**Energy Performance Certificates
for Existing Dwellings**
RdSAP Manual

BRE Training

Version 6.0   October 2009

File Name: bre rdsap training manual.pdf
Size: 4295 KB
Type: PDF, ePub, eBook
Category: Book
Uploaded: 11 May 2019, 21:42 PM
Rating: 4.6/5 from 759 votes.

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Book Descriptions:

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SAP 2012 is also used to produce Energy Performance Certificates for new dwellings. RdSAP 2012 v9.94 third link below should be used from 22nd September 2019. Join peers to innovate solutions and be part of the journey to make a difference. This applies to all countries and both to new dwellings assessed using SAP and to existing dwellings assessed using RdSAP. The details of RdSAP as it applied up to 31 March 2012 are in the amended SAP 2009 document see below. Join peers to innovate solutions and be part of the journey to make a difference. You can change your cookie settings at any time. Its purpose is to provide accurate and reliable assessments of dwelling energy performances that are needed to underpin energy and environmental policy initiatives. The SAP methodology is based on the BRE Domestic Energy Model BREDEM , which provides a framework for calculating the energy consumption of dwellings. Reduced Data SAP RDSAP was introduced in 2005 as a lower cost method of assessing the energy performance of existing dwellings. The assessment is based on standardised assumptions for occupancy and behaviour. This enables a likeforlike comparison of dwelling performance. Related factors, such as fuel costs and emissions of carbon dioxide CO_2, can be determined from the assessment. These indicators of performance are based on estimates of annual energy consumption for the provision of space heating, domestic hot water, lighting and ventilation. Other SAP outputs include estimate of appliance energy use, the potential for overheating in summer and the resultant cooling load. This and SAP2009 can be downloaded via the following links In due course it is also expected to underpin the Building Regulations in Scotland and Northern Ireland. Details of the consultation and responses can be viewed at the following links on the Consultation webpage. A formal review is currently underway, which is expected to be completed in 2016.http://marinapogon.pl/dynamic-programming-and-optimal-control-solution-manual.xml

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In the longer term it is anticipated that further changes will be needed in line with the requirements of European legislation. We'll send you a link to a feedback form. It will take only 2 minutes to fill in. Don't worry we won't send you spam or share your email address with anyone. We hope that you find it easy to follow and simple to use. This version of the manual has been produced to coincide with the introduction of the RDSAP 9.91 methodology in April 2012, which brings some substantial changes over previous versions. However, we may provide supplementary guidance as required in the form of additional handouts. Additional information may also be provided from time to time by other means, such as by. It is advisable to add any supplements to the manual binder because once you are qualified it will be up to you to maintain your knowledge of the latest conventions. The energy assessment industry is a fast developing one and changes are inevitable and regular. It is strongly recommended that you read more widely than this manual on some technical areas such as, for example, building construction. While the basics are covered here, you may wish to continue to increase your understanding of residential construction technology in order that you feel competent to inspect the full range of residential property. A current reading list supplied in Appendix 2 at the end of this manual. Becoming qualified is not just a matter of learning the technical aspects of RDSAP. There are other aspects to consider such as understanding the regulatory framework within which DEAs operate. This manual can be interactive, and in fact, we have deliberately made space available for you to scribble away so please feel free to make whatever notes, reminders or diagrams you need to within the pages. Just make sure that your notes are legible and technically correct as

the manual will be a useful point of reference, not just during training, but also for information in the future.

There are often times when it is useful to confirm your instincts with a quick check in the manual. The manual is divided into a number of clearly laid out Sections relating to major subject areas, e.g. heating or construction. Within each Section there are subsections containing subjects that are referred to in the contents page, for ease of location. SAP is used to produce energy ratings for new homes. RDSAP The Reduced Data SAP RDSAP is the government approved survey system used to produce the Energy Performance Certificates EPCs required by 2002 European Energy Performance of Buildings Directive EPBD, which came into force in The EPBD seeks to reduce the amount of CO_2 which is emitted as a result of heating, lighting and providing hot water to UK homes, many of which have remained poorly insulated. With certain exceptions an Energy Performance Certificate EPC is required whenever a residential property is sold or let and is currently valid for 10 years. The EPC gives prospective buyers and tenants up front information about the energy efficiency and running costs of the property they are considering occupying. The rating system that the EPC illustrates means that they can compare one property against another before choosing and, it is hoped that landlords and vendors would feel some pressure to upgrade their properties to make them more marketable and thereby some progress could be made in reducing the levels of CO_2 emissions. The physical RDSAP survey of a home required to produce an EPC is a noninvasive inspection. The DEA is not required to lift carpets to see the floors or to drill holes in the walls to see the insulation and is therefore limited in what they can see of the property. There may be some reliance on documentary evidence instead. RDSAP produces an EPC that, on its front page, shows an eyecatching and easytoread graphical illustration of the energy performance of the property similar to the labels displayed on white goods.

