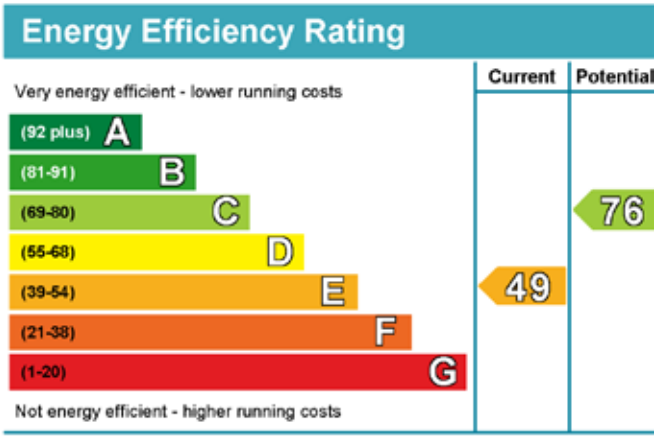
Historic England

Energy Efficiency and Historic Buildings

Advice for Domestic Energy Assessors and Green Deal Advisors



Summary

This guidance provides advice to Domestic Energy Assessors (DEAs) and Green Deal Advisor's (GDAs) producing Energy Performance Certificates and Green Deal Assessments on historic and older buildings.

Whilst many of the recommendations in Energy Performance Certificates and Green Deal Assessments will be suitable for older buildings some measures may need more careful consideration and specialist advice before works are put in hand.

For historic buildings and those of traditional construction an appropriate balance needs to be achieved between building conservation and measures to improve energy efficiency if lasting damage is to be avoided both to a building's character and significance and its fabric.

This guidance note has been prepared by David Pickles and Caroline Cattini.

It is one of two publications on Energy Performance Certificates. The other guidance note *Energy Efficiency and Historic Buildings: Energy Performance Certificates* is aimed at homeowners and those managing or renting historic or older buildings.

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www.HistoricEngland.org.uk/advice/technical-advice/energy-efficiency-and-historic-buildings/

Front cover:

1. Great importance is attached to the external appearance of buildings in conservation areas.
2. Extract from an EPC.
   © DCLG
3. Keeping an older building in good repair can help to improve its energy performance.
   © Philip White
4. On site tests such as U-value measurements of walls can help in understanding their thermal performance.

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1 What's Different About Older Buildings?

In England, over 4.7 million of today's homes were built before 1919 which represents over 20% of the housing stock. There are nearly 1.1 million dwellings in conservation areas and approximately 200,000 listed dwellings.

Older buildings are often thought to be draughty and energy inefficient but they can vary greatly in their energy efficiency depending how they are constructed and maintained. Many use less energy than some more recently constructed buildings.

Good maintenance is a key aspect of maintaining an older building's energy efficiency. A well maintained older building will generally perform much better than one that is neglected. For example, badly maintained drainage can create damp walls which are very energy inefficient.

Pre-1919 buildings of traditional construction are mostly buildings with solid masonry walls that both absorb and readily allow the evaporation of moisture. These buildings generally pre-date those constructed with walls incorporating cavities and the use of damp proof membranes which became widespread from around the 1920s.

1.1 Older buildings need to breathe

A key characteristic of older buildings is the use of permeable building materials which are able to absorb moisture and release it again without damage to the building. By contrast, most modern buildings rely on impervious materials to keep moisture out.

Lime mortar is a key part of traditional construction. When driving rain strikes an external wall the bricks and mortar absorb large amounts of moisture. When the rain has stopped the moisture is able to evaporate freely particularly through the lime mortar joints. However, if a hard

Hard impermeable cement mortar can trap moisture and damage brickwork.
©Philip White

impermeable cement mortar is used this can trap moisture so it is not so able to evaporate. This can lead to damp walls and damaged masonry.

Maintaining the building's ability to regulate moisture levels is also fundamental to its effective thermal performance.

1.2 Heat storing capacity

Older masonry buildings were often constructed with thick external masonry walls as well as masonry internal walls incorporating chimney flues. This form of construction can readily absorb and store warmth as the building is heated. This stored heat is then slowly released as the building cools down.

