SAP 10

Initial impact assessment of the changes to the SAP procedure to be incorporated in SAP 10

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Contents

Disclaimer: This statement has been prepared by AES Sustainability Consultants to inform our clients of the changes proposed to the wording and methodology within SAP 2016 (10) and the potential impacts this may have on future developments. The combined impact of the proposed changes to the methodology cannot be accurately established at this stage, and the final wording and methodology within SAP 2016 (10) is still to be released. AES Sustainability Consultants does not accept any responsibility for any costs incurred by any action taken as a result of this document.

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1 Introduction

1.1 A consultation was launched by BEIS in November 2016, setting out some proposed changes to the Standard Assessment Procedure (SAP) which is currently at version '09', as published in October 2013.

1.2 A consultation response was issued by the Government in November 2017 indicating that the majority of proposed amendments would be adopted, taking into account the consultation responses received.

1.3 A revised SAP document was published on 24th July 2018 incorporating the proposed amendments. At this stage whilst the SAP document is available, the software tool is yet to be published and the impact of some of the changes cannot be quantified. This document seeks to provide an indicative assessment of the impact of the proposed changes.

1.4 A change to Part L of the Building Regulations will be required before the revised SAP procedure can be adopted and used for Building Regulations compliance calculations, and therefore further consultation is expected before the revised methodology is adopted.

1.5 Current indication from BEIS is that that the consultation may be launched in Spring 2019, and therefore the changes are unlikely to be enacted until 2020.

Summary of key changes

1.6 The following areas of the assessment have been amended:

- CO_2 emissions factors
- Assumed heating patterns
- Changes to design temperature flow options
- Default heat pump efficiencies
- Heat network distribution losses
- Lighting assessment
- Thermal bridging
- Incorporation of shower flow rates
- MVHR performance
- Air flow rates of chimneys and flues
- Solar PV and battery storage
- Overheating

2 CO_2 emissions factors

2.1 One of the most significant changes is the proposed amendment to the majority of the fuel emission factors.

2.2 The largest change is to the factor for grid sourced electricity, which is lowered from 0.519kgCO_2/kWh to 0.233kgCO_2/kWh, representing a 55% reduction. The latest available figures from the National Grid support a reduction to this level as realistic and therefore whilst lower than the figure in the original SAP consultation, it is considered highly likely that a change of this magnitude will be carried through to the final version of SAP 10.

Impacts

2.3 The change to the calculated emissions from electricity is likely to have significant impacts in a number of areas:

- Dwellings utilising electricity for heating and hot water will have calculated emissions rates (DERs) much closer to mains gas. Assuming the fuel factor utilised for amending

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the TER calculation for electrically heated dwellings (currently 1.55) is removed, a consistent baseline will apply to gas and electrically heated dwellings. In many instances it would be anticipated that no carbon offset is likely to be required for Part L compliance with electric heating.

- The benefits from Combined Heat and Power will be reduced, as the carbon offset from producing electricity locally is substantially reduced. Coupled with the change to assumed distribution losses (see later section) this is likely to have a significant impact on the viability of CHP units.
- Solar PV systems will be need to be twice as large to deliver a given carbon reduction to address e.g. planning targets. This may swing the balance in favour of alternative low carbon or renewable energy technologies, such as heat pumps, which aligns with wider government support for this technology.
- The carbon saving potential from heat pumps is significantly increased. An air source heat pump with a COP of 2.5 would be capable of delivering heat with an effective carbon intensity of 0.09kgCO_2/kWh, less than half that of mains gas, rather than at around the same level.

2.4 Notwithstanding the lower carbon emissions, electricity remains an expensive fuel for heating, with standard tariffs at a current UK average of around 4p/kWh for gas and 16p/kWh for electricity. Viability for a switch to larger dwellings is therefore likely to be limited, and the benefit will mainly be seen in apartments where heating and hot water demand is much lower and where additional advantages of removing gas infrastructure/flues etc applies.

3 Heating patterns & flow temperatures

3.1 The assumed heating pattern has been changed to a consistent daily pattern for weekdays and weekends, reflecting evidence provided at consultation. In addition, alternative design flow temperatures have been provided for heat pumps and condensing boilers.

Impacts

3.2 At this stage the impact is difficult to quantify, however a reduction in total heating time and load is likely to reduce the emissions from heating, thereby shifting the proportion of total emissions that this accounts for and increasing the significance of hot water demand and other demands.

4 Heat pump efficiencies

4.1 A change to the SAP default heat pump efficiencies is proposed through the application of amended installation factors, applied where the product has been installed in accordance with the Microgeneration Installation Standard MIS3005.

Impacts

4.2 In general, SAP default figures are not utilised for final SAP calculations, as manufacturers efficiencies are input from the PCDF and in general are significantly higher than the default figures. The impact of this change is therefore limited.

