Potential Impact Assessment

Changes in wording and methodology between SAP 2012 (SAP 09) and Draft SAP 2016 (SAP 10) with regards to the assessment of summertime overheating

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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 in relation to the assessment of overheating only. The combined impact of other proposed changes within SAP 2016 have not been taken into account at this stage. The final wording and methodology within SAP 2016 (10) is still to be released and 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 Overheating assessment methodology – SAP 2012 vs SAP 10

1.1 The recently published draft SAP 2016 (SAP 10) methodology changes the methodology for the assessment of the risk of summertime overheating. If taken forward to the final document this may result in more properties failing Criterion 3 within SAP without mitigation measures. The proposed changes to the wording and assessment methodology are outlined below.

Extract from SAP 2012 (SAP 09)

1.2 The following table is taken from SAP 2012 (SAP 09) and provides guidance on air change rates which can be assumed for naturally ventilated properties when assessing the risk of summertime overheating against Criterion 3 (Limiting the effects of heat gains in summer) of Approved Document L1A.

Table P1: Effective air change rate

Window opening	Effective air change rate in ach			
	Trickle vents only	Windows slightly open (50 mm)	Windows open half the time	Windows fully open
Single storey dwelling (bungalow, flat) Cross ventilation possible	0.1	0.8	3	6
Single storey dwelling (bungalow, flat) Cross ventilation not possible	0.1	0.5	2	4
Dwelling of two or more storeys windows open upstairs and downstairs Cross ventilation possible	0.2	1	4	8
Dwelling of two or more storeys windows open upstairs and downstairs Cross ventilation not possible	0.1	0.6	2.5	5

Cross ventilation can be assumed only if at least half of the storeys in the dwelling have windows on opposite sides and there is a route for the ventilation air. Normally bungalows and two storey houses can be cross ventilated because internal doors can be left open. Three storey houses and other situations with two connected storeys of which one is more than 4.5 m above ground level often have floors which have fire doors onto stairs that prevent cross ventilation.

Slightly open refers to windows that can be securely locked with a gap of about 50 mm. Often this option will not give sufficient ventilation.

Windows on ground floors cannot be left open all night because of security issues. Windows on other floors can. Fully open would refer to dwellings where security is not an issue (e.g. an upper floor flat) or where there is secure night time ventilation (e.g. by means of grilles, shutters with vents or purpose-made ventilators). In most cases where there are ground and upper floor windows 'windows open half the time' would be applicable, which refers principally to night-time ventilation (ground floor evening only, upper floors open all night).

1.3 The effective air change rate is therefore selected based on whether the dwelling is able to be cross ventilated (windows on opposing sides) and the degree to which windows can be left open.

1.4 Within the assessment, 'fully open' refers to fully open, 100% of the time, 'Half open' refers to fully open, 50% of the time. The 'fully open' option could therefore only be selected for units without a security risk, and the 'half open' option would be applied to ground floor apartments and houses where ground floors would have similar security concerns.

1.5 The methodology allowed for high window g-values to be used throughout the UK, especially for houses, realising the benefit of high levels of solar gain.

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1.6 A high risk of overheating under the current methodology is therefore seen mainly on ground floor apartments, as no secure means of ventilation in conjunction with single handed units (no cross ventilation) only allows for 2 ACH under Table P1 (SAP 2012).

Current mitigation measures

1.7 Ground floor units could potentially be treated as 'secure' with the introduction of secure night time ventilation (e.g. louvres or security grilles). However, this option is very rarely used by volume house builders – instead, a high risk of overheating in ground floor apartments is usually overcome by lowering the g-value and/or the introduction of additional boost ventilation (through the wall fans for cost reasons).

Concerns with methodology

1.8 The consultation document (CONSP 14 – Proposed revisions to SAP Appendix P) quotes the Zero Carbon Hub (Overheating in Homes - The Big Picture, 2015) as follows:

> *'Housing Providers and experts raised many concerns with Appendix P. The view, summarised by the quote 'no one fails Appendix P' suggests the process is not separating out properties which are genuinely at risk of overheating as effectively as it could. Stakeholders considered that the assessment is too easy to pass and, as currently structured, allows assumptions to be included that are unrealistic. For example, that windows are constantly open. The result is that a 'low risk' assessment may be given inappropriately.'*

Extract from SAP 2016 (SAP 10):

