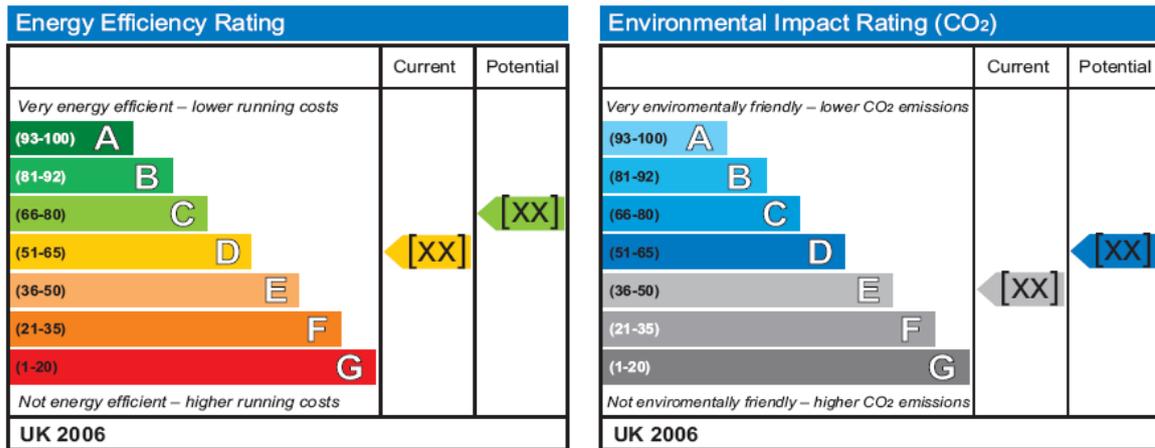


English Heritage Guidance

Understanding SAP ratings for historic and traditional homes

The Standard Assessment Procedure or SAP for short is the UK's chosen method for complying with the European Directive on energy-labelling of domestic buildings. For the Home Information Packs, SAP is used to calculate the energy performance of a home and predict the savings that might be achieved if improvements are made. The ratings are displayed on a label like the one below.



SAP is also used to calculate target emission rates that all new buildings have to meet under the Building Regulations.

Introduction

Promoting a wider awareness of energy efficiency in buildings is part of the UK Government's plan to reduce fuel usage and carbon emissions from heating, lighting and cooling.

SAP was originally developed as a simple method to enable comparisons of the energy efficiency of different buildings. Standard assumptions about occupancy are made to eliminate the effects of individual usage patterns. Information about the building, including its age, construction, location, orientation, hot water, heating and lighting systems are entered into a computer model which estimates current energy performance.

It is important to be aware that this calculation can give very different results to an energy assessment based on real, metered energy consumption data. This will be preferable to SAP estimates when comparison with other buildings is not required.

Changing the assumptions made in a SAP model can show how improvements might lead to energy savings. Modelling several alternatives with different improvements can help estimate which measures are likely to yield the greatest reductions in energy use and which are likely to have the shortest financial payback periods. However because SAP models for historic and traditional buildings are often inaccurate, such predictions will often overestimate potential savings and the results must be interpreted with care.

While committed to the Government's energy efficiency aims, English Heritage is concerned that improvements should not harm the special interest or performance of traditional and historic buildings. It has a statutory obligation to give advice on how to protect historic houses, and a sensible and reasonable approach to energy improvements is advocated: in some cases it is not feasible or cost-effective to add every possible improvement, but a more restrained approach can still produce substantial energy savings.

New buildings

Building Regulation 17C requires that all new dwellings must meet a target emission rate calculated using SAP(2005). A notice stating the SAP rating of the building must be produced and displayed in a prominent place once it is ready for marketing.

New dwellings created by a change of use

Building Regulation 16 calls for the calculation of an energy rating for any dwelling created by a change of use. The energy rating has to be notified to the local authority and, if it is to be sold or let, displayed in a conspicuous place on the dwelling itself. Historic buildings are not exempt from this requirement.

There is no requirement for the building to achieve a particular rating. Instead most dwellings created by a change of use must demonstrate that their services, fittings and thermal elements (the wall, floor or roof) meet the targets set out in the approved documents that accompany Part L of the Building Regulations. This deals with the conservation of fuel and power. Only certain works to historic buildings are exempt from these requirements, but the approved documents make clear that special consideration should be given to preserving the important features of historic buildings and to ensuring that any changes are compatible with traditional buildings.

Property sales

On 1st August 2007 Home Information Packs were made compulsory for all four bedroom homes and larger which are being sold and this has now been extended to include all dwellings. These packs contain, amongst other items, an energy performance certificate (EPC) prepared by a certified Domestic Energy Assessor (DEA) who has visited the property. The EPC contains two energy ratings: a SAP Rating, an Environmental Impact Rating (see below), and estimates of energy use and costs, all calculated using RdSAP.

