

SAP 2012 Conventions

17 May 2016 (v 6.1)

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 v6.0 indicated by light blue background.

Amended conventions for v6.1 indicated by light green background.

The list of conventions will be extended as appropriate.

#	Limitations	Topic	Conventions	Issue date
GENERAL				
1.01		Default values	<p>SAP provides default values for many items, such as window U-values and boiler efficiency.</p> <p>Whenever specific product information is available, that should be used rather than default values.</p> <p>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.</p>	Sept 2010

#	Limitations	Topic	Conventions	Issue date
1.02	Not Scotland	Pressure test (as-built assessment)	<p>The as-built assessment cannot be processed unless</p> <ul style="list-style-type: none"> (a) pressure test data is provided, either for the dwelling concerned or on another of the same dwelling type in the same development, or (b) in England the special conditions of AD L1A 2013 paragraph 3.22 or AD L1A 2010 paragraph 5.23, apply, or (c) In Wales the special conditions of AD L1A 2014 paragraph 6.4.10 or AD L1A 2010 paragraph 5.2.3 apply, or (d) In Northern Ireland the special conditions of TB F1 2006 paragraph 2.54 or TB F1 2012 paragraph 2.69 apply, or (e) evidence of a specific dispensation issued in writing by Building Control. 	<p>Sept 2010</p> <p>amended March 2011</p> <p>amended October 2015</p> <p>amended May 2016</p>
1.03	Not Scotland	Regulations compliance report	<p>As a minimum, building control should be provided with:</p> <ul style="list-style-type: none"> - the regulations compliance report, and - listing of the input data list, and - PEA (if design stage, E&W only) or EPC (if as-built stage). <p>They 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.</p> <p>Any differences between the as-designed specification and the as-built specification should be highlighted on the input data list.</p> <p>(Note. In Scotland, assessment of compliance with CO₂ emissions is at the design stage, prior to issue of building warrant. Production of a compliance report is not mandatory but should be considered good practice, where generated by the SAP software.)</p>	<p>Sept 2010</p> <p>amended March 2011</p>

#	Limitations	Topic	Conventions	Issue date
1.04	England, Wales, Northern Ireland	When to issue an EPC	<p>The Predicted Energy Assessment (PEA) is appropriate for all developers selling dwellings off-plan. PEAs should be replaced with an EPC once the dwelling is physically complete. A dwelling is deemed 'physically complete' when all of the following conditions are met:</p> <ul style="list-style-type: none"> a) Commissioning of the heating system has been satisfactorily completed, and b) Accredited 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. <p>It is the developer's responsibility to use the PEA until a dwelling is physically complete, at which time they should feed information about changes from the design stage to the as-built stage to the OCDEA so that an EPC can be produced. You should not produce an EPC without such information. However, you may find you need to prompt the developer to produce the required information.</p> <p>Provide a copy of the EPC to the client (in electronic or paper form) as well as the RRN, to be passed to the building control body.</p> <p>(Note. In Scotland, on completion of building works, the EPC must also be affixed within the completed dwelling. A copy of the EPC must be provided to the verifier with the completion certificate for each new dwelling. The EPC must reflect any variations or additional information, such as air infiltration test results, arising during the construction phase).</p>	Sept 2010 amended March 2011
1.05		SAP version for EPCs	<p>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.</p> <p>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.</p>	Sept 2010 amended Sept 2012
1.07	England, Wales	Design water use	<p>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.</p> <p>In other countries, and for any existing dwelling, this option does not apply.</p>	Sept 2010 amended March 2011

#	Limitations	Topic	Conventions	Issue date
1.08		Flats v. houses	<p>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').</p> <p>In some cases a different designation is used for issue ENE 2 of the Code for Sustainable homes, for example in a low-rise flatted development with an unheated corridor through the middle the dwellings may be treated as semi-detached for ENE 2. In such circumstances it is necessary to undertake two SAP calculations, one for the CSH and one for the EPC. For the EPC the dwellings must be designated such that the appropriate description appears at the top of the EPC.</p>	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
1.10	Not Scotland	Software version	<p>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.</p> <p>Note: In Northern Ireland provision of the on-construction EPC is a separate legislative requirement from building control submissions to show compliance with Regulation 40 (TER/DER). EPC lodgement therefore always requires migration to the latest version of the software.</p>	Sept 2011
1.11	Scotland only	Software version	<p>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.</p> <p>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.</p> <p>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).</p>	Sept 2011
1.12		Sheltered sides	<p>Enter actual number if known, otherwise 0.</p> <p>In Scotland, not more than 2, and 2 if unknown.</p>	October 2015

