SAP 2012 Conventions

31 August 2017 (v 7.01)

Conventions apply to SAP 2012 throughout the UK except where otherwise indicated under 'Limitations'.

Conventions applied for design stage calculations submitted to building control may be carried through to the as-built stage.

This edition of the Conventions supersedes all previous editions and, where any Convention is in conflict with the published SAP specification, the Convention takes precedence.

Assessors should be familiar with relevant version of the SAP specification including its Appendices and Tables, as these conventions do not aim to duplicate the conventions therein but rather to provide further guidance and clarification.

New and amended conventions for v7.0 indicated by light blue background.

The list of conventions will be extended as appropriate.

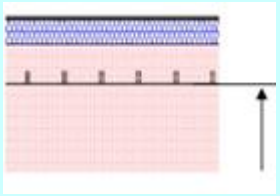
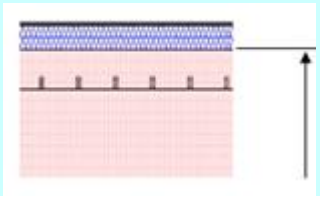
#	Limitations	Topic	Conventions	Issue date
			GENERAL	
1.01		Default values	SAP provides default values for many items, such as window U-values and boiler efficiency. Whenever specific product information is available, that should be used rather than default values. However when using any specific values there needs to be documentary evidence to support them, and such evidence should be made available to building control on request. For items using the database, the evidence required is that the specific named product, e.g. boiler, is the one being used.	Sept 2010

#	Limitations	Topic	Conventions	Issue date
1.02	England, Wales	Pressure test (as-built assessment)	The as-built assessment cannot be processed unless: (a) information is provided that meets the evidence requirements of A2.4 or (b) in England the alternate conditions of AD L1A 2013 and AD L1A 2013 with 2016 amendments (both for use in England) paragraph 3.22 or AD L1A 2010 (for use in E&W) paragraph 5.23, apply, or (c) in Wales the alternate conditions of AD L1A 2014 and AD L1A 2014 with 2016 amendments (both for use in Wales) paragraph 6.4.10 or AD L1A 2010 (for use in E&W) paragraph 5.23 apply, or (d) evidence of a specific dispensation issued in writing by Building Control. Note: in Northern Ireland TB F1 2006, TB F1 2012 and TB F1 2012 with 2014 amendments refer to SAP 2009 and SAP 2012 Conventions do not apply; refer to SAP 2009 Conventions version 5.0.	Sept 2010 amended March 2011 amended October 2015 amended May 2016 amended Aug 2017
1.02(a)	Scotland	Pressure test (EPC, as-built assessment)	The EPC assessment cannot be processed unless: (a) for a dwelling that was tested, the measured infiltration rate for the dwelling is used in the calculation. This should be the test result for that dwelling, recorded on a certificate issued by a person who has demonstrated competence in air tightness testing to the satisfaction of the Verifier*; or (b) for a dwelling that was not tested, the declared (or agreed) infiltration rate accepted by the Verifier is used in the calculation. This should be confirmed to the assessor by the developer following both sample testing of other dwellings on the development and any remedial action agreed with the verifier as a result of those tests. * Verifiers are the organisations, appointed by Scottish Ministers, who check and approve Building Warrant Applications. Each of Scottish Local Authorities is the verifier for their geographical area.	Aug 2017

#	Limitations	Topic	Conventions	Issue date
1.03	Not Scotland	Regulations compliance report	As a minimum, building control should be provided with: - the regulations compliance report, and - listing of the input data Building Control should also be supplied with any supporting information that they may request. The compliance report may show a fail under some headings; in these circumstances it is the decision of building control as to whether or not they approve the construction. Any differences between the as-designed specification and the as-built specification should be highlighted on the input data list.	Sept 2010 amended March 2011 amended Aug 2017
1.03(a)	Scotland	Regulations compliance report	Whilst not mandatory, production of a Regulations Compliance Report generated by the SAP software is good practice. Compliance with Section 6 Energy standards 6.1 to 6.6 is demonstrated at design stage, prior to issue of a building warrant. Where changes in design or specification during construction changes any element of the original SAP data input, the Verifier should be notified and be provided with updated information to demonstrate that compliance is maintained**.** * see convention 1.02(a) for the definition of a Verifier	Aug 2017
1.04	England, Wales	When to issue an Energy Performance Certificate (EPC)	EPC is produced once the dwelling is physically complete. A dwelling is deemed 'physically complete' when all of the following conditions are met: a) Commissioning of the heating system has been satisfactorily completed, and b) Thermal bridging details are signed off, and c) Air permeability is confirmed via pressure testing of representative dwellings, and d) The dwelling itself is complete and could be pressure tested. The developer should feed information about changes from the design stage to the as-built stage to the OCDEA so that an EPC can be produced. Assessors should not produce an EPC without such information and it may be necessary to prompt the developer to produce the required information. A copy of the EPC should be provided to the client (in electronic or paper form) to be passed to the building control body.	Sept 2010 amended March 2011 amended Aug 2017

#	Limitations	Topic	Conventions	Issue date
1.04 (a)	Scotland	Production of an on-construction EPC	An EPC must reflect any variations or additional information, such as pressure test results, arising during the construction of a new dwelling. Work to produce an EPC for a new dwelling, including access to Scottish EPC Register (SEPCR) systems, should not commence until the Assessor receives confirmation that all construction work and testing that could affect the assessment process is complete and the Assessor has established that they are in possession of all information needed to undertake assessment.	Aug 2017
1.05		SAP version for EPCs	EPCs are always produced using the latest SAP version. If the dwelling concerned was assessed for building regulation compliance using an earlier SAP version the data is transferred to a SAP calculator that uses the current SAP version for EPC production. In unusual cases where the dwelling has been occupied since completion but before the EPC is issued, a SAP EPC is appropriate if it is established that the dwelling has not been meaningfully altered since completion or if the details of any alteration are known and can be incorporated in the assessment. Otherwise it should be treated as an existing dwelling and assessed via RdSAP. In Scotland, in support of the completion certificate submitted to the Verifier*, a SAP EPC must be provided for each new dwelling which is subject to standard 6.9. An RdSAP EPC cannot be used for this purpose. Any certification using RdSAP may only occur as a separate action, after acceptance of a completion certificate for the dwelling by the Verifier. * see convention 1.02(a) for the definition of a Verifier	Sept 2010 amended Sept 2012 added Aug 2017
1.07	England, Wales	Design water use	For new build in England & Wales it is now required that the dwelling is designed to use not more than 125 litres/person/day for compliance with E&W Part G. SAP assessors may assume that building control will establish compliance with E&W Part G and tick the applicable box in SAP software for new dwellings in England & Wales. In other countries, and for any existing dwelling, this option does not apply.	Sept 2010 amended March 2011
1.08		Flats v. houses	A house or bungalow has both a heat loss ground floor and an exposed roof. A dwelling without a heat loss floor cannot be a house and must be treated as a flat or maisonette. Generally a flat or maisonette does not have both a heat loss ground floor and a heat loss roof (although there are some exceptions such as a ground floor flat with an extension or when the footprint of a flatted development is 'stepped').	Sept 2011 amended Sept 2012
1.09		Database version	SAP calculations must always be done using the latest version of the database (PCDF), at both as-designed and as-built stages.	Sept 2011

#	Limitations	Topic	Conventions	Issue date
1.10	Not Scotland	Software version	SAP calculations must always be done using the latest version of approved SAP 2012 software at both as-designed and as-built stages. The only exception is where the as-designed calculation was done using an earlier software version and building control allows the use of that version for the as-built calculation.	Sept 2011
1.11	Scotland only	Software version	New build SAP calculations produced in support of standard 6.1 (carbon dioxide emissions) should be carried out using the version of SAP current at the date the building warrant application is lodged. This as-designed calculation may continue to use the same version of the software for the duration of the warrant process, including any amendment to the original warrant. Where a newer version of SAP is available, use of this in respect of standard 6.1 is at the discretion of the applicant. For the issue of an EPC on completion of the dwelling, the version of SAP current at the date of completion must be used (see convention 1.05).	Sept 2011
1.12		Sheltered sides	Enter actual number if known, otherwise 0 (i.e. the worst case). In Scotland, not more than 2, and 2 if unknown.	October 2015
1.13a	England, Wales	Heated conservatory	Included in calculations if: - not thermally separated from main dwelling, or - heated by dwelling's main heating system (England) or heated by fixed heaters (Wales)	October 2015
1.13b	Scotland	Heated conservatory	Included in DER/TER calculations if not thermally separated from main dwelling.	October 2015
1.13c	Northern Ireland	Heated conservatory	Included in calculations if: - not thermally separated from main dwelling, or - independent temperature and on/off controls are not provided to the conservatory	October 2015
DIMENSIONS				
2.01		Average storey height (see Appendix 4)	Where there are rooms extending into the roof space, the average storey height is needed for the volume calculation (see 2.03). This is the average height of the habitable area (plus the thickness of the intermediate floor if it is an upper storey of the dwelling).	Sept 2010