The graph starts at 1 in the red bar and extends to 100 in the dark green and represents the cost to the occupant of heating, lighting and hot water for the property. A low number in the red is an inefficient property and a high number in the green is an extremely efficient one. It is possible for a property to score above 100 but this is extremely rare and would normally involve exporting energy gained from a renewable energy system. It means that the cost of the energy consumption of the property is more than met by the income obtained from exporting surplus energy. On the front page the EPC will also provide an indication of the costs of providing heating, hot water and lighting to the property over a three year period along with a clear indication of the financial incentive to implementing the recommendations, i.e. the savings that could be made. It is important to note that these costs will not necessarily correlate with the occupant s billing history because RDSAP uses standard occupancy assumptions that may not reflect actual occupancy of the property. Conversely, you might encounter a large family inhabiting a very small flat and who use a lot of hot water and considerable heat. The RDSAP rating ignores the occupants and their behavioural patterns, focusing instead on the dwelling itself; its fabric, heating, lighting, etc. RDSAP works by measuring the annual cost of maintaining an acceptable temperature regime in a dwelling. The assumption is that an acceptable regime would be achieved by heating the property to 21 degrees Celsius in the lounge and 18 degrees Celsius in other habitable rooms for 9 hours per week day and 16 hours at weekends. The calculation uses the size of the property to estimate a suitable average number of occupants and hence the hot water requirements for that number of occupants. This method is sometimes referred to as an asset rating.

Recommendations The subject of recommendations is dealt with in more depth in Section nine of this manual. The EPC presents the reader with recommendations for improving the fabric of the building, the heating, lighting and other areas. The top three recommendations are shown on the first page of the report see below. There is also a first reference to the Green Deal in this section. The improvements suggested help to prioritise the different ways of saving energy, illustrated over a

three year period. Loft insulation and hot water cylinder insulation, for example, are obvious improvements, as they are cheap to purchase, can be easy to install, and often save enough energy to produce real savings in less than a year. The idea is to present the homeowner with enough information to help them decide on the best value for money when investing in energy efficiency. The recommendations report offers an independent comparison of the options for example installing new doubleglazing often only adding 24 SAP points with a new boiler and controls which could easily add in excess of 10 SAP points. The running costs associated with the ratings can also help the consumer to identify the best ways to target their money to reduce fuel bills. Energy efficiency measures do make sense for cost and comfort. A typical 1960s house could have its fuel bills reduced by 200 per year for an expenditure of about 500 an effective rate of return of 40% taxfree and inflation proof. Warmer, less draughty properties are generally more comfortable to live in and may command higher prices when sold or rented. Furthermore, our understanding of the ill effects of carbon dioxide and other pollutants on our environment should be reason enough to act. It is important that DEAs record these elements accurately during their inspection. Page 2 also shows details of any low and zero carbon technologies present.

Page 3 detail above contains the full set of recommendations and an indicative cost for each, together with suggested savings per year. The green ticks suggest the measure could be applicable for Green Deal funding and the orange tick suggests partial Green Deal funding. Page 4 of the EPC detail above shows the environmental impact rating graph which illustrates carbon emissions associated with the property, expressed in tonnes of carbon dioxide produced per year. Survey of the property Data collection Consider for a moment what it is that you are actually doing when assessing the energy performance of a property. An input of heat is needed to replace the heat lost through the envelope of the dwelling. Some of this comes from natural solar input or is generated by the occupants, but most of it has to be supplied by the heating systems. So the DEA collects information on those characteristics of the dwelling which influence the heat loss; as well as the characteristics of the heating system. While learning the process of inspection you can follow a survey form which will prompt you with the data items you need to record while at the property. Take care not to miss anything at the property as doing so may mean you are forced to return again later. When completing the survey forms, make your entries clear and if you do not use a section strike a line through it to show that you have not simply forgotten to complete it. For example, if there are no extensions strike a line through the section of the form that relates to extensions. You are obliged to maintain your site notes for a period of no less than 15 years. It is perfectly possible that you could be challenged on your findings long after the EPC was completed and your notes must be good enough to defend your position in this event.