1.3 Protection for older buildings

Older buildings vary greatly in the extent to which they can accommodate change without harming their special interest. Some may be able to accommodate significant change whilst others are sensitive to even slight internal or external alteration. Before carrying out any works to an older building it is important to establish its significant features.

Some buildings or parts of buildings are of such quality, importance or completeness that they should not be altered except in the most exceptional circumstances. If possible, alterations should be designed in such a way so that they can be reversed without damaging the existing fabric. This is especially relevant where changes involve building services which are subject to more frequent upgrading. Some older buildings, such as listed buildings and buildings in conservation areas are subject to statutory protection so permission may be required before certain works can be carried out.

Older buildings vary greatly in the extent to which they can accommodate change without harming their special interest.

Categories of protected buildings include:

- Listed buildings and scheduled monuments
- Buildings of local architectural and historical interest which are referred to as a material consideration in a local authority's development plan
- Buildings of architectural and historic interest situated in conservation areas, national parks, areas of outstanding natural beauty and world heritage sites

The local planning authority will be able to confirm if a particular building falls into any of those categories or you can use Historic England's 'National Heritage List for England' which is a searchable database of all nationally designated heritage assets.

The *Green Deal Code of Practice* requires the Green Deal Provider to consider whether the building is a 'vulnerable building' which is defined as:

- A historic building (as defined in *Building Regulations Approved Document L1B 2010*)
- A building which is constructed in a way which means that special care is required to ensure that the installation of improvements does not result in damage to or deterioration of the building fabric (this is likely to include most buildings constructed prior to 1914)

2 Areas of the EPC That Need Particular Attention

There are several key issues that require particular attention if accurate energy efficiency ratings and appropriate recommendations for older buildings are to be achieved:

- Understanding how Building Regulations impact on older buildings
- Understanding the significance of the building
- Selecting the correct age band
- Identifying the correct construction
- Inputting actual rather than notional U-values
- Understanding the condition of the building

2.1 Building Regulations and older buildings

Building Regulations generally apply to new buildings and there is no general requirement for existing buildings to be upgraded to meet these standards. However, certain material alterations such as changing the use of a building or renewing parts of it such as the windows can trigger the need to comply with Building Regulations.

Work in relation to thermal upgrading is covered by *Part L* of the Regulations.

For existing buildings there are two parts:

- ***Part L1B*** work to existing dwellings
- ***Part L2B*** work to existing buildings that are not dwellings

To help reconcile thermal performance and building conservation certain classes of historic buildings are expressly exempted from the need to comply with the energy efficiency requirements of the Regulations where compliance would unacceptably alter their character and appearance.

These include:

- Listed buildings
- Buildings in conservation areas
- Scheduled monuments

The regulations also include 'special considerations' which can apply to the following categories:

- Locally listed buildings
- Buildings in national parks and other historic areas
- Traditionally constructed buildings

Additional relaxations can be considered for buildings in these categories which don't have exemption status.

More detailed advice on the application of *Part L* of the Building Regulations can be found in the Historic England publication *Energy Efficiency and Historic Buildings: application of Part L of the Building Regulations to historic and traditionally constructed buildings.*

2.2 Understanding the significance of the building

When carrying out an EPC or Green Deal assessment it is important to check any planning constraints that may affect the property. For instance, the building might be listed or be in a conservation area with Article 4 restrictions on permitted development rights. This can mean planning permission is required to make changes to various parts of the building such as windows or roofing materials.

Listed Buildings

In England there are over 374,000 listed building entries. Listing helps us acknowledge and understand our shared history. It marks and celebrates a building's special architectural and historic interest, and also brings it under the consideration of the planning system so that some thought will be taken about its future. The older a building is, the more likely it is to be listed. Listed status covers a whole building, both inside and out.

All buildings built before 1700 which survive in anything like their original condition are listed, as are most of those built between 1700 and 1840. The criteria become tighter with time, so that post-1945 buildings have to be exceptionally important to be listed. A building has normally to be over 30 years old to be eligible for listing.