4.3 With the change to carbon emissions from electricity significantly affecting the calculated carbon benefit of heat pumps, it is likely that these technologies may gain more traction in the market, particularly where planning targets require CO_2 reduction levels beyond Building Regulations standards to be met. Any further changes to the calculation of heat pump efficiency may therefore have a material impact on heating solutions and will be reviewed accordingly.

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5 Heat network distribution loss factors

5.1 Distributing heat around buildings will incur heat losses through the distribution pipework. In SAP 09, heat networks are currently assigned a loss factor of 5% - i.e. 95% of generated heat is delivered to the dwelling. Evidence provided as part of the SAP consultation indicated that this was an extremely optimistic assumption, and that actual losses could be up to circa 60% of heat generated.

5.2 SAP 10 therefore proposes a default distribution loss factor (DLF) of 1.5 (33% heat loss) providing the network is designed and signed off in accordance with the CIBSE/ADE 'Heat Networks: Code of Practice for the UK'. In the absence of a confirmed declaration to this effect, a default DLF of 2.0 is applied (50% heat loss).

5.3 Alternatively, if the DLF can be specifically determined from design stage data or measured performance and is entered onto the Product Characteristics Database (PCDB), this value can be selected for as-built assessments (see Figure 1).

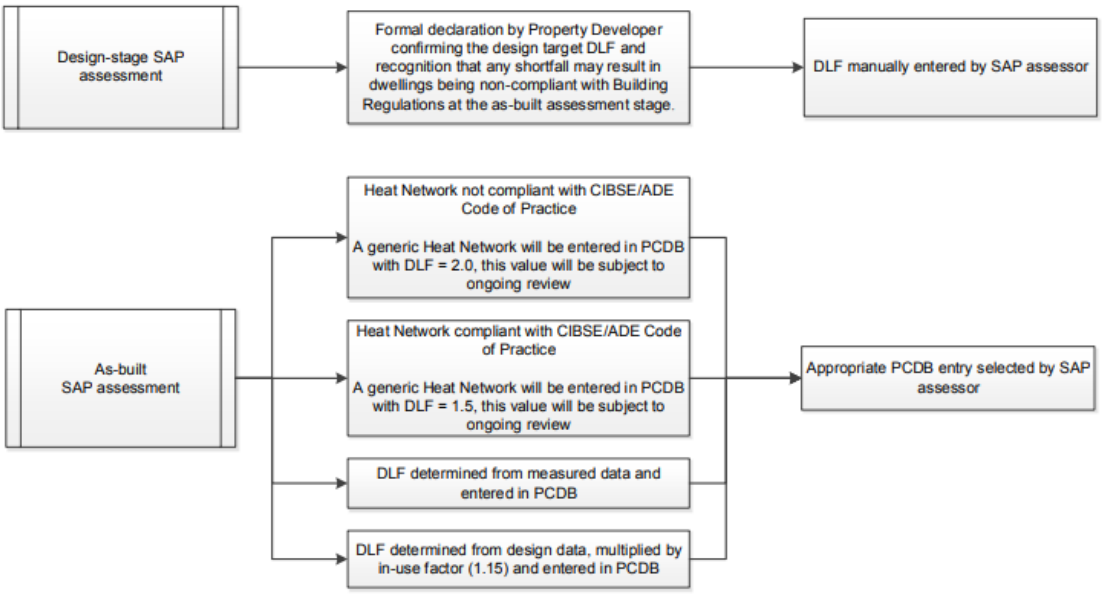

Figure 1. Selection of appropriate heat network distribution loss factor, SAP 10

Impacts

5.4 It is likely that whether specifically calculated DLF values or the default DLF of 1.5 is used, heat networks will not compare favourably with alternative heating systems, simply due to the level of heat wasted being included in the calculation.

5.5 For example, in SAP 09 a modelled apartment connected to a heat network with a 95% efficient communal gas boiler and DLF of 1.05 would achieve Part L compliance (DER/TER) by +1.49%. Amending the DLF to 1.5 represents a swing of over 35% to the negative, representing a DER/TER of -34.48%.

5.6 If an estimated DLF figure is provided at design stage could not be met or substantiated at 'as-built' stage, there is a real risk of non-compliance with Part L with limited mitigation options.

5.7 Combined with the significantly reduced carbon benefit from CHP systems, the impact is likely to make the current approach to communal heating systems significantly less viable.

5.8 It is anticipated that the change may increase the need for innovative solutions for communal heating systems, such as those powered by low carbon heat sources e.g. heat pumps or biomass, and/or utilising very low temperature distribution systems.

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6 Lighting energy

6.1 A change to the assessment of lighting energy demand will entail the calculation of a 'reference lighting capacity' within SAP. Lighting power and efficacy of the designed system will need to be input by the SAP assessor based on lighting designs / GCS specification and if the reference values are not met, default efficacy figures will be applied.