#	Limitations	Topic	Conventions	Issue date
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	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
2.02		Storey height of flats over garages	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.	Sept 2011
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
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	Sept 2011

#	Limitations	Topic	Conventions	Issue date
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	Sept 2011
OPENINGS				
3.01		U values of doors to unheated spaces	<p>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.</p> <p>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 3.3.2).</p> <p>Note: Attached garages are disregarded altogether.</p>	Sept 2010
3.02		Window areas	To be specified either individually or at least per elevation.	Sept 2011
3.03		External doors	<p>Solid door – glazed area < 30% of door area</p> <p>Semi-glazed door – glazed area 30-60% of door area</p> <p>Glazed door – glazed area > 60% of door area, included as a window</p>	October 2015
3.04	England, Wales	Window orientation	The orientation of all windows must be specified.	October 2015
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 ventilation	Solar powered vents should be entered into SAP software as passive vents.	Sept 2010

#	Limitations	Topic	Conventions	Issue date
4.04		Wet rooms	<p>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.</p> <p>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.</p>	Sept 2011
4.05		Semi-rigid ducts	Semi-rigid ducts can be specified only if found in the database (brand and model)	October 2015
U-VALUES AND THERMAL BRIDGING				
5.01		Correct U-value calculations	<p>U-values are calculated using the conventions given in BR 443.</p> <p>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.</p> <p>Acceptable routes are:</p> <ul style="list-style-type: none"> - 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 <p>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.</p>	<p>Sept 2010</p> <p>amended March 2011</p> <p>amended October 2015</p>
5.02	England, Wales, Northern Ireland	Swimming pools	In England & Wales U-values of swimming pool basins need to be checked for building control applications from 1 October 2010. However for entry into the SAP calculator the U-value of the floor is to be obtained as if the swimming pool were not there.	<p>Sept 2010</p> <p>amended March 2011</p>

#	Limitations	Topic	Conventions	Issue date
5.03		Party wall U-values	<p>In the context of U-values, 'party wall' includes any wall between the dwelling and another heated space which can be:</p> <ul style="list-style-type: none"> - another dwelling - commercial premises - a heated corridor or stairwell in a block of flats - a heated common area <p>Note. A heated corridor is one with controlled fixed heaters. Heat from distribution pipes is to be disregarded.</p> <p>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).</p> <p>U = 0.5 should be used for party walls unless documentary evidence is provided, in which case:</p> <p>A solid party wall has U = 0.</p> <p>To qualify for U = 0.2 (effective edge sealing):</p> <ul style="list-style-type: none"> - the sealing must prevent air going in or out of any cavity - the sealing is required top and bottom and vertically. <p>To qualify for U = 0:</p> <ul style="list-style-type: none"> - any cavity must be sealed as above, and - any cavity must be fully filled <p>Framed systems (timber or metal) may have more than one cavity.</p>	<p>Sept 2010</p> <p>amended March 2011</p> <p>amended October 2015</p>
5.04		Window U-values and g-values	<p>The U-value is that of the complete window, not that of the glazing alone.</p> <p>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).</p> <p>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.</p> <p>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.</p>	<p>Sept 2010</p> <p>amended Sept 2012</p>

#	Limitations	Topic	Conventions	Issue date
5.06		Thermal bridging, general	<p>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 γ value can only be used if it is:</p> <ul style="list-style-type: none"> (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. <p>When calculating thermal bridge junctions at <u>either design or as-built stage</u>:</p> <p>All junction types listed in SAP Table K1 and in these conventions should be considered. Evidence is required for γ-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.</p> <p><u>At the design stage:</u></p> <p>For a junction to be assigned a γ-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.</p> <p><u>At the as-built stage:</u></p> <p>For a junction to be assigned a γ-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, 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.</p>	Sept 2010 re-written March 2011