Categories of listed buildings:

- **Grade I** buildings are of exceptional interest, sometimes considered to be internationally important; only 2.5% of listed buildings are Grade I
- **Grade II*** buildings are particularly important buildings of more than special interest; 5.5% of listed buildings are Grade II*
- **Grade II** buildings are nationally important and of special interest; 92% of all listed buildings are in this class and it is the most likely grade of listing for a home owner

Listing does not freeze a building in time it simply means that Listed Building Consent must be applied for in order to make any changes which might affect its special interest. Listed buildings can be altered, extended and sometimes even demolished within Government planning guidance. The local authority uses Listed Building Consent to make decisions that balance the building's historic significance against other issues such as its function, condition or viability.

Common works requiring consent might include the replacement of windows or doors, removing internal walls, painting over brickwork or altering or removing fireplaces. It is always advisable to consult the conservation officer at the local planning authority to get a better idea about what it means in any particular case.

Listed buildings and places of worship are exempted from the need to have an EPC.

A

B

A Listed status covers a whole building both inside and out.
B Great importance is attached to the external appearance of buildings in conservation areas.

Conservation Areas

In England there are over 9,000 conservation areas. Conservation areas are usually designated by local planning authorities as areas of special architectural or historic interest. Demolition of all buildings is controlled and the scope of work that can be carried out without planning permission is restricted.

In a conservation area, the main emphasis is on the protection and enhancement of the area. Great importance is attached to external appearance of the building (the walls and roof and the detailing of windows, doors, and roof-lights). The addition of external cladding and the changing of a roof line will generally require planning permission, and in some conservation areas planning permission will also be required for works such as the replacement of doors and windows, loft extensions, dormers and roof-lights.

Some buildings in a conservation area may be listed. Their internal and external features contribute to the importance of these areas and inappropriate changes will have a direct impact on the character of the area.

2.3 Selecting the correct age band

The relevant age bands within RdSAP for older buildings are pre-1900 and 1900 to 1929. It is important the correct age band is selected for a property as RdSAP makes certain assumptions based on this information. The age band determines the default U values for walls, roofs and floors as well as the ratio of the floor area to window area.

More information on the age of a property and its development may be ascertained by asking the occupant. They may have evidence of when the building was built and when any extensions might have been added.

2.4 Identifying the construction

When producing an EPC, care needs to be taken when surveying the building to ensure the correct form of construction is identified. It is also important to identify the historic significance of the various parts of the construction.

External walls

Often solid walls are wrongly identified as cavity wall construction. Failure to correctly identify the construction could result in an incorrect energy efficiency rating and a recommendation for inappropriate works.

Knowing the age of a building should help in identifying the form of wall construction. Pre-1919 buildings will mostly be of solid wall construction unless they are timber framed. However, walls

A

B

C

D

A Often solid walls are wrongly identified as cavity wall construction.
B Lifting historic timber floors may cause considerable damage.
C Historic windows and doors should be retained where these exist.
D Draught-stripping to windows and doors can provide significant thermal improvements.

which appear to be solid can have narrow cavities. These early forms of cavity wall need particular attention as many are not suitable for cavity fill as the cavities are too narrow.

A solid brick wall will have a different appearance to most cavity walls. With cavity walls only the 'stretcher' or long side of the brick (typically 215mm long) is usually visible. With solid walls the 'header' or the short end of the brick (typically 102mm wide) will also be visible. Some older cavity walls were designed to look like solid walls so the appearance alone will not always give the right answer.

If a wall has an external render finish then the thickness of the wall will need to be checked to ascertain the form of construction. Solid brick walls will generally be about 230mm thick compared to a modern cavity wall which will be in the region of 270-350mm thick. It may be possible to look in the loft space to see more of the wall construction.

Other types of solid wall can be made of stone or a mixture of stone and brick. Again the age should help with identifying the construction. They tend to have wall thicknesses of 450-500mm. For stone walls in RdSAP there is a choice between granite or whinstone (black granite) and sandstone.

It is important when looking at solid masonry walls to establish the internal finishes. For instance solid walls can often have a layer of plaster dry-lining which can significantly improve the U-value of a wall. Not including this information could produce a poorer energy rating leading to recommendations that may be inappropriate.