1.9 The consultation paper identifies that air change rates based on windows being open for a full 24 hours are often not practical, especially where noise or security may be an issue. The SAP consultation largely follows the proposed wording of CONSP 14, but limits the available options to 'trickle vents only', 'windows slightly open' or 'windows fully open', as shown in the revised table P1 below:

Window Opening	Effective air change rate in ach		
	Trickle vents only	Windows slightly open (50 mm)	Fully open
Single storey dwelling (bungalow, flat) Cross ventilation possible	0.1	0.8	3
Single storey dwelling (bungalow, flat) Cross ventilation not possible	0.1	0.5	2
Dwelling of two or more storeys Windows open upstairs and downstairs Cross ventilation possible	0.2	1	4
Dwelling of two or more storeys Windows open upstairs and downstairs Cross ventilation not possible	0.1	0.6	2.5

1.10 The previously used natural ventilation air changes for 'fully open' (100% of the time) have been removed from the document as the consultation suggests and the air changes quoted as 'window half open' under SAP 2012 have been renamed to 'fully open'.

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Introduction of additional checks

1.11 The following extract is taken from the SAP 10 document:

1. Determine the effective air change rate during hot weather. If a mechanical ventilation system provides summer ventilation, use the specified air change rate for the system. If this is a higher rate than is used during the heating season, the assessor should obtain evidence showing that this higher rate can be maintained continuously. If natural ventilation is used the answers to the following questions are used by SAP software to select the appropriate entry from table P1: This contains indicative values based on the procedure in BS 5925[43].
    a. Is there a local source of noise likely to prevent windows being left open for long periods? (Y/N)
    If the dwelling is in close proximity (<20m) and line of sight to a main road, railway, industrial site, is under a major airport approach (within 6km from airport), or subject to any other obvious source of noise, this should be assumed to prevent occupants from opening windows for long periods .
    b. Is there a security risk if windows are left open unattended? (Y/N)
    Assume any window or door classed as 'easily accessible' according to Approved Document Q could not be left open unattended, unless appropriately certified secure night time ventilation (e.g. by means of grilles, shutters with vents or purpose-made ventilators) is fitted. Note that this classification will include some upper floor windows.
    c. To what extent can windows be left open for extended periods? Choose from:
        - Can't be left open (trickle vents only)
        - If the answer to a. or b. is 'yes', assume trickle vents only (and the following options should be supressed).
        - Slightly open (50mm)
        - Slightly open refers to windows that can be securely locked with a gap of about 50 mm.
        - Fully open
    d. Is cross-ventilation possible?
    Cross ventilation can be assumed only if at least half of the storeys in the dwelling have windows on opposite sides and there is a route for the ventilation air. Normally bungalows and two storey houses can be cross ventilated because internal doors can be left open. Three storey houses and other situations with two connected storeys of which one is more than 4.5 m above ground level often have floors which have fire doors onto stairs that prevent cross ventilation.
    e. Number of storeys: this is determined from the dwelling dimensions data.

1.12 The new text aims to make the current assessment with respect to security more robust, and adds a check relating to local sources of noise.

Security

1.13 The wording of the SAP 10 document suggests that potentially all houses have an inherent security issue by following the definition for 'easily accessible' from AD Q.

Either:
- a window or doorway, any part of which is within 2m vertically of an accessible level surface such as the ground or basement level, or an access balcony, or
- a window within 2m vertically of a flat or sloping roof (with a pitch of less than 30°) that is within 3.5m of ground level.

1.14 Following this wording in conjunction with the revised Table P1, it could be assumed that any ground floor windows cannot be securely left open without secure night time ventilation, and dwellings with ground floor windows must therefore be assessed under the category 'trickle vents only'.

1.15 A more appropriate approach would be to adopt the wording of CONSP 14. "If the property has two storeys, then one of the 'single storey dwelling' rows should be chosen to reflect reduced ventilation due to ground floor windows being closed", thereby still allowing for 'fully open' windows.

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Noise

1.16 The impact of the proposed changes is significant, as where noise constraints apply as defined within the document it should be assumed that ventilation is through trickle vents only. All affected naturally ventilated dwellings would be likely to fail the compliance check.

1.17 The wording of the SAP 10 document leaves a number of aspects requiring further clarification before the full impact can be established and clear responsibility for the assessment established:

- Definition of 'long periods' when assessing openability of windows – length of time and time of day to be established.
- 'Close proximity' - defined as <20m – does this apply to all windows if only some fall within the 20m radius? Does this apply equally to higher floors where actual distance could be greater?
- 'Line of sight' – definition requires clarification – what constitutes as an obstruction with respect to noise (eg acoustic fencing)
- 'Main road' – requires clarification
- 'Any other obvious source of noise' – how much investigation will be required and whose responsibility?