#	Limitations	Topic	Conventions	Issue date
5.07		Thermal bridging, sources of Y-values	<p>The Y-value for each junction is obtained from:</p> <ol style="list-style-type: none"> 1. For any junction for which an ACD is being used use the applicable Y-value in the 'accredited' column in Table K1, or 2. For any junction for which an ECD is being used use the Y-value associated with the junction reference number, or 3. For any junction for which a calculated Y-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 Y-value for the applicable junction type from the 'default' column in Table K1. <p>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".</p> <p>See Appendix 1 to these conventions for locations of the various junction types.</p> <p>If a Y-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. If no calculated value is available use the default Y-value.</p> <p>When there is more than one junction of a given junction type which have different Y-values (e.g. corners in the main dwelling and stud wall corner in a roof room; multiple types of lintel), either:</p> <ol style="list-style-type: none"> (a) enter the junction type more than once with its respective Y-values and lengths, or (b) use the highest Y-value for the junction type with the total length of the junctions, or (c) calculate a weighted average (Y-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. 	<p>March 2011</p> <p>amended Sept 2012</p> <p>amended October 2015</p>

#	Limitations	Topic	Conventions	Issue date
5.08		Thermal bridging, additional junction types	<p>The following values may also be used as accredited values:</p> <p>E14: $Y = 0.04 \text{ W/m}\cdot\text{K}$ E15: $Y = 0.28 \text{ W/m}\cdot\text{K}$ P4: $Y = 0.12 \text{ W/m}\cdot\text{K}$ P5: $Y = 0.04 \text{ W/m}\cdot\text{K}$</p> <p>For P2 and P3 the default value is 0.0 and these junctions need not be considered.</p> <p>For E16 (corner) it is acceptable to use the value of $0.09 \text{ W/m}\cdot\text{K}$ 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.</p> <p>The value of $Y = -0.09 \text{ W/m}\cdot\text{K}$ for the inverted corner E17 may be used only in conjunction with the value $Y = 0.09 \text{ W/m}\cdot\text{K}$ for a normal corner E16.</p>	March 2011 re-written October 2015
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	<p>Divide the total Y-value by the number of dwellings involved, and apply that to each dwelling. Thus for a junction between two dwellings use $Y/2$, between three dwellings use $Y/3$.</p> <p>Note. In SAP Table K1 the Y-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:</p> <ul style="list-style-type: none"> - if between two dwellings use the value given in Table K1; - if between three dwellings use the value from Table K1 multiplied by $2/3$. 	October 2015
5.12		Thermal bridges to unheated spaces	<ol style="list-style-type: none"> 1. Obtain the Y-value as normal (between inside and outside) 2. Multiply by factor from Table 1 at the end of these conventions 	October 2015
5.13	England, Wales	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.	October 2015
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	<p>The Thermal Mass Parameter (TMP) is required for calculations by SAP 2012. It can be:</p> <ol style="list-style-type: none"> 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 entered into software as a TMP value that has been calculated as in a. (for example using a spreadsheet), or treated as being low, medium or high using the global values of 100, 250 or 450 kJ/m²K given in SAP 2012 Table 1f. <p>Guidelines for selection of values for c. are:</p> <ul style="list-style-type: none"> - timber frame is usually low; - it is medium if there are dense blocks in external or partition walls; - it is high if at least two of external wall, internal partition wall, party wall have dense blocks - internal insulation makes it low irrespective of the construction; - in all of the above, only the innermost 100 mm of the construction influences the thermal mass <p>If the choice is unclear, consult Table 2 at the end of these conventions.</p> <p>In case of dispute, a detailed calculation via a. or b. should be undertaken.</p>	<p>Sept 2010</p> <p>amended Sept 2012</p> <p>amended October 2015</p>
SPACE HEATING				
6.01		Micro-CHP	If the system is unavailable in the database, select condensing boiler with SAP default efficiency.	Sept 2010

#	Limitations	Topic	Conventions	Issue date
6.02		Two main heating systems	<p>Although in the large majority of cases there is only one main heating system, SAP provides for two main systems.</p> <p>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.</p> <p>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.</p> <p>When there are two main systems, system 1 always heats the living area.</p>	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
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	<p>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.</p> <p>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.</p> <p>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.</p> <p>Efficiency of community boilers can be quoted as net or gross. It is the gross efficiency that is used in SAP.</p>	Sept 2010 re-written October 2015