Roofs

It is relatively easy to establish the form of construction of roofs where access is available to the roof space. However, establishing the construction where rooms are within a roof or have flat roofs can be more difficult as it is sometimes not possible to establish the exact construction from a visual inspection.

With rooms in a roof space internal historic finishes such as lath/lime plaster ceilings and close-boarded ceilings may be significant in some older buildings and need to be retained. This may mean that insulation at rafter level has to be added from above the rafters which would require removal of the roof coverings. Adding insulation above the rafters as sarking insulation could have a significant impact on the detailing and appearance of the roof typically at the eaves, ridges and abutments with chimneys.

Floors

Many traditionally constructed buildings have a timber ground floor suspended above a ventilated sub-floor void. In most cases the void is very shallow making access to it very difficult. Adding insulation to suspended floors can often require all the floorboards to be lifted. It is important therefore to recognise historic timber floors with early wide boards, usually of elm or oak, where lifting may cause considerable damage.

Many traditional buildings will also have solid floors many of which can have historical significance. The heat loss through solid floors is comparatively small compared with many other building elements. The insulation of a solid floor usually requires excavation which can be potentially damaging to historic floors. Even where there is no historic value to the existing solid floor, any alterations to the existing floor structure need to be carefully considered as such work can have an impact on other parts of the building fabric.

Windows and doors

It is important to recognise where historic windows and doors survive as these form an important part of the significance of an older building. Such features are an irreplaceable resource which should be conserved and repaired whenever possible. The aim should be to improve thermal performance whilst retaining historic windows and doors where these exist.

Properly maintained, old timber windows and doors can enjoy extremely long lives. Many historic components continue to give service after

150, 200 or even 250 years. This is largely due to the high quality and durability of the timber that was used in the past. If they do require repair then this can be carried out usually at significantly less cost than replacement. It is very rare that a window is totally beyond repair.

Draught-proofing is one of the cheapest and least intrusive methods of improving the thermal performance of windows and doors and the costs can be quickly recovered by the energy savings. About 20% of the heating in a typical home is lost through the windows- most of which escapes through air gaps around the window rather than through the glass. Draught-proofing also has the added advantage of reducing noise and dust. Research has shown that air infiltration through a sash window in good condition can be reduced by as much as 86% by adding draught-proofing. (*Research into the Thermal Performance of Traditional Buildings: Timber Sash Windows*, English Heritage 2009).

Draught-proofing can also be provided by secondary glazing which will significantly improve the overall thermal performance of the window. If well designed secondary glazing can be discreet and reversible.

Using actual U-values will make the EPC energy rating more accurate for older buildings.

2.5 Inputting actual U-values

With version 9.91 of RdSAP (2009) introduced in April 2012 it is now possible to enter actual U-values for elements of a structure rather than notional estimates taken from a database. This is optional and the data for this would need to have been supplied from a manufacturer or from an installation certificate supplied by an approved assessor. However, data for existing traditional construction is currently very limited. Using actual U-values will make the EPC energy rating more accurate for older buildings.

English Heritage has carried out research into the actual u-values of solid brick walls (*Research into the Thermal Performance of Traditional Brick Walls* 2013).

Lack of maintenance is one of the main contributory factors for decay in older houses.

2.6 Understanding the condition of the building

For traditional buildings to maintain their optimal thermal performance they need to be well maintained and be free of defects that could compromise this performance.

Lack of maintenance is one of the main contributory factors for decay in older houses. This could be from overflowing gutters which saturate the external wall of the building, blocked ventilation causing decay to floor timbers or inadequate ventilation resulting in mould growth from condensation.

When materials become saturated, frost and the changes in temperature can cause the surface of masonry to wide-laminate and decay. High moisture content in masonry can also result in damage from salts.

If materials such as wood are damp and have no chance to dry out then they can rapidly deteriorate from the damage caused by wood-boring insects and fungi. Often these problems can be easily solved by eliminating the source of the moisture and increasing natural ventilation.

Ill considered or inappropriate alterations can also cause decay. A very common problem with older houses is the outside ground level being too high in relation to the structure of the building. External levels can build up over many years so the damp proof course, if there is one, is bridged resulting in rising damp. High external levels can also cause timber suspended floors to become constantly damp resulting in timber decay. Other common inappropriate repairs include the use of cement mortars and renders which do not allow for sufficient evaporation of moisture which can lead to decay.