1.18 The above uncertainties would leave it extremely subjective as to when noise restrictions would apply. It is our opinion that this should not be left to the SAP assessor to establish and should instead be confirmed by a suitably qualified professional such as an Acoustician.

1.19 A more robust approach would entail actual/projected noise levels being assessed, with e.g. a defined dB limit applied to remove the significant ambiguity.

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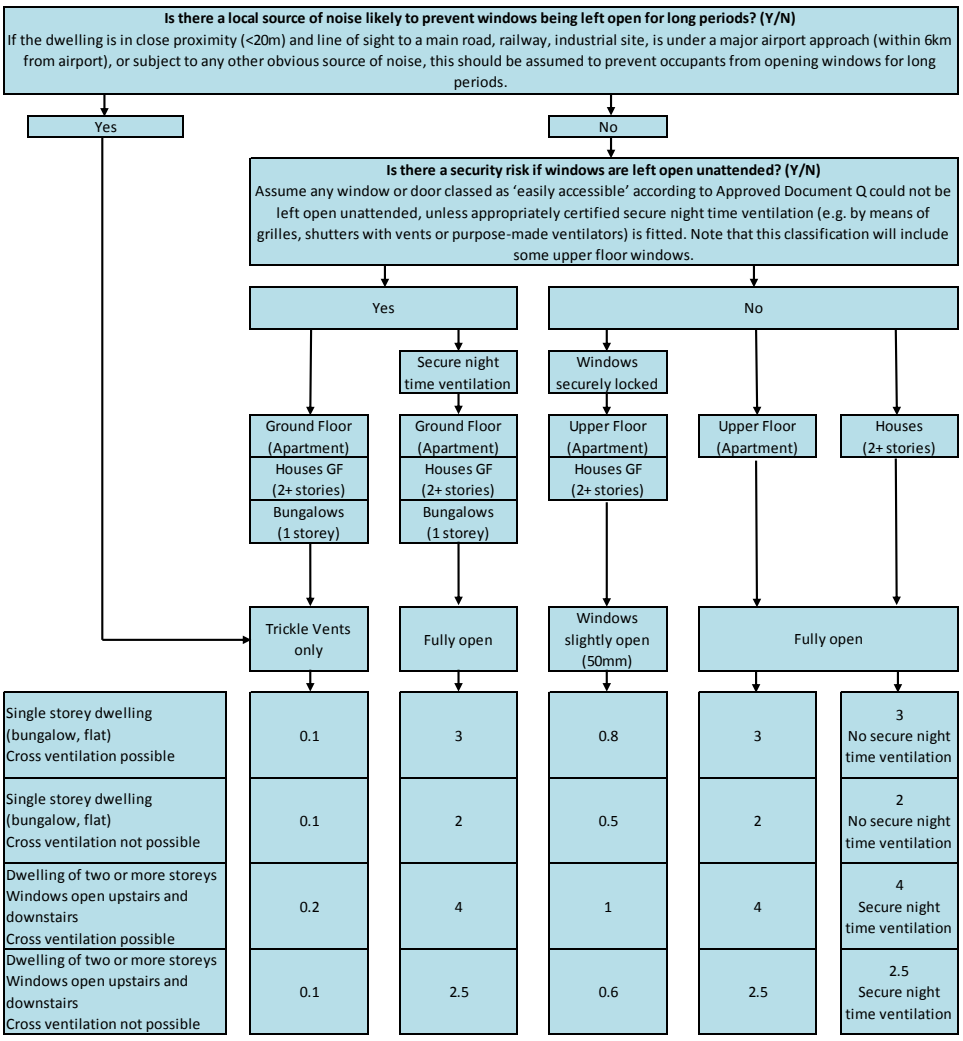
1.20 The flowchart below simplifies the choices for assessing natural ventilation in SAP 10:



1.21 All units which would be assessed as trickle vents only or slightly open (50mm) windows are highly likely to result in a criterion 3 fail in SAP 10 due to the low air change rates assumed for a naturally ventilated property.

1.22 In addition, for upper floor apartments, the air change rate for a single aspect unit with windows fully open changes from 4 to 2, which is likely to lead to a significantly higher overheating risk if mitigation measures are not incorporated.