#	Limitations	Topic	Conventions	Issue date
2.02		Storey height of flats over garages (see Appendix 4)	In the case of a flat over an unheated garage (or similar) where the entrance to the flat is on the ground floor with a heated stairway leading to the main part of the flat (see Figure 1 at the end of these conventions), an exception is made to the rule in 2.01: a) The intermediate floor thickness is added to the ground floor height (dimension X in Figure 1); b) The first floor height is measured from internal floor to ceiling (dimension Y in Figure 1).	Sept 2010
2.03		Dwelling volume	The volume of the dwelling comprises the internal volume of the dwelling, measured between the finished internal surfaces of the elements bounding the dwelling. Spaces outside the dwelling, for example roof voids, are not included even though within the insulated fabric. A roof/ceiling void is not included in the dwelling volume but included into wall area; this dimension should be for calculating the volume:  This dimension should be used for calculating wall area: 	Sept 2011 amended Aug 2017
2.04		Gable wall area	Where the roof insulation is between the ceiling joists, the area of the gable wall above the finished ceiling level does not need to be included in the heat loss wall area. Where the insulation is along the slope of the roof (between the rafters) the gable wall needs to be included in the heat loss wall area (unless it is a mid-terrace house). Note that the gable wall area also needs to be included where there is a flat ceiling with insulation in the slope between the rafters.	Sept 2011

#	Limitations	Topic	Conventions	Issue date
2.05		Internal elements (for thermal mass calculation)	Areas of internal and party walls, floors and ceilings are measured: - vertically using floor-to-ceiling height - horizontally as the length on plan ignoring any intersecting partitions. - disregarding openings (Appendix 5 provides the thermal mass for some illustrative constructions).	Sept 2011 amended Aug 2017
2.06		Bay windows	Include the area of the bay in the floor area. Include the perimeter of the bay in the total perimeter for calculation of thermal bridging wall/floor and wall/roof. See also convention 5.16.	amended Sept 2016
2.07		U-values of elements of room in roof insulated at rafters	Where the roof insulation follows the shape of the room, the U-value of the walls and ceilings to the unheated roof voids should be calculated as normal with the room–in-roof shelter factor applied. Where the insulation is contained entirely within the rafters, the U-value of the sloping ceilings should be multiplied by a factor of 0.72, and the resultant U-value used for the walls and ceilings to the unheated voids spaces. See diagram 3.1 in Appendix 3.	Aug 2017
OPENINGS				
3.01		U values of doors to unheated spaces	It is generally not necessary to adjust the U-values of doors in semi-exposed walls, in particular when the area of the element covered by the unheated space is less than 10% of the total exposed area of all external walls. In some cases (such as a flat with very small external elements) the door may be more than 10%, in which case the U-value of the door in the semi-exposed wall should be adjusted in the same way as that for a semi-exposed wall (SAP documentation section 3.3. Note: Attached garages are disregarded altogether.	Sept 2010 corrected Aug 2017
3.02		Window areas	To be specified either individually or at least per elevation.	Sept 2011
3.03		External doors	Solid door: if glazed area < 30% of door area Semi-glazed door: if glazed area 30-60% of door area Glazed door with glazed area > 60% of door area, included as a window	October 2015

#	Limitations	Topic	Conventions	Issue date
3.04	England, Wales	Window orientation	The actual orientation of all windows must be specified at as built stage.	October 2015 amended Aug 2017
3.04(a)	Scotland	Window orientation	For a design-stage SAP calculation in support of standard 6.1, guidance permits the designer to either specify the orientation of all glazing or assume that all glazing is oriented east/west (see Section 6 Energy, clause 6.1.3 of the Domestic Technical Handbook). For EPC production, the orientation of all windows must be specified for the calculation to be representative of the actual dwelling.	Aug 2017
VENTILATION				
4.01		Mixed centralised and decentralised mechanical ventilation	Where there is a mixed mechanical system, e.g. consisting of two centralised MEV systems or a centralised MEV system serving part of the dwelling and decentralised MEV serving the remainder, the data for the two systems are combined and the result entered into SAP software. A spreadsheet to assist the process is available from www.bre.co.uk/sap2009.	Sept 2010
4.02		Mechanical ventilation but no data for the number of wet rooms	If there is mechanical ventilation but no data for the number of wet rooms served, use the default data (SAP Table 4g).	Sept 2010
4.03		Solar powered ventilation	Solar powered vents should be entered into SAP software as passive vents.	Sept 2010
4.04		Wet rooms	The data for mechanical ventilation systems is given according to the number of wet rooms. A wet room is a room used for domestic activities (such as cooking, clothes washing and bathing) which give rise to significant production of airborne moisture, e.g. a kitchen, utility room, bathroom, shower room and also sanitary accommodation. For SAP the number of wet rooms to be entered is the additional wet rooms in addition to the kitchen, which is assumed always to be present.	Sept 2011
4.05		Semi-rigid ducts	Semi-rigid ducts can be specified only if found in the database (brand and model)	October 2015

#	Limitations	Topic	Conventions	Issue date
4.06		Individual ventilators with heat recovery	If a single individual ventilator with heat recovery – disregard; if individual intermittent ventilators with heat recovery installed in each wet room, treat as natural ventilation with intermittent extract fans; if continuously running – treat as default Decentralised Extract Ventilation; in this case the heat recovery element is disregarded.	Aug 2017
4.07		Positive Input Ventilators from Loft	In the case of PIV supplying preheated air from the loft – specify the actual number of extract fans, with a minimum of 2 extract fans required.	Aug 2017
U-VALUES AND THERMAL BRIDGING				
5.01		Correct U-value calculations	U-values are calculated using the conventions given in BR 443. See also Appendix 3. SAP assessors should establish the specification of the construction for each element and should satisfy themselves that the U-values used in the calculation are correct. Acceptable routes are: - calculation provided by a person accredited for U-value calculations - calculation undertaken by the assessor - calculation provided by another party and checked by the assessor In some cases, the calculation may depend on other pre-calculated results; in those cases the sources of the data used must be available. For example, a suspended floor where the thermal resistance of the floor deck has been calculated by numerical modelling.	Sept 2010 amended March 2011 amended October 2015 amended Aug 2017

#	Limitations	Topic	Conventions	Issue date
5.02		Swimming pools within a dwelling	In England U-values of swimming pool basins need to be checked for building control applications from 01 October 2010. In Wales U-values of swimming pool basins need to be checked for building control applications from 01 October 2010 (ADL-1A for use in England and Wales) and from July 2014(ADL-1A for use in Wales). In Scotland, there is no separate maximum U-value for the insulation envelope specific to swimming pool basins. However, in all countries, for entry into the SAP calculator the U-value of the floor is to be obtained as if the swimming pool basin were not there, although the pool hall should be included. The area covered by the pool should be replaced with the equivalent area of floor with the same U-value as the pool surround.	Sept 2010 amended March 2011 amended Aug 2017
5.03		Party wall U-values	In the context of U-values, 'party wall' includes any wall between the dwelling and another heated space which can be: - another dwelling - commercial premises - a heated corridor or stairwell in a block of flats - a heated common area Note. A heated corridor is one with controlled fixed heaters. Heat from distribution pipes is to be disregarded. The only U-values at present for party walls are 0, 0.2 and 0.5. This applies to both flats and houses regardless of construction type (masonry, timber frame etc). U = 0.5 should be used for party walls unless documentary evidence is provided, in which case: A solid party wall has U = 0. To qualify for U = 0.2 (effective edge sealing): - the sealing must prevent air going in or out of any cavity - the sealing is required top and bottom and vertically. To qualify for U = 0: - any cavity must be sealed as above, and - any cavity must be fully filled Framed systems (timber or metal) may have more than one cavity.	Sept 2010 amended March 2011 amended October 2015

<table>
<tr><th>#</th><th>Limitations</th><th>Topic</th><th>Conventions</th><th>Issue date</th></tr>
<tr><td>5.04</td><td></td><td>Windows and roof windows - U-values and g-values

Amended Sept 2016</td><td>The U-value is that of the complete window, not that of the glazing alone.