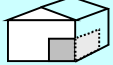
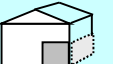
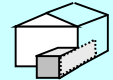
#	Limitations	Topic	Conventions	Issue date
6.06		CHP supplying both dwellings and commercial buildings	<p>Where a CHP system is providing heat to dwellings and electricity to commercial premises, the electricity generation must be credited only once.</p> <p>a) If the electricity generated is included in the assessment of the commercial premises but the electricity is assumed to have the same CO₂ 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..</p> <p>b) If the electricity generated is included in the assessment of the commercial premises and the electricity is assumed to have a CO₂ 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).</p> <p>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 CO₂ 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:</p> $\frac{\text{assumed CHP electricity CO}_2 \text{ emission factor}}{\text{grid electricity CO}_2 \text{ emission factor}}$ <p>The CHP heat efficiency and effective CHP electrical efficiency should then be entered in SAP.</p> <p>Note: for all alternatives, the CHP heat utilisation is taken into account in the heat efficiency of the CHP..</p>	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	<p>a. separate plumbing circuits, either with their own programmer, or separate channels in the same programmer, or</p> <p>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</p> <p>In both cases subject to the conditions in SAP 2012 section 9.4.14</p> <p>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.</p>	October 2015
DHW HEATING				
7.01		Separate boiler or heat pump for DHW	<p>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:</p> <ul style="list-style-type: none"> - 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	<p>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.</p>	Sept 2010
7.03		Independent programming of DHW heating	<p>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.</p>	Sept 2010
7.04		Primary pipework	<p>For a new dwelling all primary pipework is regarded as accessible.</p>	October 2015

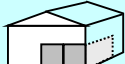
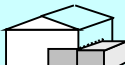
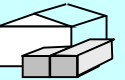
#	Limitations	Topic	Conventions	Issue date
7.05		Instantaneous waste water heat recovery	<p>Valid only for hot water from a combi boiler or a mains pressure hot water system (thermal store or unvented cylinder) and for mixer showers having a thermostatic mixer valve.</p> <p>Two showers can be connected to the same WWHRS provided that the length of the drain pipe between shower and WWHRS is not excessive (generally less than 3 metres).</p> <p>SAP 2012 allows for two WWHR systems to be specified, but if there are two one of them must be System B.</p> <p>Instantaneous electric showers cannot have a WWHRS but are included in the total number of showers in the dwelling.</p> <p>For as-built assessments documentary evidence in the form of a completed WWHRS checklist is required.</p>	October 2015
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	<p>Ascertain whether the PV is connected to the dwelling's electricity meter. If the position cannot be ascertained mark it as not connected.</p> <p>Note: The above affects only cost benefit. Carbon benefit is always counted.</p> <p>Where common areas in blocks of flats are assessed separately, the carbon benefit of PVs connected to landlord supply must not be counted twice.</p>	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

Table 1: 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

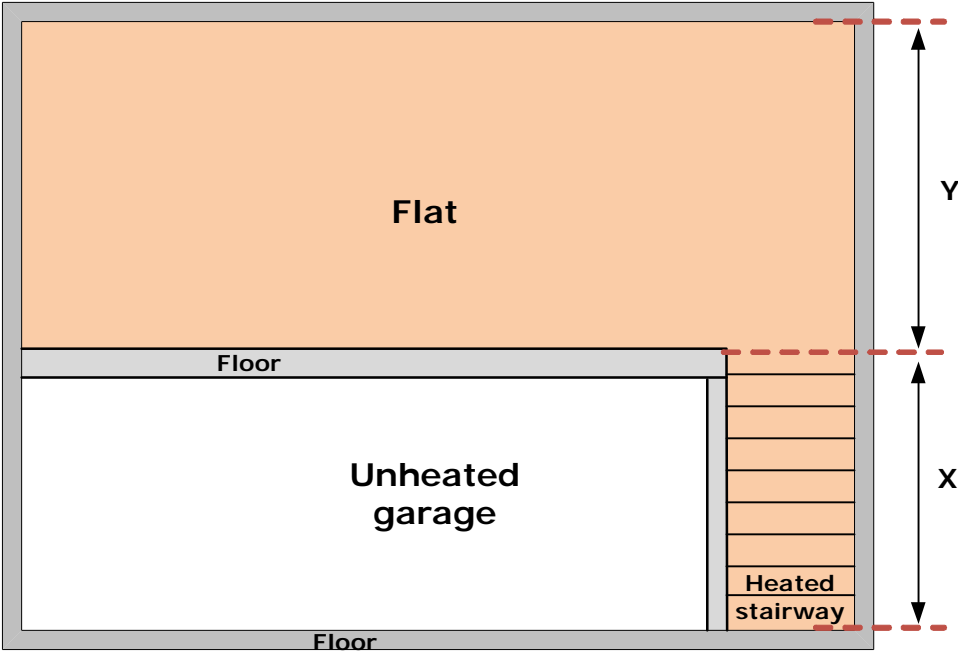
Table 2: Thermal mass parameter for whole dwelling

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

Figure 1



Weblinks for thermal bridge 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.

