

10 ways that SAP 2009 will impact you

The new SAP 2009 methodology was published in draft for consultation on May 13th 2009. This article from Dyfrig Hughes of National Energy Services summarises the key changes that will most affect builders and designers.

Overview

The draft SAP 2009 contains a number of things that will impact substantially on design and construction practice. We will not know the full extent until Part L 2010 is released, but the changes in SAP 2009 will in themselves have a considerable impact.

There are essentially two types of change within SAP 2009. Firstly, those that aim to improve the accuracy of the SAP methodology. Secondly, changes to make SAP more flexible, enabling a variety of new and existing technologies to be combined within a given dwelling.

The overall effect will be an increase in the predicted energy consumption of dwellings for heating. There will also be an increase in energy use in dwellings with air conditioning as the cooling load is also now considered. The amount of CO₂ produced per unit of energy consumed will also increase substantially in many cases, due to a new national assessment methodology. The CO₂ emissions from electricity will, for example, increase by 40% between SAP 2005 and SAP 2009.

The key Building Regulations compliance criterion is that the Dwelling Emission Rate (DER) for the proposed dwelling must be less or equal to the Target Emission Rate (TER). The DER and TER are based on carbon emissions per square metre of floor area for heating, hot water and lighting. Many of the changes in SAP 2009 will affect both the DER and TER. This means that housing developers may not feel the full impact of these increases in emissions. It will however be harder to achieve a zero carbon home.

This article looks at the 10 changes within SAP that seem most likely to impact design and construction.

1. Party Walls

In SAP 2005, heat loss through party walls is assumed to be zero. In SAP 2009, the U-value of a cavity party wall will be set to between 0.0 and 0.5 W/m²/°C, depending upon the specification. This is because research by Leeds Metropolitan University has demonstrated that air movement within the cavity leads to a substantial amount of heat loss, more so than a similar area of external wall. In the dwellings studied in their research, the effective U-values for party walls were estimated at between 0.50 and 0.63 as compared to the external wall U-value of 0.23 and the floor U-value of 0.17. Developers must now design and build so as to eliminate this air movement—for example, fully filling the party cavity in conjunction with edge sealing and possibly adding a “cavity sock”. The U-values assumed by SAP 2009 are therefore taken as 0.50 for an unfilled, unsealed cavity; 0.20 for a sealed unfilled cavity and 0.0 for a fully filled and sealed cavity. For more details of the research backing this up and of the measures that can be taken to address the problem, see:

<http://www.leedsmet.ac.uk/as/cebe/projects/stamford/pdfs/del7coheating.pdf> (alternative URL: <http://tinyurl.com/pmur8o>)

2. Thermal Bridges

In SAP 2005 it is possible to assess the impact of non-repeating thermal bridges very easily by adopting Accredited Construction details and assigning an effective U-value (the 'y' value) of $0.08 \text{ W/m}^2/^{\circ}\text{C}$. In practice, the Accredited Construction Details approach does not appear to be delivering buildings on the ground with the claimed thermal performance. A better approach is to assess the heat losses through each thermal bridge and to add them all up. This approach is already available in SAP 2005 as the preferred approach, but it requires more work than being able to select a single 'y value'. As U-values are increasingly reduced to generate further CO₂ reductions, the proportion of heat loss through thermal bridges becomes increasingly important.

The only 'y value' option available in SAP 2009 is the 'worse case' value of 0.15. To better this, developers and SAP assessors will need to examine the detailing at junctions e.g. between walls, floors, roofs, windows and internal walls; and to properly assess the heat loss through thermal bridges.

Changes in the SAP methodology for carrying out these calculations also mean that the calculated thermal bridging heat loss may be significantly higher in SAP 2009 than was the same calculation in SAP 2005. This is because SAP 2005 ignored junctions with party walls and, where Accredited Construction Details are not being used, the calculated values are multiplied by 1.25.

3. Cooling and Air Conditioning

SAP 2005 includes an assessment of the risk of the dwelling overheating in summer, and is one of the criteria for Building Regulations approval. If dwellings overheat there is a risk that the usage of portable and fixed air conditioning systems will increase, with a consequent increase in carbon emissions.

SAP 2009 adds the ability to assess the need for cooling and the associated energy and carbon emissions from fixed air conditioning systems. Homes fitted with air conditioning will therefore see an increased DER. As these systems run on electricity the associated CO₂ emissions can be substantial. A 3 kW system running continuously for four hours per day from June to August would produce around 650 kg of CO₂. On this basis the DER in a dwelling with a floor area of 150 m² would be over 4 kg CO₂/m² (as compared to a typical DER in a 2006 Regulations dwelling of around 22). However, SAP 2009 takes a number of factors into account in estimating the energy consumption, including the A to G rating of the unit, the thermal mass of the dwelling and the external temperatures in the region that the dwelling is located. Oddly, SAP 2005 also assumes that the dwelling only needs cooling down to a temperature of 25 °C. The effect of this is that the increase in the DER due to the air conditioning is likely to be much less than 4 kg CO₂/m².