It is acceptable to use an average U-value, as long as the average U-value used is based upon a standard Glass and Glazing Federation (GGF) 1230 x 1480 mm test window in accordance with BS EN ISO 10077-1. The GGF window is a two-pane window with one open and one fixed pane. However, it is preferable to assign a specific U-value to individual windows (which manufacturers can usually provide). If the design has large areas of glazing a better DER usually results by using individual window U-values (and individual frame factors for solar gain).

In the case of a BFRC rated window, the U-value and g-value are taken from the front of the certificate. The g-value is that for the window as a whole, incorporating the frame factor. Because of this, the frame factor is set to 1 in the SAP calculation.

g-values for BFRC windows are usually less than 0.5 and should be checked if greater.

In the case of manufacturer-declared properties of windows the data needed as U-value, g-value for the glazing and frame factor. Documentary evidence of these data is required.

For windows and roof windows that are NOT vertical BR 443 gives U-value adjustment which can be applied to windows and roof windows depending on the inclination.

<table>
<tr><th rowspan="2">Inclination of roof</th><th colspan="2">U-value adjustment (W/m2K)</th></tr>
<tr><th>Double glazed</th><th>Triple glazed</th></tr>
<tr><td>70˚or more (treat as vertical)</td><td>0.0</td><td>0.0</td></tr>
<tr><td><70˚and >60˚</td><td>+0.2</td><td>+0.1</td></tr>
<tr><td>≤70˚and >40˚</td><td>+0.3</td><td>+0.2</td></tr>
<tr><td>≤40˚and >20˚</td><td>+0.4</td><td>+0.3</td></tr>
<tr><td>≤20˚(treat as horizontal)</td><td>+0.5</td><td>+0.4</td></tr>
</table>
</td><td>Sept 2010

amended Sept 2012

Amended Aug 2017</td></tr>
</table>

#	Limitations	Topic	Conventions	Issue date
5.06			The transmission heat transfer coefficient associated with non-repeating thermal bridges H_{TB} must be calculated, or the calculation verified, by the SAP assessor; a y value can only be used if it is: (a) the default value of 0.15*, or (b) derived from H_{TB} calculated following the rules in SAP 2012 Appendix K, or (c) calculated for another dwelling that is identical except for orientation. When calculating thermal bridge junctions at <u>either design or as-built stage</u>: All junction types listed in SAP Table K1 and in these conventions should be considered. Evidence is required for Ψ-values other than the defaults in SAP Table K1. Junction types that are neither listed in SAP Table K1 nor in these conventions are disregarded. <u>At the design stage</u>: For a junction to be assigned a Ψ-value for an Accredited Construction Detail (ACD) or an Enhanced Construction Detail (ECD) (see weblinks at the end of these conventions) for the purposes of SAP calculations, a list of the intended junction detail reference numbers should be confirmed by the client. The thermal bridging should be specified using (a)*, (b) or (c) above. <u>At the as-built stage:</u> For a junction to be assigned a Ψ-value for an Accredited Construction Detail (ACD) or an Enhanced Construction Detail (ECD) for the purposes of SAP calculations, confirmation is needed from the builder that the specific junction has been built in accordance with Accredited Construction Details and that the associated checklists have been completed. A list of the junction detail reference numbers should be confirmed by the client. The values for the design stage are used provided that (a) they were fully specified at the design stage and (b) it is confirmed that no design alterations were made. * Note: In Scotland, a default value of y=0.15 cannot be assigned in a SAP calculation or EPC relating to a building warrant applied for on or after 1 October 2015. Calculation of H_{tb} must be undertaken.	Sept 2010 re-written March 2011 amended Aug 2017

#	Limitations	Topic	Conventions	Issue date
5.07		Thermal bridging, sources of Ψ-values (Appendix 2)	The Ψ-value for each junction is obtained as follows: 1. For any junction for which an ACD is being used use the applicable Ψ-value in the 'accredited' column in Table K1*, or 2. For any junction for which an ECD is being used use the Ψ-value associated with the junction reference number, or 3. For any junction for which a calculated Ψ-value is provided, this may be used subject to written confirmation that the calculation was performed by someone with suitable experience and expertise defined in AD L1A paragraph 3.10, or 4. If none of the above applies for any junction, use the Ψ-value for the applicable junction type from the 'default' column in Table K1*. Values for accredited details can be used only for those junctions with an ACD/ECD reference number, e.g. for junction E2 an example is "MCI-WD-02" or Scottish ACD "1.08". See Appendix 1 to these conventions for locations of the various junction types. If a Ψ-value for any junction is not available use the applicable default value from SAP Table K1 (see 5.08 for exceptions). The following junctions in Table K1 have no ACDs associated with them and so no ACD reference number: E8, E9, E16, E17, E19, E20, E21, E22, E23, E24, E25, P1, P6, P7, P8, R1 to R9. If no calculated value is available use the default Ψ-value. When there is more than one junction of a given junction type which have different Ψ-values (e.g. corners in the main dwelling and stud wall corner in a roof room; multiple types of lintel), either: (a) enter the junction type more than once with its respective Ψ-values and lengths, or (b) use the highest Ψ-value for the junction type with the total length of the junctions, or (c) calculate a weighted average (Ψ-value for each junction type weighted by the length of each junction) and enter the result into the SAP calculator along with the total length of the junctions. * Note: "Accredited" column in Table K1 cannot be used in Scotland.	March 2011 amended Sept 2012 amended October 2015 amended Aug 2017

#	Limitations	Topic	Conventions	Issue date
5.08		Thermal bridging, additional junction types	The following values may also be used as accredited values: E14: Ψ = 0.04 W/m·K E15: Ψ = 0.28 W/m·K P4: Ψ = 0.12 W/m·K (applied to each dwelling) P5: Ψ = 0.04 W/m·K (applied to each dwelling) For P2 and P3 the default value is 0.0 and these junctions need not be considered. For E16 (corner) it is acceptable to use the value of 0.09 W/m·K from the "Accredited" column in SAP Table K1* provided that the construction around the corner is the same as the rest of the wall and is not interrupted by any structural elements. The value of Ψ = -0.09 W/m·K for the inverted corner E17 may be used only in conjunction with the value Ψ = 0.09 W/m·K for a normal corner E16. * Note: "Accredited" column in Table K1 cannot be used in Scotland	March 2011 re-written October 2015 amended Aug 2017
5.10		Thermal bridging around openings	In the case of a lintel (and other window or door surrounds) the length of junction is the length of the opening in the wall.	Sept 2011
5.11		Thermal bridges shared by more than one dwelling	Divide the total Ψ-value by the number of dwellings involved, and apply that to each dwelling. Thus for a junction between two dwellings use Ψ/2, between three dwellings use Ψ/3. Note. In SAP Table K1 the Ψ-values for junctions E7, E9, E18, E25 and P1 to P8 inclusive are already divided by 2. If using values from Table K1 for any of these junctions: - if between two dwellings use the value given in Table K1; - if between three dwellings use the value from Table K1 multiplied by 2/3. See also Appendix 2	October 2015
5.12		Thermal bridges to unheated spaces	1. Obtain the Ψ-value as normal (between inside and outside) 2. Multiply psi-value by the factor from Appendix 2.3 at the end of these conventions	October 2015 amended Aug 2017
5.13	England and Wales only	Thermal bridging	For Part L 2013 the lengths of all junctions must be entered into the software to allow calculation of TER, except when the default value of y = 0.15 is used. For curtain walls see Appendix A2.5	October 2015 amended Aug 2017
5.14		Thermal bridging – door sills	Include the lengths of sills of doors, including any doors treated as windows, in the length of the wall/floor junction for the floor level that contains the doors.	June 2015