You will collect information on the building, the age, construction and insulation present in the dwelling, together with information about the heating and hot water systems and any renewable energy systems. Your survey forms should provide supporting evidence to back up any decisions you make. For example, it is not good enough simply to state that the property was built in You must provide sufficient evidence to allow an auditor or other reader of your notes to be confident in your decision. Did you see the deeds and photograph them. Did the planning office provide a date. Did you rely on stylistic clues and if so what were they. The thermal envelope In order to calculate the heat loss of the property, the software needs to know the area of the walls, the external wall thicknesses, the floor areas, and the roof area assumed to be the same as the floor area together with details of any insulation present. The assessor measures these areas as well as the room height and the length of the heat loss walls. The subject of property measurement is covered in detail later in this manual. Results of thousands of previous energy surveys allow the software to accurately estimate the area of the windows for a property of any type and age without the need to actually measure the windows, in most cases. It is necessary that the assessor follows the conventions so that all DEA end up with the same result. A built element with a larger Uvalue will have a higher rate of

heat loss, so the built element will leak heat more quickly. The heat loss through the fabric of the building depends upon the construction method; material and thickness of each part of the envelope; and upon the area of that part. By collecting descriptions of the building age and construction, the energy rating software can assign a suitable rate of heat loss and U value to each built element of roof, wall, floor etc.

It can do this because the Uvalues are usually characterised by the building procedures of the period and since 1966 by the energy design standards demanded by successive upgrades of modern Building Regulations. However, what the software needs to know is whether any changes to the insulation standards have occurred since the property was constructed. So for instance, a house built during the period of has an assumed wall Uvalue of 1.0. If the wall has had cavity wall insulation fitted the improved U value falls to 0.40, a reduction of 60%. Such an insulation upgrade will substantially improve the EPC rating. RDSAP age bands are considered in Section Four of this manual. Heating systems The annual cost of providing heating including water heating to a home depends upon the amount of energy required to maintain the set standard of comfort, after allowing for the heat losses, the efficiency of conversion of energy to useable heat, the quantity of fuel needed to provide the energy, and the price of fuel. It will also be reduced or offset by the presence of any renewable energy system. Information is needed on the type of the primary heating system; details of the primary heat source e.g. the central heating boiler; the fuel used including for electricity the tariff, i.e. onpeak or offpeak; the use made of secondary space heating systems; the type of water heating system; the type of hot water storage, if any; as well as types of controls and renewable energy systems incorporated in the space and water heating systems. Heating is considered in more detail later in this manual. The software process When the DEA enters data into the software, it then uses the input data, combined with its builtin defaults, to carry out the calculations. The output of this calculation is the predicted running cost for the home under standard.

The predicted running cost is then divided by the floor area of the home and this figure is then converted into an energy efficiency rating and an environmental impact rating, somewhere on the A to G scale. The calculation is then used to estimate the savings from installing energy efficiency improvements, so that the energy advice report can make recommendations for improving the home and give a predicted potential rating if they were to be carried out. The Landmark Register The report is produced, reviewed by you and finalised when you are happy that its content can be finalised. Once finalised you cannot later change the report or its content. Once you are qualified, your EPCs will automatically be lodged on the Landmark Register where all EPCs are stored. During training and assessment you will not be able to lodge reports and do not have to worry about creating a real EPC for a property. You are able to practice with the software as much as you need to. All softwares use same conventions and methodology. While training you will have access to a training account which will allow you to use most of the features of EPC online but will stop short of allowing you to produce real EPCs. You are able to practice with the software without fear of actually creating an EPC for a property. The software that you will use at this stage is essentially the same as the live software that you will use once qualified. Purpose of EPC Marketed sale Nonmarketed sale Rental social Rental private This option should be used for EPCs required for marketed sales known as single survey in Scotland. This option should be used for Right to buy or sales that are not advertised. For example the sale of a house by one family member to another. This option should be used for dwellings owned by social landlords; this could be local authorities or housing associations. This option should be used for rental EPCs from the private sector.