ECD:

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

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)
May 2016	Issue 6.1 Amended 1.02, A2.4, figure A.

Appendix 1: Thermal bridges

Figures A1.1 and A1.2 illustrate the location of the thermal bridge types listed in SAP Table K1. It is expected that certification schemes will provide more detailed guidance for their assessors.

Figure A1.1 : Location of thermal bridges

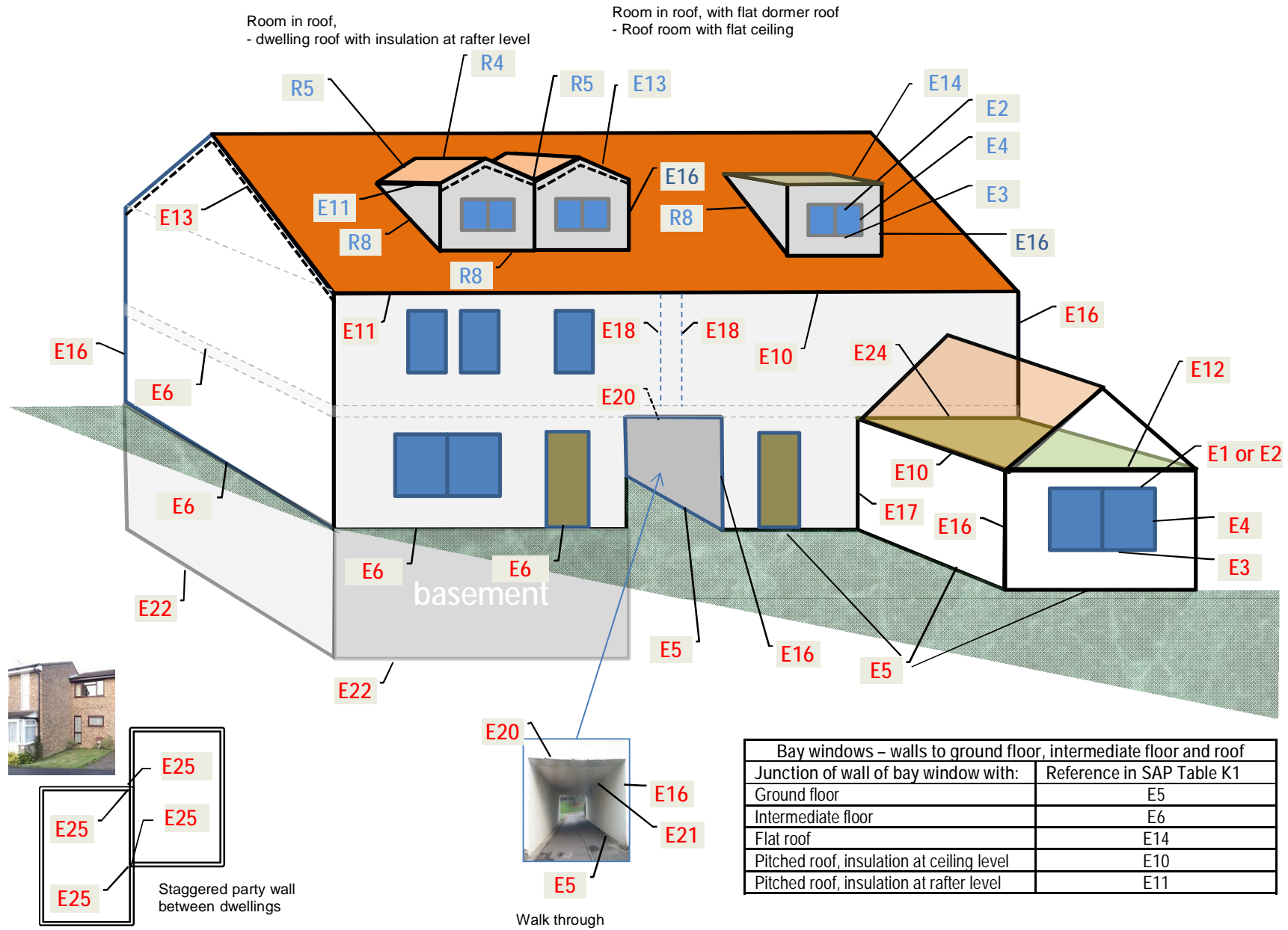
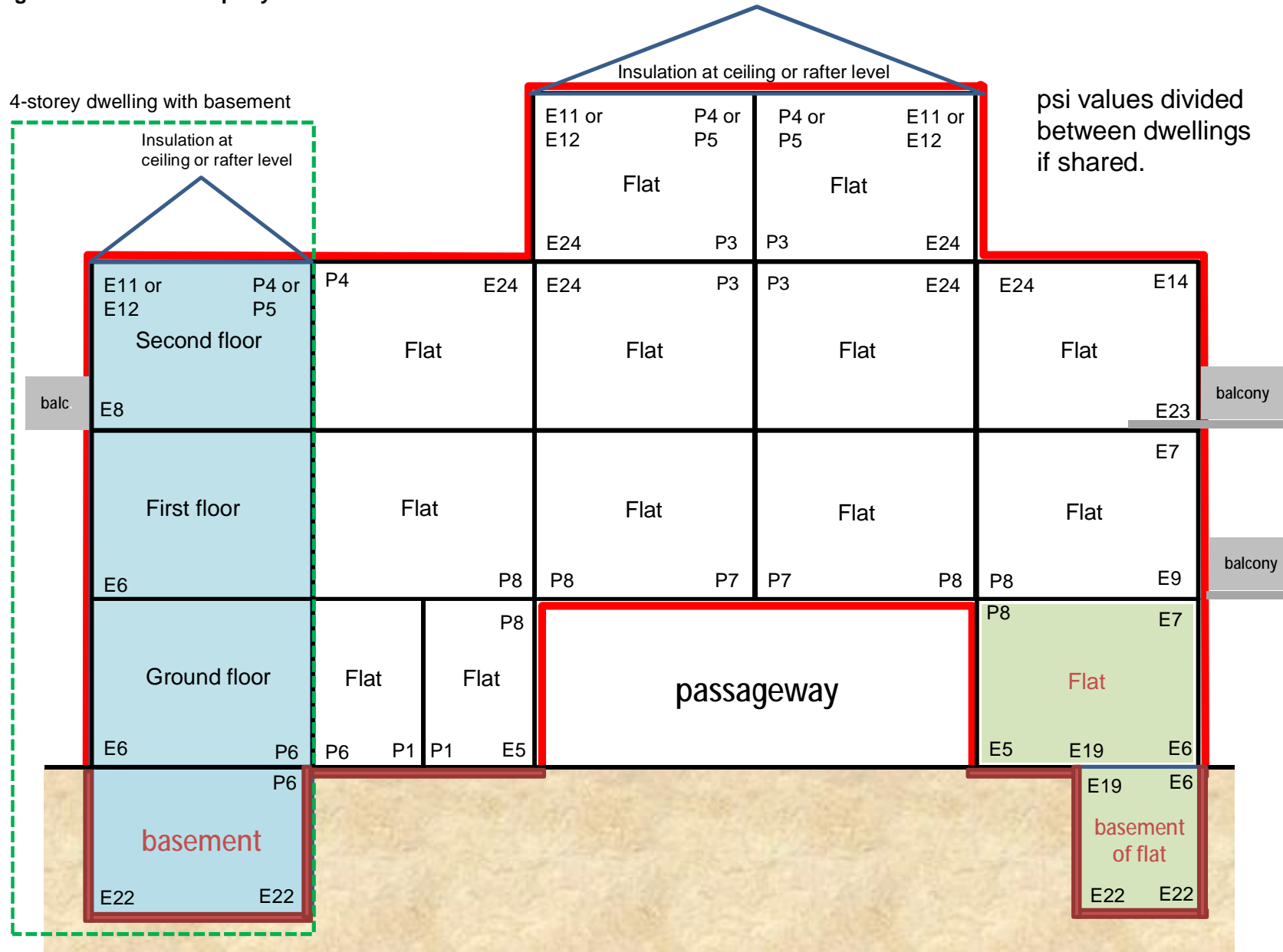