#	Limitations	Topic	Conventions	Issue date
5.15		Thermal mass	The Thermal Mass Parameter (TMP) is required for calculations by SAP 2012. It can be: a. calculated from the areas and kappa values of each element, including party walls, party floors and party ceilings and both sides of internal partitions (which include internal walls and intermediate floors), where the kappa values are from SAP Table 1e or calculated following the guidelines in SAP Table 1e, or b. entered into software as a TMP value that has been calculated as in a. (for example using a spreadsheet), or c. treated as being low, medium or high using the global values of 100, 250 or 450 kJ/m²K given in SAP 2012 Table 1f . For indicative thermal mass parameters, consult Appendix 5 at the end of these conventions. In case of a dispute, a detailed calculation via a. or b. should be undertaken.	Sept 2010 amended Sept 2012 amended October 2015 amended Aug 2017
5.16		Oriel windows and raised roof windows	An oriel window is a form of bay window, which projects from the main wall of a building but does not reach to the ground. See Appendix 2.4 for determining Ψ-values of junctions.	Aug 2017
SPACE HEATING				
6.01		Micro-CHP	If the system is unavailable in the database, select condensing boiler with SAP default efficiency.	Sept 2010
6.02		Two main heating systems	Although in the large majority of cases there is only one main heating system, SAP provides for two main systems. A second main system is not to be confused with a secondary heater. The latter are rooms heater(s) heating individual room(s) either as a supplement to the main heating in the room (e.g. a wood burning stove in the main room) or for rooms not heated by the main system. A main system is generally one that would be described as central heating (a heat generator providing heat to several rooms via a heat distribution system), although the term does also include for example storage heaters and fixed direct-acting heaters in each room. When there are two main systems, system 1 always heats the living area.	Sept 2010
6.03		Two solid fuel boilers	Where there are two solid fuel boilers feeding the same distribution system, the fraction of heat should be taken as 0.5 from each.	Sept 2010

#	Limitations	Topic	Conventions	Issue date
6.04		Boiler using liquid biofuel or biogas	The boiler must be found in the Product Characteristic Data File for the fuel concerned, except B30K.	Sept 2010 amended October 2015
6.05		Community heating systems and heat networks	Where the community scheme can be identified in the community heat network database, it is to be selected (then all community system data is provided by the data record). Provisional data applies for new community schemes. Community data records are not deleted when updated data is added; instead a new record is added with a new community network version number. If the community data is updated between the as-designed assessment and the as-built-assessment, the data record used for the as-designed assessment may be used for the as-built assessment. In the absence of community heat network data, SAP assessors need to obtain details of heat generators, distribution loss, etc from the system designers. Where a community network is envisaged but not yet connected, the assessment is done using the heating system installed in the dwelling. Efficiency of community boilers can be quoted as net or gross. It is the gross efficiency that is used in SAP.	Sept 2010 re-written October 2015

#	Limitations	Topic	Conventions	Issue date
6.06		CHP supplying both dwellings and commercial buildings	Where a CHP system is providing heat to dwellings and electricity to commercial premises, the electricity generation must be credited only once. a) If the electricity generated is included in the assessment of the commercial premises but the electricity is assumed to have the same CO_2 emission factor as electricity from the grid, the CHP heat and electrical efficiencies are entered into the SAP software. This will normally apply when the CHP is located in a different building from the commercial premises and electricity is supplied from the CHP to the commercial premises over the regional distribution network operator's (DNO) cables, and may also apply in other circumstances.. b) If the electricity generated is included in the assessment of the commercial premises and the electricity is assumed to have a CO_2 emission factor of zero, only the CHP heat efficiency is entered into the SAP software (electrical efficiency is zero or heat-to-power ratio of 10,000). c) For a situation intermediate between a) and b), i.e. if the electricity generated is included in the assessment of the commercial premises and the electricity is assumed to have a CO_2 emission factor between zero and that of grid electricity, an effective CHP electrical efficiency is used, equal to the CHP electrical efficiency multiplied by the fraction given by: assumed CHP electricity CO_2 emission factor divided by grid electricity CO_2 emission factor The CHP heat efficiency and effective CHP electrical efficiency should then be entered in SAP. Note: for all alternatives, the CHP heat utilisation is taken into account in the heat efficiency of the CHP.	Sept 2010 amended Sept 2013
6.07		Central heating pump	Always 2013 or later for a new dwelling.	October 2015
6.08		Low temperature heat emitters	The design flow temperature for condensing boilers and heat pumps should be assigned as unknown unless there is documentary evidence that the system has been designed and commissioned as a low temperature one.	October 2015
6.09		Community CHP	SAP Appendix C, section C7 applies to any community CHP, not only biomass (e.g. CHP fired by municipal waste).	October 2015
6.10		Electric CPSU	An electric CPSU can use 10-hour or 18-hour tariff.	October 2015
6.11		Weather and load compensators	Compensators can be applied only if located in the database.	October 2015

#	Limitations	Topic	Conventions	Issue date
6.12		Time and temperature zone control	a. separate plumbing circuits, either with their own programmer, or separate channels in the same programmer, or b. programmable TRVs or communicating TRVs that are able to provide time and temperature zone control (conventional TRVs without a timing function provide only independent temperature control). In this case the device must be located in the database In both cases subject to the conditions in SAP 2012 section 9.4.14 In the case of direct-acting electric systems, including underfloor heating, it can be achieved by providing separate temperature and time controls for different rooms.	October 2015
6.13		Underfloor heating in a wet room	In the case of community heating treat electric underfloor heating of small rooms (i.e. wet rooms) as a secondary room heater (panel, convector or radiant heater).	Aug 2017
DOMESTIC HOT WATER (DHW) HEATING				
7.01		Separate boiler or heat pump for DHW	Sometimes there is a separate boiler or heat pump providing DHW only. If there is information about it in the PCDF, it can be entered into SAP software as follows: - two main systems - main system 1 is that providing space heating - main system 2 is that DHW boiler - fraction of main heat from system 2 is zero - water heating from main system 2.	Sept 2010 amended October 2015
7.02		More than one hot water system	Except in the case of heat pump systems, solid fuel room heaters with back boilers and where there is solar water heating, it is only possible to include one water heating system. In the event of there being more than one specified, the one selected should be that which is intended to heat most of the hot water, e.g. an immersion heater that is provided primarily as a backup should be disregarded.	Sept 2010
7.03		Independent programming of DHW heating	Many heating system programmers have a single channel time control with a separate switch that can be set to 'H/W only', 'H/W and space heating', 'Space heating only' and similar combinations. Such a device does not provide independent programming of the hot water. In order to qualify as water separately timed it must be possible to program the space heating for two or more time periods a day and the hot water to be programmed for at least two different periods per day. This requires a time switch or programmer with more than one time control channel.	Sept 2010
7.04		Primary pipework	For a new dwelling all primary pipework is regarded as accessible.	October 2015

#	Limitations	Topic	Conventions	Issue date
7.05		Instantaneous waste water heat recovery	Valid only for hot water from a combi boiler or a mains pressure hot water system (thermal store or unvented cylinder) and for mixer showers having a thermostatic mixer valve. Two showers can be connected to the same WWHRS provided that the length of the drain pipe between shower and WWHRS is not excessive (generally less than 3 metres). SAP 2012 allows for two WWHR systems to be specified, but if there are two one of them must be System B. Instantaneous electric showers are included in the total number of showers in the dwelling but should NOT be included in the number of showers served by the WWHRS, because electric showers cannot have a WWHRS. For as-built assessments documentary evidence in the form of a completed WWHRS checklist is required.	October 2015 amended Aug 2017
RENEWABLES				
8.02		Multiple wind turbines	A spreadsheet is available on www.bre.co.uk/sap2009,which accepts details of multiple turbine types and converts them into equivalent parameters for a single type that can be entered into software.	Sept 2012
8.03		PV pitch	Choose the nearest of 0, 30, 45, 60 or 90 to the actual pitch. If midway between two of these use the higher value.	October 2015
8.04		PV connection	Ascertain whether the PV is connected to the dwelling's electricity meter. If the position cannot be ascertained mark it as not connected. Note: The above affects only cost benefit. Carbon benefit is always counted. Where common areas in blocks of flats are assessed separately, the carbon benefit of PVs connected to landlord supply must not be counted twice.	October 2015
SUMMER OVERHEATING				
9.01		Cross ventilation	It is important that the guidelines set out in SAP Appendix P are adhered to in assessing whether or not there is cross ventilation and the extent of window opening. Issues to consider include the presence or otherwise of fire doors and the degree to which security concerns prevent windows being left open at night, e.g. ground floor flats.	Sept 2012
MISCELLANEOUS				
10.01		Transaction type	For a new dwelling the transaction type is always "New dwelling"	October 2015
10.02		Tenure	For a new dwelling the choice will often be "unknown", unless the tenure is known definitely.	October 2015