Institutions such as universities will fall into this category. Not sale or rental This option should be used if the EPC regulations do not require and EPC for the dwelling, for example, if a homeowner wanted an EPC just to see how energy efficient their dwelling is. There is a field on this page that asks if the report is created from existing data. This refers to the practice of cloning, whereby data is

used from previous EPCs. This practice is outside of the scope of this manual and requires additional training. Further information may be gained by contacting NES. Consequently that field and the next, which asks for a reference number, should be left blank. You will be asked whether you measured internally or externally. Internal or external measurements The measurements required are The floor area The exposed perimeter Room height on each storey Exposed perimeter includes the wall between the dwelling and an unheated garage or a separated conservatory and, in the case of a flat or maisonette, the wall between the dwelling and an unheated corridor. Internal dimensions are permissible in all cases. When using external measurements for a dwelling joined onto another dwelling semidetached and terraced houses the measurement is to the midpoint of the party wall. Flats and maisonettes are usually measured internally. Whichever is chosen the same basis must be used for all parts of the dwelling. Room heights are always measured internally within the room, from carpet level to ceiling. The software automatically makes an allowance for the thickness of intermediate floors. This allows the software to assume an average wind speed for the area. The average wind speed is used in the calculation of the benefit of a micro wind turbine. Even if a wind turbine is not present the terrain type must be recorded to enable the software to assess whether a recommendation for a wind turbine is viable.

See the table for the choices and note that unless you are in a city centre location, suburban is the most common choice. Dense urban City centres with mostly closely spaced building of four storeys or higher Suburban Towns or village situations with other buildings well spaced Rural Open country with occasional houses and trees Mains gas available If there is a gas meter at the property or a mains gas appliance then you need to record that mains gas is available. The fact that there is a gas supplied to other properties in the street does not mean that mains gas is available to the property you are inspecting. Number of rooms and habitable rooms The software asks for the number of habitable rooms and whether any of these are unheated. Habitable rooms include any living room, sitting room, dining room, A nonseparated conservatory adds to the habitable room count if it has an internal quality door between it and the dwelling. Excluded from the room count are any rooms used solely as a kitchen; utility room; bathroom; cloakroom; ensuite accommodation and similar; any hallway; stairs or landing; and also any room not having a window. Flats and Maisonettes Note that flats are dealt with in more depth in Section Four. Semiexposed elements This page asks for details of the flat or maisonette you are entering and will simply not apply if you are dealing with a house. If you are entering a flat you will need to enter the flat type; that is whether it is a basement, a ground floor, mid floor or top floor flat. You will also be asked to enter the flat s position in the block. If it is a first floor flat, the floor position will be 1 and the software helps you by providing the choices. Under semiexposed elements the software asks if there is a corridor and, if so, what type and what length. A more detailed explanation of this and some examples is contained within Section Four of this manual.

Using either will mean that the software defaults to the insulation depth that apply according to the date you have entered for the property s or extension s date of build. However, with unknown there will not be a recommendation for further insulation. Take for example a roof in a 1900 terraced house, over the page. If you are unable to access the loft you might enter that the loft insulation is unknown. The software will assume the roof is insulated as it would have been when new in 1900 that would be none and there will then not be a recommendation for increasing the insulation. This is because the roof has not been assessed for its suitability; there might be a condensation problem or there might already be 300 mm of insulation. This does illustrate why it is so important for the DEA to make every effort to inspect the roof space where possible. Choosing asbuilt for a wall for example, means the wall is as it was when built. For a 2007 house cavity walls asbuilt means the walls are built to 2007 Building Regulations and will therefore be insulated. Property age Property age is extremely important to the software. The property age is required for the software to select the default heat loss values Uvalues for the wall, roof and floor and to calculate the window area.

Clearly properties of different ages will perform very differently and the general rule is that the newer the property is the better the U values of its component parts. Houses of different ages also have different window to wall and window to floor ratios. The age bands for newer properties correspond to changes in Building Regulations and the older age bands, pre1966, with changes in methods of building. The RDSAP age brackets are as follows and the job of the DEA is use their best efforts to date the property accurately and place it in the correct age band. Age bands Pre1900 A E I B C D E F G M J 2007 onwards K Roofs RDSAP deals with roofs on the main property and any extensions.