The ratings in EPCs are not as accurate as the ratings produced for new dwellings, or the energy ratings for dwellings created by a change in use of a building. This is because they are produced from a reduced set of data items using a method known as Reduced Data SAP, or RdSAP.

RdSAP makes assumptions about the building based upon its age and nature of construction. For instance all buildings constructed before 1930 are assumed to have suspended timber floors throughout, and all solid brick walls are assumed to be 220mm thick. Not having to measure and record these construction details speeds up site visits, reduces production costs, and increases consistency by eliminating a possibility of assessor error. But the assumptions reduce the accuracy of the ratings of the energy performance of historic and traditional dwellings.

More contentiously still, EPCs include recommendations for improvement measures that are generated by an automated system. Some recommendations, such as more efficient boilers or controls, are uncontroversial provided they are implemented carefully.

Others, however, such as installing wall insulation, are potentially dangerous and could lead to damp problems. Great care needs to be taken to ensure that the recommendations generated are appropriate for the historic or traditional house in question before they are implemented.

Other property transactions

From the 6th April 2008 EPCs will be needed as part of the sale or letting of buildings other than dwellings with a total usable floor area over 500m² and this will apply to all buildings from 1st October 2008. Display Energy Certificates, similar to EPCs but based on measured fuel consumption rather than a SAP calculation will also have to be displayed in public buildings with a total usable floor area over 1000m² from 1st October 2008.

Development of SAP ratings

The first SAP methodology was published by the Government and the Building Research Establishment (BRE) in 1993. It has been revised several times since, with the latest version published in 2005.

SAP can be used to produce three distinct ratings for dwellings which are used for different purposes. These are:

- the energy efficiency (or SAP) rating,
- the dwelling CO₂ emission rate, and
- the environmental impact rating.

Early SAP ratings were based on the cost per square metre of floor area of heating and hot water since these were the costs that used to dominate domestic fuel bills. The latest version, SAP(2005) is able to deal with extensively insulated modern properties with energy generating systems such as solar photovoltaic or ground source heat pumps. The SAP rating aims to reflect the *financial cost* of lighting and heating so it will be affected by the type of fuel being used: thus a house running on mains gas will achieve a better rating than one using LPG.

The rating scale in SAP (2005) runs from 1 for extremely inefficient buildings to 100 for a dwelling costing theoretically nothing to run. For those buildings which generate surplus energy to sell back to the grid, the SAP rating could rise above 100.

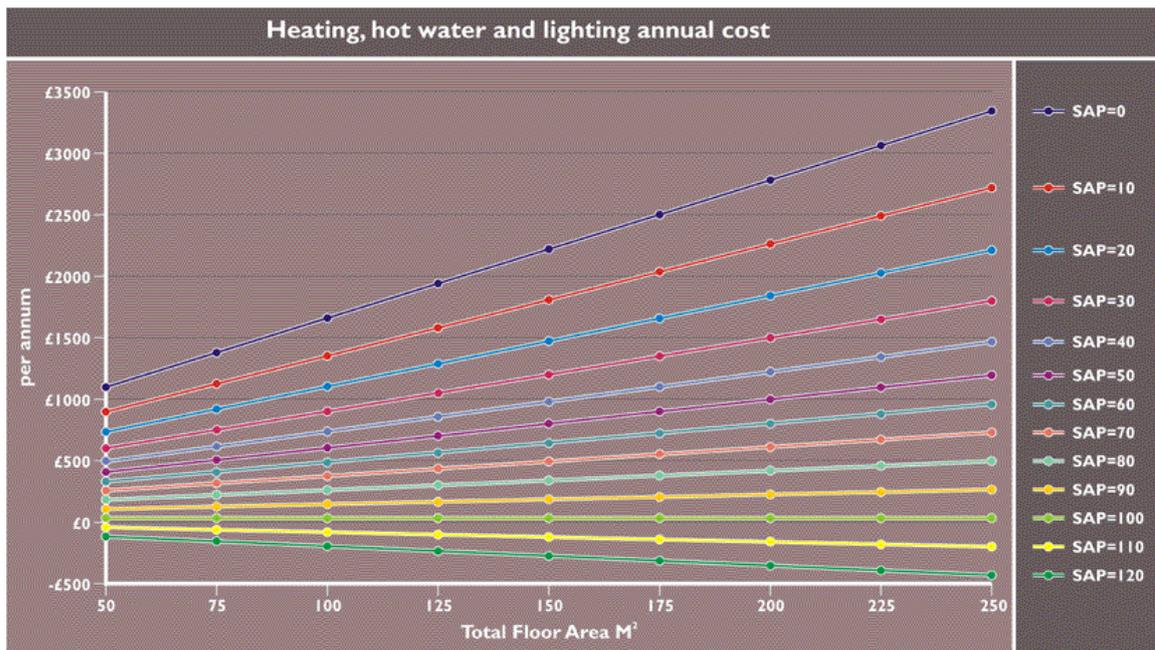
For the purposes of EPCs the SAP ratings are grouped into the following bands:

Band	Rating
A	92 or more
B	81 to 91
C	69 to 80
D	55 to 68
E	39 to 54
F	21 to 38
G	1 to 20

Interpreting SAP ratings

Standard Occupancy is central to SAP calculations: the estimate of energy consumed is based on national averages for appliance and hot-water use, and for space-heating temperatures and periods. Many larger traditionally constructed dwellings are not heated to modern standards and so the actual fuel costs may be much lower than the SAP rating would suggest. Even so, it can provide an interesting insight into theoretical running costs. The figure below shows how the annual fuel cost for heating, hot water and lighting are estimated from the SAP rating and the total internal floor area.

Fuel costs estimated from the SAP rating and the floor area



Fuel cost assumptions

SAP ratings assume an average cost for fuel over a period of time. SAP (2005) is based on costs across the UK between 2002 and 2005. Average fuel costs are normally updated only once every three years, so sudden but sustained rises in prices, such as those recently experienced, will not be reflected in the rating until the next update.

Applying SAP ratings to traditional buildings

SAP ratings for traditional buildings often prove to be very inaccurate. There are a number of reasons for this:

- it is easy to make errors in the basic measurements.
- simplified mathematical models are used to represent complex three-dimensional objects. They cannot hope to reflect the range of shapes and sizes of real buildings.
- most older existing buildings will have had many minor alterations, extensions, repairs and damage over the years all of which have affects current energy performance. Modelling all this complexity is impractical.
- The models are not flexible enough to include or allow for the very different materials and construction detailing of traditional buildings: there are simply no

boxes to tick for earth walls, thatch roofs, traditional timber framed buildings or even shutters on the windows.

- SAP does not take into account the thermal mass of construction (ie thick solid walls). In traditional buildings this helps to smooth temperature variations and reduce heating and cooling periods.

Ratings for existing dwellings are usually calculated with RdSAP, incorporating yet more assumptions and estimations into the result. Indeed RdSAP starts with the assumption that traditional building types are less energy-efficient than modern ones, an assumption that English Heritage disputes.

Another problem is that a large building uses relatively less fuel than a smaller one of similar type, because it has *relatively* less surface area through which heat can escape. This can create the impression that smaller buildings are poorly constructed or insulated and lead to pressure to 'improve' them. The SAP rating includes a mathematical adjustment which modifies this anomaly, but it is unable to remove it entirely.

Dwelling Carbon Dioxide Emission Rate (DER)

The DER is an extension of the SAP calculation, designed to estimate the carbon dioxide (CO₂) emissions from heating and lighting a building per unit of floor area. Any savings from energy-generation technologies are subtracted, and the result is expressed as kilograms per square metre per year (kg/m²/year). The DER is only used for new buildings, buildings which have been extended, or where there has been a change of use. Broadly speaking, to satisfy the requirements of Part L of the Building Regulations, all should be able to demonstrate carbon dioxide reductions of 20% over previous standards.

Since the DER is calculated using the same generalised assumptions that are built into SAP, once again it will be subject to the same flaws. However fuel costs will be irrelevant since the purpose of the DER is to calculate CO₂ emissions.

Unlike SAP, DER ratings contain no adjustment for the size of the building, so the rating for a large dwelling will be misleadingly lower than that of a smaller house built with the same materials and constructional details.

Environmental Impact Rating (EIR)

The EIR is intended to reflect the building's impact on the environment in terms of carbon dioxide emissions per square metre of floor space. Like the SAP rating the EIR applies a mathematical adjustment to reduce the bias that makes small buildings appear less efficient.

Like the SAP rating scale the EIR scale goes from 1 to 100, with 100 representing a building with no net emissions. This will be further simplified by assigning rating bands which will be the same as SAP ratings (e.g. A is equivalent to a score of 92 or more).

Since SAP ratings are based on the cost of fuel, they are not a close reflection of the overall environmental impact of the building (if fuel costs less, but is therefore used more, emissions will increase, but the SAP rating will nevertheless be better). DERs provide a more relevant measure but are not normally used for existing buildings because of their mathematical bias against small buildings. The EIR combines the best features of both other ratings. Nevertheless the EIR still often proves to be inaccurate for traditional buildings and its main use is in making theoretical comparisons between buildings.

Comments

English Heritage would value comments from Domestic Energy Assessors and members of the public on the usefulness (or otherwise) of this interim guidance note. We would also be interested in hearing about your experiences using Home Information Packs and especially the SAP process and its applicability to your building.

Please send these to conservation@english-heritage.org.uk . We will not be able to acknowledge individual submissions, or give advice, but we will do our best to incorporate your comments into future editions of these guidance notes.

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