#	Limitations	Topic	Conventions	Issue date
10.03		Validity of previous conventions	England: SAP 2009: Conventions v5.0 was applicable from 01 October 2013. SAP 2012: assessments from April 2014 - Conventions v5.0. assessments from 01 December 2015 - Conventions v6.0. assessments from 01 July 2016 - Conventions v6.1. assessments from 31 August 2017 - Conventions v7.0 Wales: SAP 2009: Conventions v5.0 was applicable from 01 October 2013. SAP 2012: assessments from July 2014 - Conventions v5.0. assessments from 01 December 2015 - Conventions v6.0. assessments from 01 July 2016 - Conventions v6.1. assessments from 31 August 2017 - Conventions v7.0 Scotland: SAP 2009: Conventions v5.0 was applicable from 01 October 2013. SAP 2012: assessments from 01 October 2015 - Conventions v5.0. assessments from 01 December 2015 - Conventions v6.0. assessments from 01 July 2016 - Conventions v6.1. assessments from 31 August 2017 - Conventions v7.0 Northern Ireland: SAP 2009: Conventions v5.0 was applicable from 01 October 2013.	Added Aug 2017

Revision history

September 2010	First issue Conventions: 1.01 to 1.07, 2.01 to 2.02, 3.01, 4.01 to 4.03, 5.01 to 5.07, 6.01 to 6.06, 7.01 to 7.03, 8.01
March 2011	Second issue Re-numbered: 5.07 to 5.09 Amended: 1.02, 1.03, 1.04, 1.07, 5.01, 5.02, 5.03, 5.05, 5.06 1.06 deleted pending clarification Added: 5.07, 5.08, Appendix 1
September 2011	Third issue Amended 5.08 Added 1.08 to 1.11, 2.03 to 2.06, 3.02, 4.04, 5.10
September 2012	Fourth issue Amended 1.05, 1.08, 5.04, 5.07, 5.09 Added 8.02, 9.01
September 2013	Fifth issue Amended 6.06 Added Appendix 2
October 2015	Sixth issue Renumbered: 5.09 to 5.15 and Table 1 to Table 2 Added: 1.12, 1.13, 3.03, 3.04, 4.05, 5.11, 5.12, 5.13, 5.14, 6.07, 6.08, 6.09, 6.10, 6.11, 6.12, 7.04, 7.05, 8.03, 8.04, 10.01, 10.02, Table 1, A2.5, A2.7, A2.8 Amended: 1.02, 5.01, 5.03, 5.07, 5.08, 5.15, 6.04, 6.05, 7.01, A2.4, A2.13, A2.14 Deleted: 5.05, 8.01 (applied to SAP 2005 only)
October 2016 to 31 August 2017	Issue 7.0 Added: 1.02a, 1.03a, 1.04a, 2.07, 3.04a, 4.06, 4.07, 5.16, 6.13, 10.03 Revised: 1.02, 1.03, 1.04, 1.05, 1.08, 1.10, 2.01, 2.02, 2.03, 2.05, 3.01, 3.04, 4.03, 5.01, 5.02, 5.03, 5.04, 5.06, 5.07, 5.08, 5.12,5.13, 5.15, 7.05, A2.4(a) Appendix 2 has been amended. Appendices renumbered, new appendices added: A2.4 “Convention for oriel windows”, A2.5 “Conventions for curtain wall”, A3 “U-values for rooms in roof”, Appendix “Additional notes” deleted.
September 2017	Formula in Appendix 2.4 has been corrected

Appendix 1 – Documentary evidence

Where particular data values are brought to a SAP calculation, evidence is needed to confirm them. This appendix sets out appropriate forms of documentary evidence.

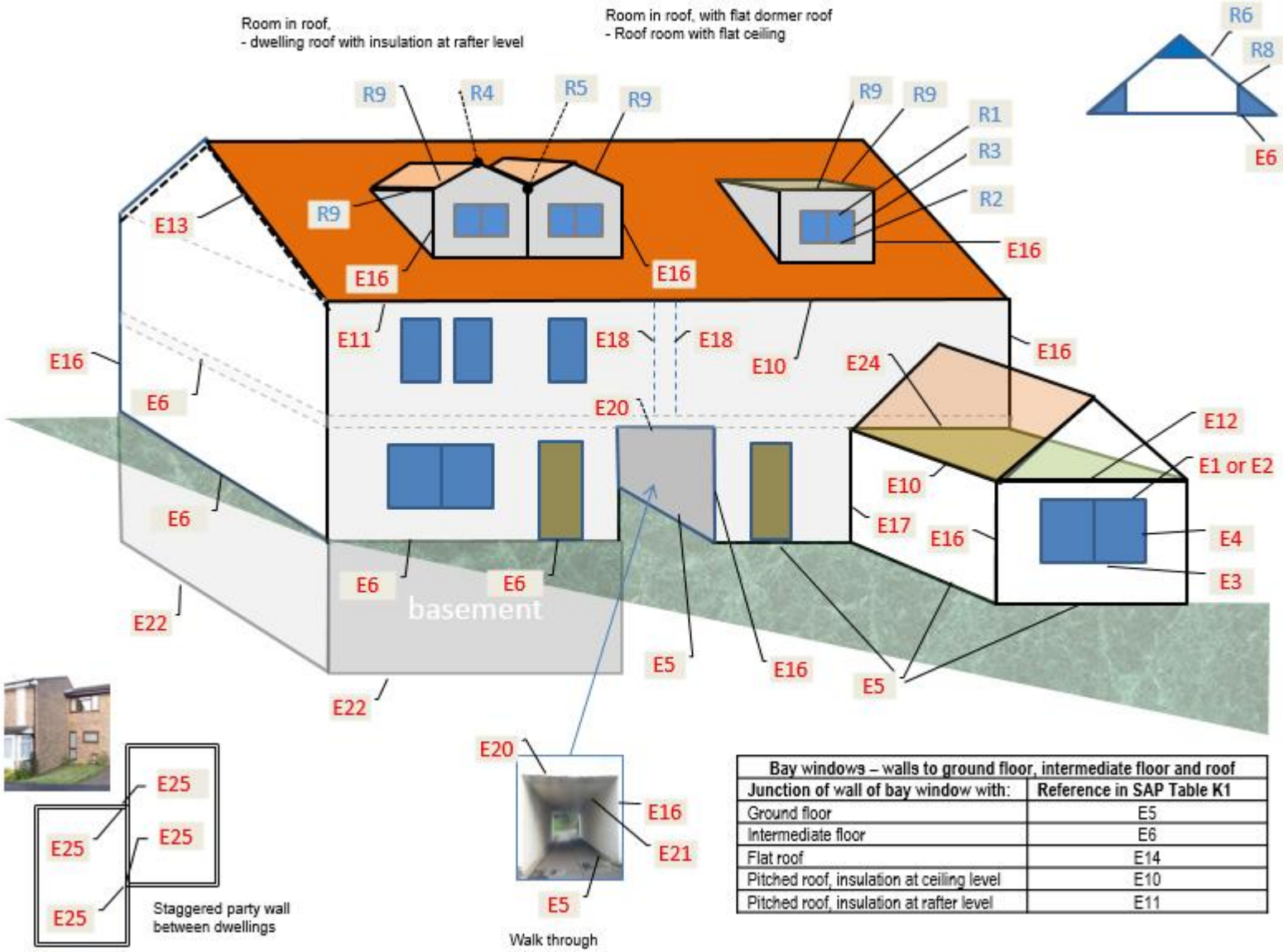
#	Item	Conventions	Evidence
A2.1	U-values for external elements	5.01	U-value calculation data sheet including construction layers (materials, thickness and thermal properties) and U-value corrections
A2.2	Window U-values and g-values	5.04	Certificate based on BFRC methodology, or Statement from developer or equivalent person confirming the window properties as built, or that the windows meet minimum requirements of building regulations
A2.3	Party wall U-values	5.03	Sealing Specification on plans of location of edge sealing, including edge sealing detail, e.g. drawing or named system, or Written confirmation from builder that sealing has been done. Filling and Sealing Confirmation that MIMA Guidance has been adhered to, or written confirmation from builder that filling and sealing has been done.
A2.4	Air permeability as built (Not Scotland)	1.02	For a dwelling that was tested the test results, or a certificate from a person registered by an authorised air pressure testing scheme, for that dwelling. For a dwelling that was not tested: • the test results, or a certificate from a person registered by an authorised air pressure testing scheme, for dwellings of the same dwelling type that were used to derive the input value on each development site; or • if the dwelling is on a development site with no more than two dwellings: - test results, or a certificate from a person registered by an authorised air pressure testing scheme, of a dwelling of the same dwelling type constructed by the same builder during the preceding 12 month period, or; - where the test results or a certificate cannot be provided the value of 15m3/(h.m2) at 50Pa may be used in the SAP calculation.