Impacts

6.2 At this stage the impact of the change cannot be quantified, however evidence will need to be provided to assessors and depending on the default values, additional low energy lighting may need to be installed rather than just empty fixtures provided in order to avoid a penalty.

7 Thermal bridging

7.1 There are a number of key changes proposed to the treatment of thermal bridging:

- Overall default Y-value changed from 0.150 to 0.200
- Removal of 'accredited' Psi values from SAP Table K1 (individual defaults only)
- Default Psi values amended, some significantly worse

Impacts

7.2 In general, an overall default Y-value is rarely utilised, as performance is generally improved by calculating bridging lengths even where individual defaults are used. It may be applicable in some circumstances with bespoke detailing where no individual or industry calculations are available.

7.3 For many assessments, accredited values are currently utilised where the checklist requirements are met. The removal of these values, together with the substantially worse defaults means that in the majority of cases Part L compliance will be difficult to gain without utilising details from one of the approved sources:

- Government approved sources e.g. Accredited Construction Details Scotland (2015)
- Details from reputable non-government database of independently assessed junction details
- Psi values calculated by person with suitable expertise and experience and following guidance in BR497

7.4 Where a standardised build specification and detailing is used, the current approach of using approved values applicable to the construction (e.g. Constructive Details for aircrete masonry) or values calculated specifically (e.g. by AES) for that developer and detailing will continue to apply.

7.5 For bespoke details and steel / concrete frame construction there will be a need to calculate thermal bridging values on a project-by-project basis, or consider adoption of standardised detailing to avoid needing to recalculate. This is already often the most cost-effective route for compliance rather than requiring higher insulation standards or technology to provide carbon offset, however will be even more critical under SAP 10 in ensuring Fabric Energy Efficiency compliance as well as carbon compliance.

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8 Shower flow rates

8.1 The calculation of hot water demand will take into account both the number of showers and baths present and provide a more accurate assessment of actual hot water consumption. In addition, the electricity used by electric showers will be taken into account which is currently overlooked in SAP 09.

8.2 A number of additional background changes relating to shower durations and incoming mains water temperature will also be applied.

Impacts

8.3 The impacts of the changes cannot be quantified at this stage. Due to the change to carbon emissions factors for electricity, the inclusion of electric showers within the calculation is likely to be of a minimal impact to overall CO_2 emissions when compared with including an equivalent shower.

9 MVHR performance

9.1 In-use factors for the efficiency of mechanical ventilation systems are applied in accordance with Table 4h. For MVHR systems, amended factors will be applied, split between systems installed entirely within the heated envelope or not, and with 'Level 1' or 'Level 2' insulated ductwork. The factors for systems outside the envelope and with uninsulated ductwork are significantly worse than the current values.

9.2 To enable the use of PCDB approved performance figures, the SAP assessor should be supplied with a completed inspection checklist and air flow measurement test sheet following commissioning to enable the calculated performance to be claimed.

Impacts

9.3 The calculated performance of systems will be improved where system design is efficient and fully insulated to the minimum standards stated, and penalized where these requirements are not met. This should incentivise good design and insulation where these systems are specified or the benefit will be lost.

9.4 If systems are not installed and commissioned appropriately, with documentation provided, the assessed efficiency will be dropped to the default values within the SAP document - SFP of 2.0, heat recovery 66% - versus typical figures of SFP 0.6 and heat recovery of 90%, significantly affecting the assessed benefit.

10 Air flow of chimneys and flues

10.1 Additional categories have been added for open chimneys and flues attached to different types of heating appliance. Flow rates for intermittent fans and the majority of other types are retained at current values, therefore the most significant is a reduction in flow rate for a flue attached to a closed fire (stove) which is effectively reduced from 20m^3 to 10m^3 /hour.

Impacts

10.2 It is likely that the assessed performance of closed stoves will be improved. Wood burning appliances will become slightly more beneficial to the SAP calculation. Multi-fuel appliances will continue to be penalised by the carbon emissions which relate to coal / anthracite.

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11 Solar PV and Battery storage

11.1 SAP 09 uses a fixed assumption that 50% of energy generated is utilised in the dwelling, for the calculation of EPC costs. SAP 10 will recognise battery storage through a higher self-consumption factor of 0.9 being applied.

11.2 PV diverter systems - diverting surplus PV generation to a hot water immersion rather than export - will additionally be recognised, up to a capacity cap of 15kW. A correction factor of 0.9 applies to the hot water storage reflecting potentially higher storage temperatures and associated heat loss.

11.3 The option to gain carbon benefit from installing a system connected to the landlord supply of an apartment block will be removed.

Impacts

11.4 The impact of the inclusion of battery storage is limited to the EPC cost rating and will not affect DER/TER.

11.5 The removal of carbon benefit for systems connected to landlord supply would require that the PV systems are connected directly to one or more dwellings within an apartment block, and a block compliance calculation would be applied to calculate overall emissions.

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