1.23 The following section of this impact assessment models a range of dwellings to demonstrate the likely results of following the new methodology. It should be noted that this assessment is based on a full review of the consultation documentation in conjunction with the more recently published draft SAP 10 document.

1.24 As worded in the current SAP 10 documentation, it is not completely clear how two+ storey dwellings should be treated with respect to the extent of openable windows. The wording could be interpreted that due to ground floor windows having security issues, the 'fully open' option is not available and therefore dwellings of this type would additionally be assessed with a high risk of overheating.

1.25 This would potentially entail the widespread adoption of mechanical ventilation for these types of dwellings or careful solar control to mirror the approach for ground floor apartments. At this stage, following a review of the consultation documentation our interpretation is that it would still be appropriate to allow for a 'fully open, 50% of the time' option for all two+ storey dwellings, minimising the potential for a high risk of overheating.

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2 Impact assessment using SAP 2012 with SAP 10 ACH

2.1 The following section shows the results of initial modelling using a typical block of apartments (low rise – 3 stories) and 3 sample house types (detached, end & mid-terrace).

2.2 The rules as outlined above from SAP 10 have been applied and different scenarios (trickle vents only, secure night time ventilation, low g-values, curtains drawn and full mechanical ventilation) are presented.

Block of apartments:

2.3 3 storey block of apartments, 5 ground floor, mid and top floor apartments, cross ventilation not possible, building entrance facing south. Walls = 0.20, ground floor = 0.14, main roof = 0.11, corridors unheated. Window U-value 1.40, g-value 0.50. Location: Thames Valley.

Ground Floor

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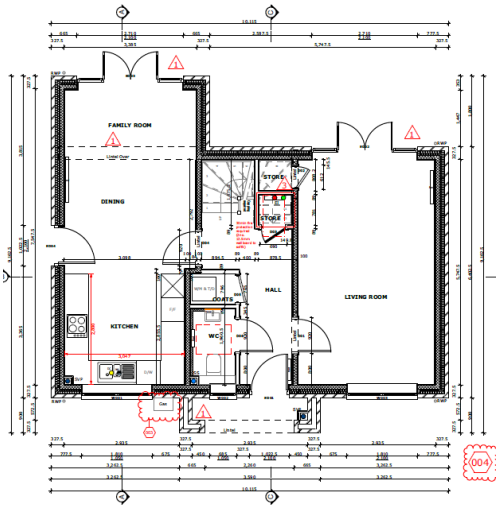
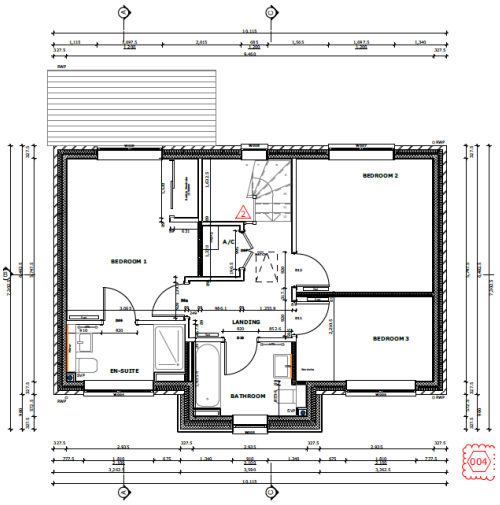
Houses – Detached (3 Bed, 1 bath & 1 En-suite):

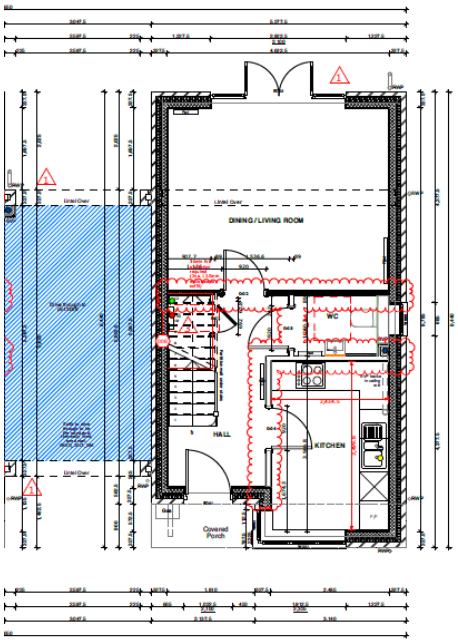
2.4 2 Storey Detached house, entrance orientation facing south, Walls = 0.20, ground floor = 0.14, main roof = 0.11. Window U-value 1.40, g-value 0.63. Location: Thames Valley.