#	Item	Conventions	Evidence
A2.4(a)	Scotland	1.02 (a)	**For a dwelling that was tested:** • a copy of the test certificate and written confirmation from the applicant/agent that the verifier has accepted that test certificate; **For a dwelling that was not tested:** • written confirmation from the applicant/agent that the verifier has accepted the design infiltration rate recorded on the supplied drawings and specification for all untested dwellings. In some cases, action following sample testing may result in the applicant/agent and verifier agreeing a revised design infiltration rate. Note that this option includes dwellings where a 'default' infiltration rate of 15 $m^3/h.m^2$ @ 50 Pa is declared and accepted. An assessor should not be required to contact the verifier directly in this matter. Responsibility to provide complete and correct information on the subject dwelling rests with the party engaging the assessor's services. Criteria for the competence of a person undertaking tests are set out in paragraph 5.4 of the BSD document 'Sound and Airtightness Testing' available at: http://www.gov.scot/Topics/Built-Environment/Building/Building-standards/techbooks/ast2015.
A2.5	Overall dwelling specification		Confirmation in writing that the dwelling has been constructed and completed according to the specification provided to the assessor.
A2.6	Thermal bridging	5.06, 5.07, 5.08	Options include: - junction reference numbers and associated checklists for any ACDs or ECDs used - Ψ-values and checklists by professional bodies - manufacturers' Ψ-values and checklists where they have indicated that the calculations have been done by persons with suitable expertise and experience. - written confirmation that individual Ψ-values have been calculated by someone with suitable expertise and experience
A2.7	Low temperature heat emitters	6.08	Suitable evidence of low temperature design, e.g. Design, installation and commissioning certificate: www.ncm-pcdb.org.uk/sap/lowtemperatureheating
A2.8	Instantaneous waste water heat recovery	7.05	Suitable evidence of correct installation, e.g. Installation checklist and certificate: www.ncm-pcdb.org.uk/sap/page.jsp?id=25

#	Item	Conventions	Evidence
A2.9	Items from the Product Characteristics Database – heating and hot water systems, heating controllers, mechanical ventilation, FGHRS, WWHRS		Written confirmation from the developer that the specific products have been used in the dwelling concerned (sufficient to retrieve from the database).
A2.10	Manufacturer's declared efficiency values for room heaters		Manufacturer's declared value as specified in E2 in Appendix E of SAP 2012.
A2.11	Cooling systems		Manufacturer's declared value as specified in Table 10c of SAP 2012.
A2.12	Solar water heating, PVs	8.01	Data sheet or equivalent giving manufacturer name and - for solar water heating: area, efficiency and heat loss coefficient; - for PVs: the kWp rated power
A2.13	Community heating	6.05	If not from community networks database then: - evidence for plant configuration and efficiency values; - evidence for choice of distribution loss factor.
A2.14	Summer overheating	9.01	cross-ventilation/ fire doors, window opening and security
A2.15	Appendix Q		Consult Appendix Q documentation for the item concerned.

Appendix 2: Thermal bridges

Figure 2.1 : Location of thermal bridge types listed in SAP Table K1
It is expected that certification schemes will proved more detailed guidance for their assessors.



Bay windows – walls to ground floor, intermediate floor and roof	
Junction of wall of bay window with:	Reference in SAP Table K1
Ground floor	E5
Intermediate floor	E6
Flat roof	E14
Pitched roof, insulation at ceiling level	E10
Pitched roof, insulation at rafter level	E11

Figure 2.2 : Location of thermal bridge types listed in SAP Table K1 for **flats and party walls**

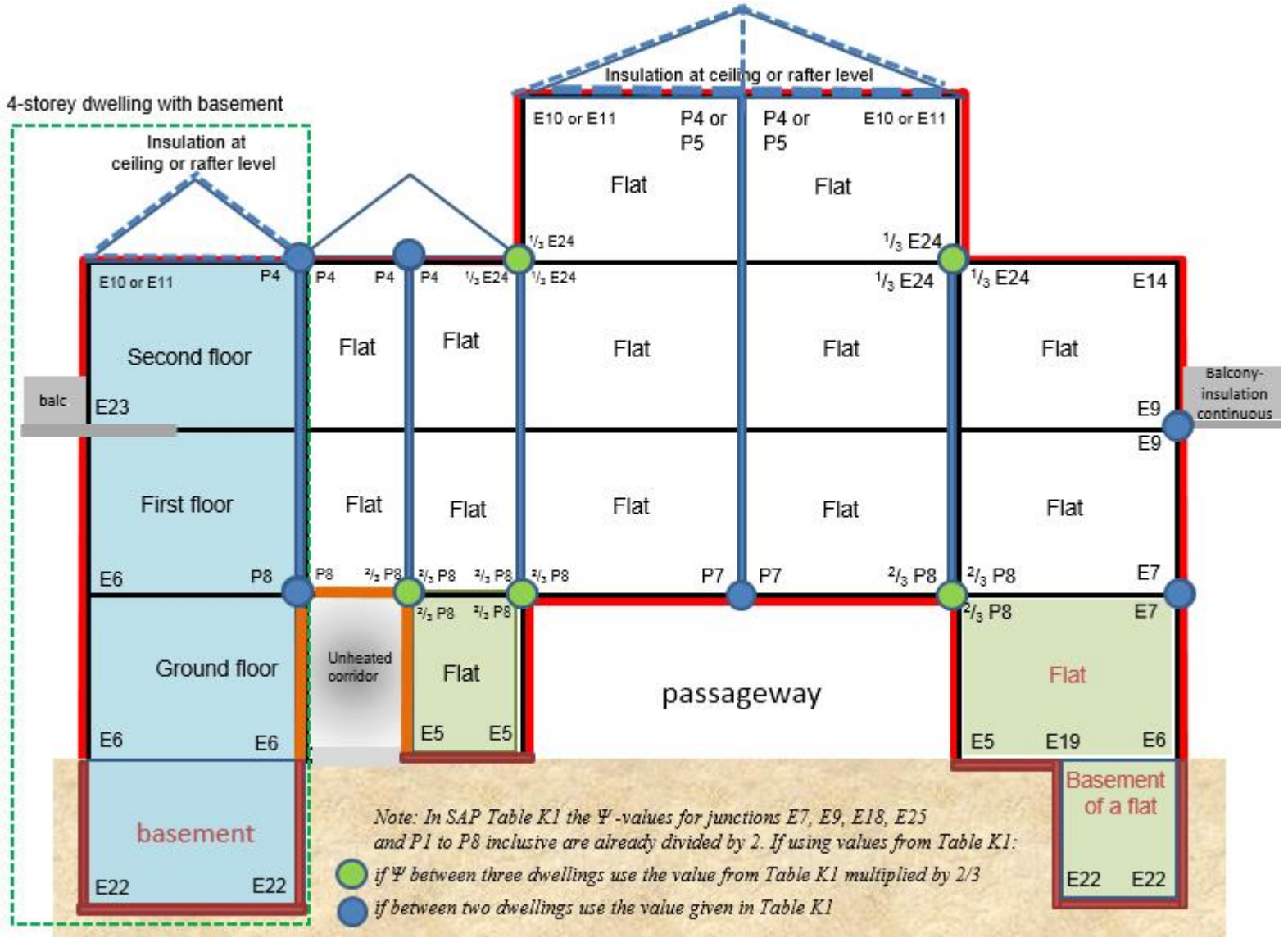


Figure 2.2.2 :. Inverted corner and normal corner divided between two dwellings – use E18 for each junction for each dwelling.