Each is entered separately, starting with the construction type. Roofs types, their insulation and the options available in the software are described in Section Five page 24.For both, this is where you will enter the construction type, insulation type, insulation thickness and any U values that are known. For walls the overall thickness of the wall is required and whether there is a dry lining. Note that walls and floors are covered in detail in Section Five. Aalternative wall This section of the software relates to alternative walls only and you will simply leave the section untouched if there is not such a wall at the property. You would enter an alternative wall type where the property has a significant area of wall that is of different construction or insulation level than the building part it belongs to, but this wall type cannot be identified as an extension since it does not surround any floor area. Where an area of alternative wall exists but it constitutes less than 10% of the total external wall area of the building part it belongs to, it can be ignored. The 10% of the wall area is identified including the windows and doors; it is only when measuring to the area of wall calculate the area to be included into the data summary that the area of any windows and doors is subtracted. This means that if you believe there to be an alternative wall then you will have to measure any window and door openings. Alternative wall types can occur as part of the main house, or part of any extension and you should record which of these applies. It is possible to enter up to five alternative walls. Note that alternative walls are dealt with in detail in Section Four. In this example, it looks to be approximately 10% of the total wall area, but further measurement is required. Dimensions The software requires the following data for the main property and each extension The floor area in metres squared. The room height in metres to the nearest centimetre.

The heat loss perimeter HLP in metres. See Section Four of this manual for detailed RDSAP measuring conventions. Rooms in the roof Note that roof rooms are dealt with in detail in Section Four. This section of the software deals with rooms built within the roof space of a property and the section will simply be ignored if there is not one at the property. A room in the roof is a habitable room built into what would normally be a loft space, above the main part of the dwelling, or above any extensions. Note that for such a loft space to qualify as a room in the roof for energy assessment purposes, it must incorporate fixed staircase access, i.e. not just a loft ladder. It will usually have sloping ceilings for part of the area and may also include dormer or Velux windows. If a roof room is present, the software requires you to enter the age range, floor area and the details of the insulation present. If you are able to obtain documentary evidence of the Uvalues of the component parts, you can enter this information in the extended data section on roof rooms see Section Four. 22 Openings windows Note that windows and glazing are dealt with in detail in Section Four. This section of the software deals with the openings in the property created by windows and also by any open fireplaces and ventilation systems. Details of any draught proofing are also entered here. The software asks that you enter whether the window area is typical of that type of property or whether it is more or less than typical. It also asks that you enter the proportion of the property s window area that is multiple glazed if any and what type of multiple glazing is present.Open fireplaces On the same page of the software in the ventilation section you are asked to enter the number of open fireplaces. These contribute greatly to the ventilation of the property and will remove some of the warmth generated by the heating. Note that open fireplaces are dealt with in detail Section Four of this manual.

Ventilation The software asks you to enter the ventilation method and the options are Natural ventilation this means the property is ventilated in the traditional way by windows and possibly vents in the walls and windows. Mechanical, supply and extract this is a whole house mechanical system which both introduces fresh air into the property and extracts heat from the stale air. Bathroom and kitchen extractors DO NOT qualify as mechanical ventilation. Mechanical, extract only this is a whole house ventilation system which mechanically extracts stale air from the property passive vents or gaps in the fabric of the building. This is sometimes known as MEV. Bathrooms and Kitchens extractors do not get classed as MEV. Air conditioning The presence of air conditioning in the property simply requires a box to be ticked in the software. Extended openings This section is for use when there is much more or much less than typical areas of glazing at a property and enables the location, dimensions, glazing type, orientation, U value and g value of each window to be entered individually. See also Section Five. 23 Space heating Main heating systems This important section of the software deals with the MAIN heating systems within the property. It is possible to enter either one or two main heating systems and apportion the amount of work each does in maintaining the acceptable heating regime that was described earlier in this manual. The Product Database which contains specific technical information on a wide range of heating systems is located in this section of the software. Searching it for a system just requires clicking on the appropriate tab. A number of entries are required about the main heating systems and given the complexity and range of possible entries, these have been covered in the heating section of this manual Section Six. 24 Electric meter See Section Four of this manual for more about electric meters.