Notice that, unlike heating, the cooling load will vary by region. This makes increasingly questionable the fact that, for the heating calculation, SAP assumes the same external temperatures in the north of Scotland as it does in the south of England. Indeed one of the questions posed in the consultation document for SAP 2009 is "Looking ahead, should SAP ratings be regionally dependant?"

4. Thermal Mass

Thermal mass is a measure of how 'lightweight' or 'heavyweight' a building is.

Timber frame is typically a 'lightweight' construction whereas a building with external, party and internal walls made from heavyweight block and with concrete lower and upper floors is typically 'heavyweight'. 'Heavyweight' energy efficient homes generally make better use of solar gains in the day by absorbing them and radiating the warmth later on as the level of solar radiation drops.

The summer overheating calculation in SAP 2005, takes thermal mass into account. SAP 2009 takes this a step further by using the thermal mass in calculating the heating and cooling load. Experience in the Republic of Ireland, where thermal mass is already part of their SAP calculation, indicates that the inclusion of thermal mass for heating will lead to differences in SAP ratings of around 1% between lightweight and heavyweight constructions.

5. Hot Water

The main change of interest to designers, developers and builders here is that the assumed hot water usage in a dwelling is reduced by 5% if the dwelling is designed to achieve a water use target of not more than 125 litres per person per day (all water use, hot and cold).

6. Multiple Heating or Ventilation Systems

In SAP 2005, you could only have one central heating system, backed up by one room heater. SAP 2009 enables you to have two central heating systems or boilers running on different fuels. The heat load is split between two separate systems according to the floor area served. It is not quite clear how it will be split when two different boilers serve the same heating circuit.

Community heating schemes can now also be accommodated that have two boilers (or two sets of boilers) running on different fuels in addition to a Combined Heat and Power (CHP) plant.

Similarly, a dwelling can now be served by two different mechanical ventilation systems.

7. Heat Pumps

In SAP 2005, the Coefficient of Performance (COP) of a heat pump was fixed within the SAP calculation. SAP 2009 enables manufacturers to add their heat pumps to a database containing the specific COP. It is not yet clear what difference this will make to the performance of heat pumps as trials by manufacturers to estimate actual COPs are still underway.

8. Innovative Technologies

SAP 2005 introduced the Appendix Q feature. This was to enable newly available innovative technologies to be included within a SAP calculation without having to wait until the next SAP revision. This appears to have worked well, although the number of technologies added since SAP 2005 came out has been fairly small. SAP 2009 allows more than one system to be added at one time. So for example, it will be possible to add a system that recovers heat from boiler flue gases as well as a system that recovers heat from waste water from showers.

9. CO₂ Emission Factors

SAP 2009 includes a significant revision in the assumed CO₂ emissions per kWh of fuel used. For example, the factor for electricity increases from 0.422 to 0.591 i.e. a 40% increase; anthracite goes up from 0.317 to 0.365, a 15% increase. By contrast, mains gas goes up from 0.194 to 0.206—a 6% increase. There is also a substantial drop in the emissions associated with community heating schemes running on waste combustion (down 17%), and biomass (down 24%). Similarly, for individual heating systems, emissions from wood chips go down while emissions from wood pellets in bags go up. This is because the calculations now include many more factors (e.g. transportation) and are uniform across all fuels. Although these changes will most likely be masked in Building Regulations due to the TER/DER approach, they will make it more difficult to achieve low and zero carbon homes. They will also change the relative performance of systems running on the various fuels.

10. Lights, Appliances and Cooking

These all contribute heat to a dwelling, some of which is useful and which reduces the heating requirements of the dwelling. SAP 2009 includes two ways of assessing these and other incidental gains (such as heating from pipework, solar gains and heat gains from people). The DER will assume a level of gains that is around 33% lower than that assumed in the SAP rating. This is to encourage builders to get the heat and cooling demand of the dwelling down to a level that presumes the presence of low energy appliances and lighting.

Conclusion

The draft SAP 2009 contains a number of things that will impact designers, builders and developers. The most significant changes likely to affect work on site are the need to insulate and seal party walls and the need to pay serious attention to non repeating thermal bridges. However, there are also a host of other changes that taken together will have a significant impact. We will need to see the accompanying Part L changes before the full impact becomes clear.

Responses to the SAP 2009 consultation are required by 12th August 2009.

About Dyfrig Hughes and National Energy Services

Dyfrig Hughes manages the NHER Technical and Development team at National Energy Services Ltd and oversees the development of NHER Plan Assessor, the NES SAP based tool for Regulations compliance, Code for Sustainable Homes energy assessment and production of newbuild Energy Performance Certificates (EPCs). He has worked in the energy field since 1983 and in 1990 issued the first ever energy rating certificate in the UK. A free trial of NHER Plan Assessor is available by calling NHER on 01908 672787.

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