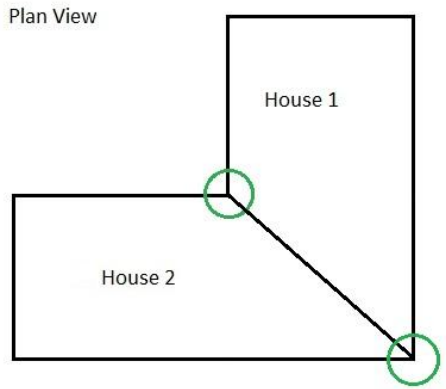
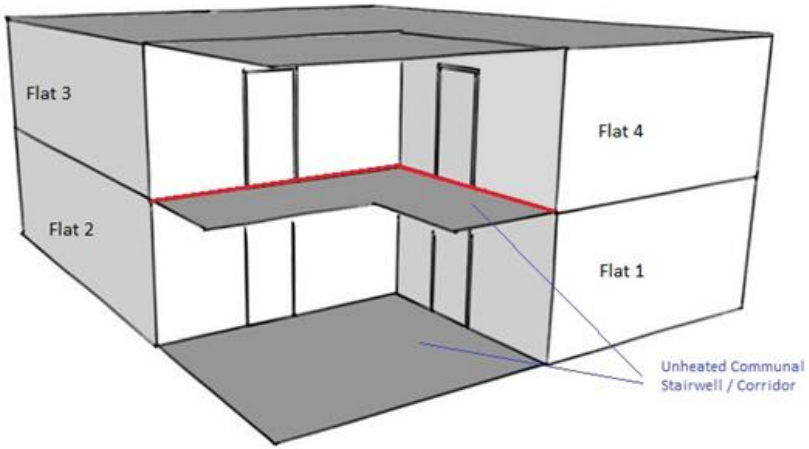
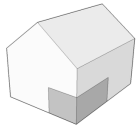
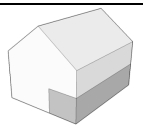
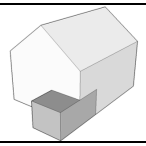


Figure 2.2.3 :. Junction to unheated stairwell – treat as party floor (E6 or E7)

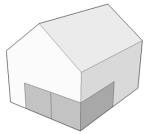
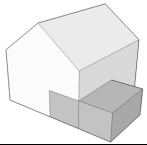
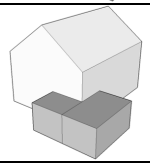


Appendix 2.3: Factors for sheltered thermal bridges (see convention 5.12)

Factors for integral single garages (single garage is a garage for one car)

Garage type		Elements between dwelling and garage	Factor for a single garage	
			Inside	Outside
Single fully integral		Side wall, end wall and floor	0.83	0.89
Single fully integral		One wall and floor	0.86	0.92
Single, partially integral displaced forward		Side wall, end wall and floor	0.85	0.91

Factors for integral double garages (double garage is a garage for two cars)

Garage type		Element between dwelling and garage	Factor for a double garage	
			Inside	Outside
Double garage fully integral		Side wall, end wall and floor	0.83	0.89
Double, half integral		Side wall, halves of the garage end wall and floor	0.91	0.94
Double, partially integral displaced forward		Part of the garage side wall, end wall and some floor	0.93	0.94

Factors for room in roof adjacent to unheated loft space

Area	Element between dwelling and unheated loft space	Factor
Room in roof built into a pitched roof insulated at ceiling level	insulated wall of room in roof	0.90
	or insulated ceiling of room below	0.90

Factors for stairwells and corridors

Elements between stairwell/corridor and dwelling	Heat loss from corridor through:	Factor
Stairwells:		
Facing wall exposed		0.74
Facing wall not exposed		0.71
Access corridors:		
Facing wall exposed, corridors above and below	facing wall, floor and ceiling	0.82
Facing wall exposed, corridor above or below	facing wall, floor or ceiling	0.85
Facing wall not exposed, corridor above and below	floor and ceiling	0.72
Facing wall not exposed, corridor above or below	floor or ceiling	0.78

Appendix 2.4 Thermal bridging - Convention for Oriel windows

Method 1: Oriel window modelled by detailed analysis

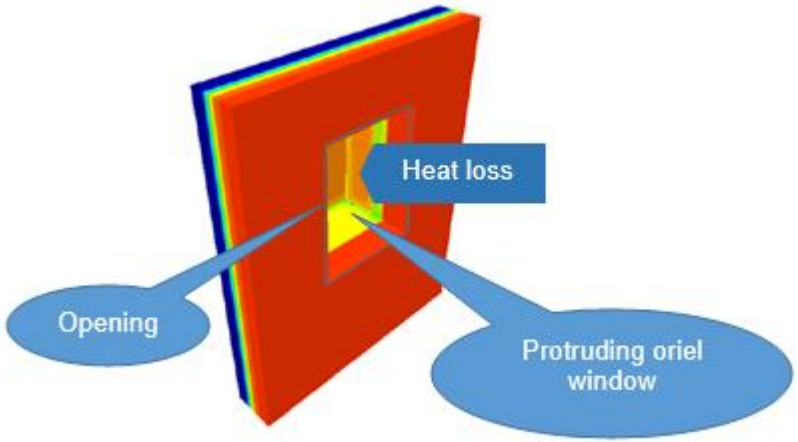
Heat loss from the opening from which an oriel window protrudes

$$Q_{opening} = Q_{modelled} - (U_{wall} \times A_{wall})$$

Effective U-value of the opening is:

$$U_{effective} = Q_{opening} / A_{opening}$$

$U_{effective}$ is applied to the projected area of opening

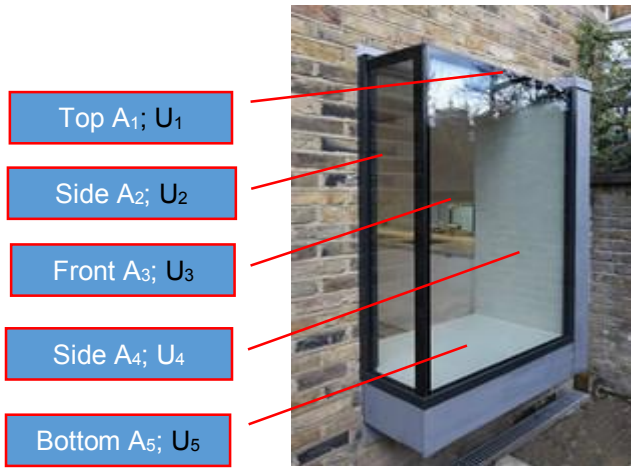


$U_{effective}$ takes into the account heat losses associated with thermal bridging so Ψ-values associated with sills, jams and lintels are zero.

Method 2: Oriel window not modelled

An approximate conservative estimate of $U_{effective}$ is calculated as:

$$U_{effective} = \frac{\Sigma(A_n \times U_n) + f_{TB}}{A_{openings}}$$



$A_{opening}$ is the area of opening in the wall (projected area)

$U_{effective}$ is the effective U-value that is applied to the projected area

f_{TB} factor that accounts for thermal bridges occurring in the oriel window;

$f_{TB} = 0.15$ is the default value recommended for the calculation; it covers all thermal bridges for a window and therefore no additional thermal bridging should be added for window sills, lintels or jambs.

Appendix 2.5 Thermal Bridging - Convention for curtain walls

Where thermal bridging has been included in the façade u-value, it is appropriate to input the measured length and apply a ψ-value of “0” in order to gain improvement on the notional value, but not for openings.

The façade U-value includes all effects of thermal bridging within the façade, and may also include the thermal bridging for other junctions such as corners calculated in line with EN ISO 12631. Therefore calculate the thermal bridging heat loss with:

- the lengths of window and door surrounds set to zero;
- the lengths of other junctions included in the calculated façade U-value entered as the actual length of junctions and psi-value set to zero;
- for all other junctions not included in the façade U-value enter their actual length and actual psi-value.

For example:

U-value of the curtain wall façade is calculated in line with EN ISO 12631, the U-value includes all heat loss through all elements of curtail wall including all thermal bridging at junctions, which allows the designer to specify one overall façade U-value incorporating all thermal bridges within the curtain wall façade.

U-value: Apply the calculated overall curtain wall façade U-value incorporating all thermal bridges to the area of the curtain wall façade;

Thermal bridging calculation:
Since the notional calculation includes thermal bridging, it is important to specify appropriate lengths of thermal bridges at psi-value when doing thermal bridging calculation within SAP.