Figure A1.2 : Flats and party walls



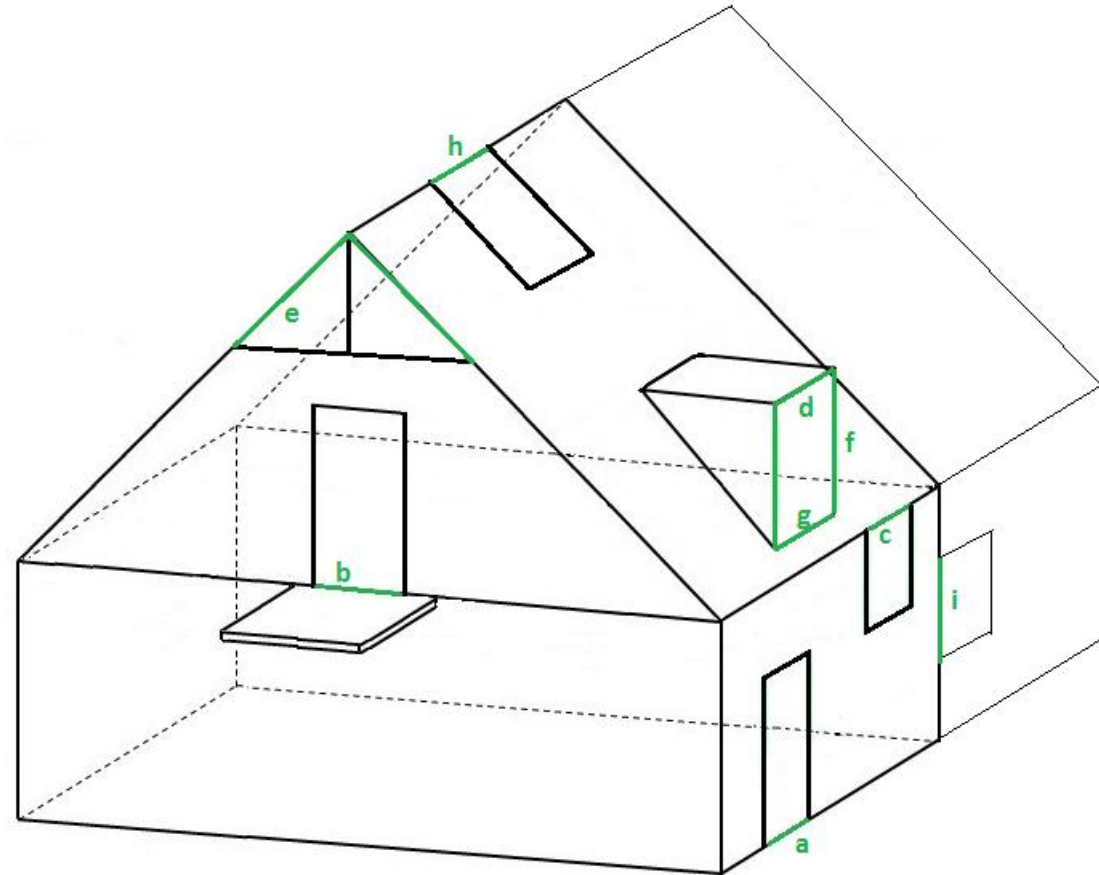
Additional notes

1. Where two junction types overlap or nearly so, do not include both but instead include just the one with the higher Y-value.

Examples:

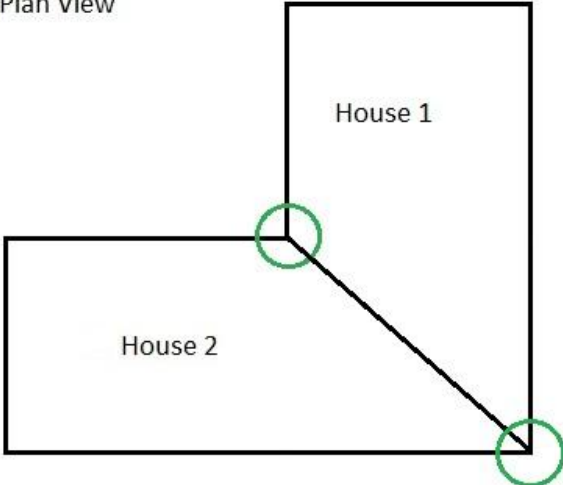
The green lines indicate the extent of the overlapping junctions. Elsewhere the normal rules apply.

- a. Door sill E3 is in line with ground floor junction E5 (include E5 and disregard E3).
- b. Door sill E3 in line with upper floor to balcony.
- c. Lintel E1/E2 at line of eaves E10/E11
- d. Lintel E1/E2 at line of flat roof E14.
- e. Side of triangular windows at line of gables E13.
- f. Dormer window jambs E4 at normal corners of dormer E16.
- g. Window sill E3 at junction between dormer wall and insulated sloped roof.
- h. Head of roof light R1 at line of ridge R4.
- i. Window jamb E4 at junction of party wall E18/E25.