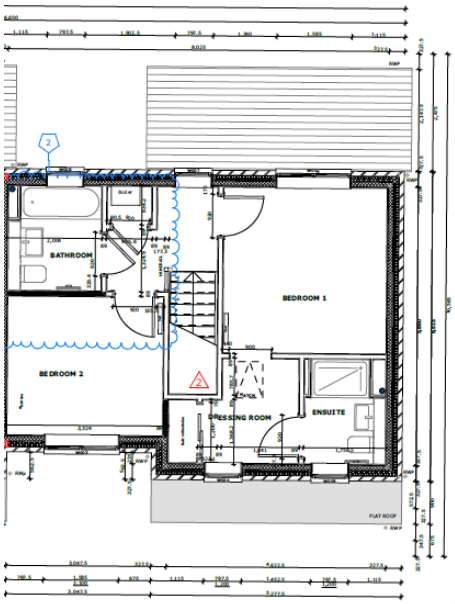




House – End / Mid-Terrace (2 Bed, 1 bath & 1 En-suite):

2.5 2 Storey End / Mid-terrace house, entrance orientation facing south, Walls = 0.20, ground floor = 0.14, main roof = 0.11. Window U-value 1.40, g-value 0.63. Location: Thames Valley.





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			SAP2012			SAP2016			Impact
Dwelling type	**Security constraints**	**Cross Ventilation**	**Windows**	**Air changes**	**Overheating risk**	**Windows**	**Air changes**	**Overheating risk**	
2+ storey dwelling	Ground floor only	Yes	Half open - 50%	**4**	Medium / Low	Fully open - 50%	**3**	Medium	Slightly higher risk due to lower air change rate - unlikely to be compliance failure
Apartments - Single aspect with no security measures installed									
Ground floor, single aspect	All windows	No	Half open - 50%	**2**	High	Trickle vents only	**0.1**	High	GF units will require mechanical ventilation to deliver sufficient air change rates - likely around 3 or above. Upper floor units may require low g-values (0.3) and/or mechanical ventilation
Mid floor, single aspect	None	No	Fully open - 100%	**4**	Medium	Fully open - 50%	**2**	High	
Top floor, single aspect	None	No	Fully open - 100%	**4**	Medium	Fully open - 50%	**2**	High	
Apartments - Single aspect with security measures installed									
Ground floor, single aspect	All windows	No	Fully open - secure	**4**	Medium	Fully open - secure	**2**	High	All units may require low g-values and/or mechanical ventilation to deliver sufficient air change rates - likely around 3 or above.
Mid floor, single aspect	None	No	Fully open - 100%	**4**	Medium	Fully open - 50%	**2**	High	
Top floor, single aspect	None	No	Fully open - 100%	**4**	Medium	Fully open - 50%	**2**	High	
Apartments - dual aspect (cross ventilation) with no security measures installed									
Ground floor, single aspect	All windows	Yes	Half open	**3**	Medium	Trickle vents only	**0.1**	High	Cross-ventilation enables upper floor units to achieve required air change rates. Ground floor units would still require secure ventilation
Mid floor, single aspect	None	Yes	Fully open - 100%	**6**	Medium	Fully open - 50%	**3**	Medium	
Top floor, single aspect	None	Yes	Fully open - 100%	**6**	Medium	Fully open - 50%	**3**	Medium	
All dwellings - noise constraints									
All dwelling types			Not considered			Trickle vents only	**0.1 / 0.2**	High	Noise constraints apply a 'trickle vents only' air change rate, necessitating mechanical ventilation for all dwelling types

2.6 As demonstrated by the example calculations, the change in overheating assessment procedure could have a significant impact on the compliance check within the SAP calculation. For a typical apartment block, a mitigation strategy is likely to require significantly lower g-values than were considered appropriate under the previous assessment methodology, potentially combined with the provision of secure natural ventilation or mechanical ventilation.

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2.7 As noted, the assessment undertaken is based on the proposed change to be brought in with SAP 10 in relation to overheating only. The combined impact of the other changes proposed in SAP 10 has not been taken into account at this stage. It is possible that changes to the assessment of overheating in SAP 10 may be made as a result of feedback or the Part L consultation expected later in 2018/2019 and therefore the impacts will be reviewed accordingly at this time.

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