E6/E7 Intermediate floor within/between dwelling(s):
Include lengths of junctions and psi-values if these are not included in the calculation of the curtain wall façade;

E16/E17 Corner (Normal / Inverted):
Where each instance of this bridge has been included in the façade U-value calculation, specify the actual length of junctions and psi-value=0.

E18/E25 Party (& staggered) wall between dwellings:
Where each instance of this bridge has been included in the façade u-value calculation, specify the actual length of junctions and psi-value=0.

Junctions relating to window/door connections (lintel, jamb & sill):
Do not include lengths of junctions around window/door surrounds, they should be set to zero as per SAP section 3.6. (this is because notional U-value already includes allowance for thermal bridging for curtain wall).

Other junctions:
The junctions with ground floor E5 and roof (junction type depending on roof type) will be included using length of junction and appropriate psi-value.

Appendix 2.6 Web links for thermal bridge details

Acredited Construction Details (ACD):

England & Wales: www.planningportal.gov.uk/buildingregulations/approveddocuments/partl/bcassociateddocuments9/acd

Scotland: www.scotland.gov.uk/Topics/Built-Environment/Building/Building-standards/techbooks/techhandbooks

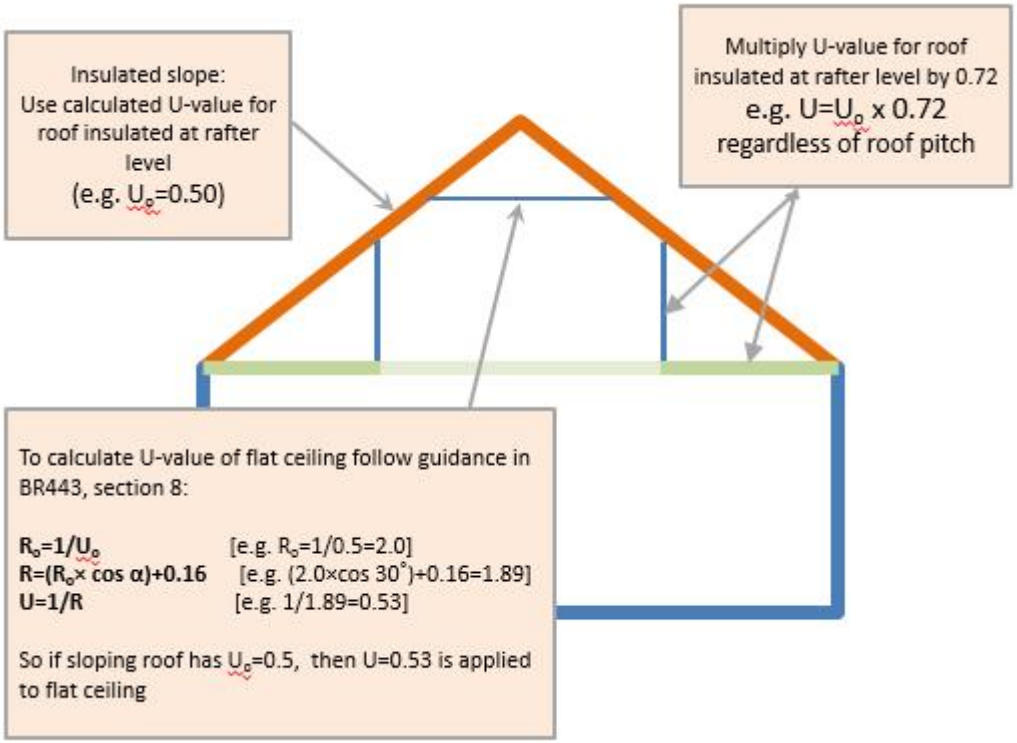
The Scotland ones can be used in England & Wales if the actual construction corresponds.

Enhanced Construction details (ECD):

www.energysavingtrust.org.uk/business/Business/Housing-professionals/Interactive-tools/Enhanced-Construction-Details/Enhanced-Construction-Details-Matrix

Appendix 3 – U-values for room in roof

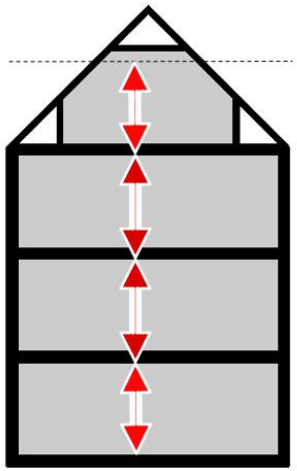
3.1 U-values for elements to unheated roof voids in a room in the roof (see convention 2.07)



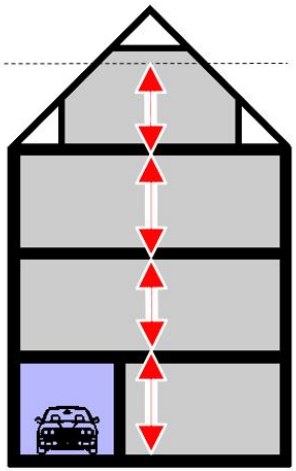
Appendix 4. Dwelling dimensions (the diagrams below show how to measure height of storeys in order to calculate volume of dwelling)

Multi-storey dwellings

Dwelling without a garage

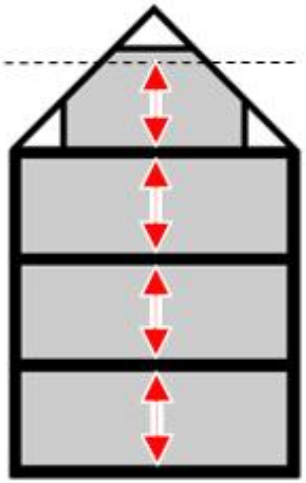


Dwelling with a garage

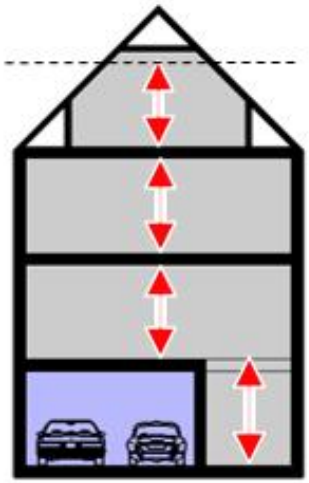


Blocks of flats

Block of flats without a garage



Block of flats with a garage



The difference in the approach to floor herights is due to the method of calculating thermal bridging of junctions. For blocks of flats the space between floors is already included in the psi-values, while the space between floors in other dwellings is not included, therefore the area of wall should be added.

Appendix 5. Thermal mass parameter for whole dwelling

The following provides the thermal mass for some illustrative constructions.

Thermal mass of elements				Illustrative construction	Indicative Thermal Mass
Ground floor	**External walls**	**Party wall**	**Internal partitions**		
Low	Low	Low	Low	Suspended timber floor, carpeted Timber frame external wall Timber frame party wall Partitions: plasterboard on timber frame	Low
Medium	Low	Low	Low	Suspended concrete floor, carpeted Timber frame external wall Timber frame party wall Partitions: plasterboard on timber frame	Low
Medium	Medium	Low	Low	Suspended concrete floor, carpeted Masonry cavity wall – AAC block, filled cavity Timber frame party wall Partitions: plasterboard on timber frame	Low
Medium	Medium	Medium	Low	Suspended concrete floor, carpeted Masonry cavity wall – AAC block, filled cavity AAC party wall Partitions: plasterboard on timber frame.	Medium
Medium	Medium	Medium	Medium	Suspended concrete floor, carpeted Masonry cavity wall – AAC block, filled cavity AAC party wall Partitions: medium block, plasterboard on dabs	Medium

Thermal mass of elements				Illustrative construction	Indicative Thermal Mass
Ground floor	**External walls**	**Party wall**	**Internal partitions**		
High	Medium	Medium	Medium	Slab on ground, carpeted Masonry cavity wall – AAC block, filled cavity AAC party wall Partitions: dense block, plasterboard on dabs	Medium
High	High	Medium	Medium	Slab on ground, carpeted Masonry cavity wall – dense block, filled cavity AAC party wall Partitions: medium block, plasterboard on dabs	Medium
High	High	High	Medium	Slab on ground, carpeted Masonry cavity wall – dense block, filled cavity Dense block party wall Partitions: medium block, plasterboard on dabs	High
High	High	High	High	Slab on ground, carpeted Masonry cavity wall – dense block, filled cavity Dense block party wall Partitions: dense block, dense plaster	High