Such issues need to be tackled before measures to improve energy performance are undertaken.

3 Where to Get Advice

Where further detailed investigation is required or where certain measures are proposed that pose a potential risk to fabric then owners should be advised to obtain further expert advice.

The *Green Deal Code of Practice* states that when dealing with older buildings the Green Deal Provider must take particular care to ensure that:

- The proposed improvements are appropriate for the building
- The finishes and fabric of the building are protected from damage resulting from installation of the improvements by using appropriate materials, products and specifications

The Green Deal recognises that for more complex older buildings a more detailed appraisal may be required from an architect or surveyor with specialist skills and if the Green Deal Provider is in doubt about this they must consult the local authority historic buildings or conservation officer.

3.1 Historic England guidance

See: www.HistoricEngland.org.uk/advice/technical-advice/energy-efficiency-and-historic-buildings/

Energy Efficiency and Historic Buildings; Application of Part L of the Building Regulations to historic and traditionally constructed buildings (2011)

Energy Efficiency and Historic Buildings (all 2012)

Insulating pitched roofs at rafter level/warm roofs

Insulating pitched roofs at ceiling level/cold roofs

Insulating flat roofs

Insulating thatched roofs

Open fires, chimneys and flues

Insulating dormer windows

Insulating timber framed walls

Insulating solid walls

Early cavity walls

Draught-proofing windows and doors

Secondary glazing

Insulation of suspended ground floors

Insulating solid ground floors

3.2 Research Reports

Wood, C, Bordass, W and Baker, P, *Research into the Thermal Performance of Traditional Windows* (2009) Glasgow Caledonian University for English Heritage

Rhee-Duverne, S and Baker, P *Research into the Thermal Performance of Traditional Brick Walls* (2013) Glasgow Caledonian University for English Heritage

3.3 Other Publications

Historic Scotland, *Fabric Improvements for Energy Efficiency in Traditional Buildings* (2012)
www.historic–scotland.gov.uk

Sustainable Traditional Buildings Alliance, *Responsible Retrofit of Traditional Buildings* (2012)
www.stbauk.org

3.4 Contact Historic England

East Midlands
2nd Floor, Windsor House
Cliftonville
Northampton NN1 5BE
Tel: 01604 735400
Email: eastmidlands@HistoricEngland.org.uk

East of England
Brooklands
24 Brooklands Avenue
Cambridge CB2 2BU
Tel: 01223 582700
Email: eastofengland@HistoricEngland.org.uk

Fort Cumberland
Fort Cumberland Road
Eastney
Portsmouth PO4 9LD
Tel: 023 9285 6704
Email: fort.cumberland@HistoricEngland.org.uk

London
1 Waterhouse Square
138-142 Holborn
London EC1N 2ST
Tel: 020 7973 3000
Email: london@HistoricEngland.org.uk

North East
Bessie Surtees House
41–44 Sandhill
Newcastle Upon Tyne
NE1 3JF
Tel: 0191 269 1200
Email: northeast@HistoricEngland.org.uk

North West
Suites 3.3 and 3.4
Canada House
3 Chepstow Street
Manchester M1 5FW
Tel: 0161 242 1400
Email: northwest@HistoricEngland.org.uk

South East
Eastgate Court
195-205 High Street
Guildford GU1 3EH
Tel: 01483-252000
Email: southeast@HistoricEngland.org.uk

South West
29 Queen Square
Bristol BS1 4ND
Tel: 0117 975 0700
Email: southwest@HistoricEngland.org.uk

Swindon
The Engine House
Fire Fly Avenue
Swindon SN2 2EH
Tel: 01793 414700
Email: swindon@HistoricEngland.org.uk

West Midlands
The Axis
10 Holliday Street
Birmingham B1 1TG
Tel: 0121 625 6820
Email: westmidlands@HistoricEngland.org.uk

Yorkshire
37 Tanner Row
York YO1 6WP
Tel: 01904 601901
Email: yorkshire@HistoricEngland.org.uk

Historic England

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