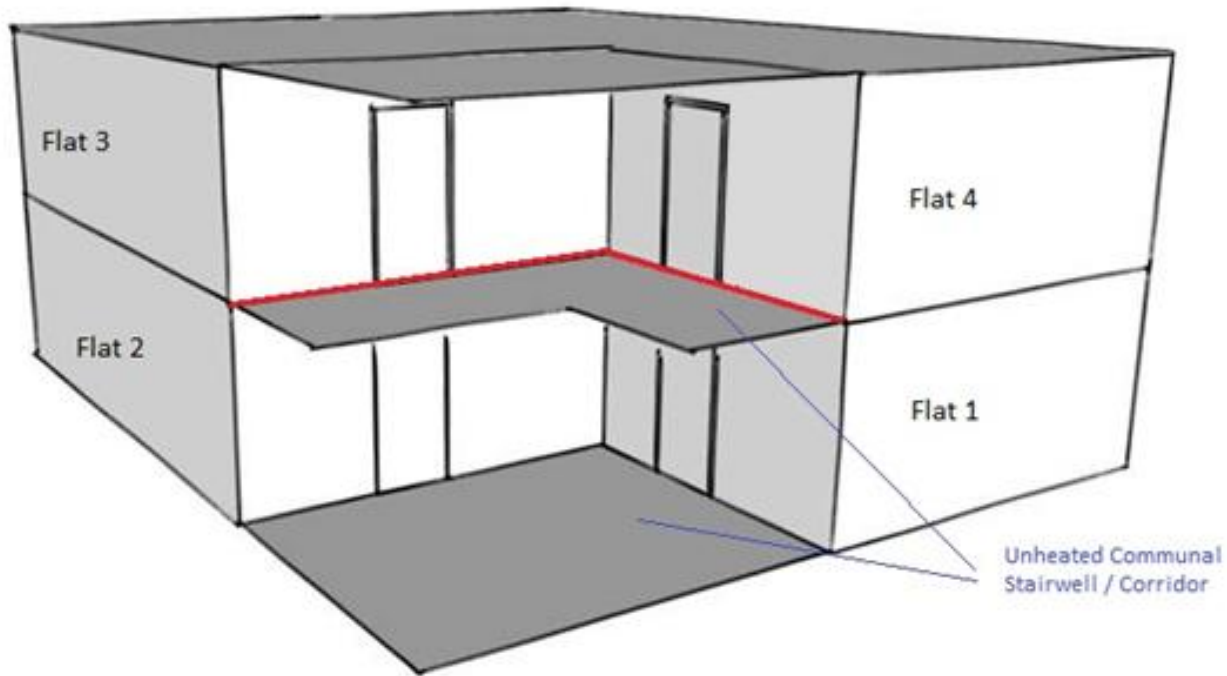


2. Inverted corner and normal corner divided between two dwellings – use E18 for each junction.

Plan View



3. Junction to unheated stairwell – treat as party floor (E6 or E7)



Appendix 2 – 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	<u>Sealing</u> 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. <u>Filling and Sealing</u> Confirmation that MIMA Guidance ¹ has been adhered to, or Written confirmation from builder that filling and sealing has been done.

¹ www.mima.info/pdf/MIMA-Party-Wall-Bypass-Guide.pdf

#	Item	Conventions	Evidence
A2.4	Air permeability as built	1.02 (a)	<p><u>For a dwelling that was tested:</u></p> <p>The test results, or a certificate from a person registered by an authorised air pressure testing scheme, for that dwelling.</p> <p><u>For a dwelling that was not tested:</u></p> <ul style="list-style-type: none"> · 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: <ul style="list-style-type: none"> - 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.
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	<p>Options include:</p> <ul style="list-style-type: none"> - junction reference numbers and associated checklists for any ACDs or ECDs used - Y-values and checklists by professional bodies - manufacturers' Y-values and checklists where they have indicated that the calculations have been done by persons with suitable expertise and experience. - written confirmation that individual Y-values have been calculated by someone with suitable expertise and experience
A2.7	Low temperature heat emitters	6.08	<p>Suitable evidence of low temperature design, e.g. Design, installation and commissioning certificate:</p> <p>www.ncm-pcdb.org.uk/sap/lowtemperatureheating</p>
A2.8	Instantaneous waste water heat recovery	7.05	<p>Suitable evidence of correct installation, e.g. Installation checklist and certificate:</p> <p>www.ncm-pcdb.org.uk/sap/page.jsp?id=25</p>

#	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
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.