

Appendix R: Reference values

This appendix provides reference values for the parameters of a SAP calculation, which are used in connection with establishing a target fabric energy efficiency and/or a target CO₂ emissions rate for the purposes of demonstrating compliance with regulations for new dwellings. The reference values are used to define a notional dwelling of the same size and shape as the actual dwelling.

Note: Building regulations can vary between England, Wales, Scotland and Northern Ireland. The data in this Appendix apply only to the jurisdiction(s) stated.

Table R1 : Reference values for England

Element or system	Value
Climate data	UK average
Size and shape	Same as actual dwelling
Opening areas (windows, roof windows and doors)	Same as actual dwelling up to a maximum for total area of openings of 25% of total floor area. If the total area of openings in the actual dwelling exceeds 25% of the total floor area, reduce to 25% as follows: 1) Include all opaque and semi-glazed doors with the same areas as the actual dwelling (excluding any doors not in exposed elements, e.g. entrance door to a flat from a heated corridor). 2) Reduce area of all windows and roof windows by a factor equal to [25% of total floor area less area of doors included in 1)] divided by [total area of windows and roof windows in actual dwelling].
External walls including semi-exposed walls	$U = 0.18 \text{ W/m}^2\text{K}$
Party walls	$U = 0$
Floors	$U = 0.13 \text{ W/m}^2\text{K}$
Roofs	$U = 0.13 \text{ W/m}^2\text{K}$
Opaque door (<30% glazed area)	$U = 1.0 \text{ W/m}^2\text{K}$
Semi-glazed door (30%-60% glazed area)	$U = 1.2 \text{ W/m}^2\text{K}$
Windows and glazed doors with >60% glazed area	$U = 1.4 \text{ W/m}^2\text{K}$ Frame factor = 0.7 Solar energy transmittance = 0.63 Light transmittance = 0.80 Orientation same as actual dwelling Overshading same as actual dwelling
Roof windows	$U = 1.4 \text{ W/m}^2\text{K}$ (Adjustment factor of +0.3 $\text{W/m}^2\text{K}$ applied to roof window as described below Table 6e; resultant U value = 1.7 $\text{W/m}^2\text{K}$) Other parameters as for windows
Curtain wall	Curtain walling to be treated as standard glazing and opaque wall with the same areas as the actual dwelling. When the total opening area exceeds 25% of floor area the glazed area to be reduced to 25% as for opening areas above. U -value of opaque wall = 0.18 $\text{W/m}^2\text{K}$ U -value of glazing = 1.5 $\text{W/m}^2\text{K}$ (which includes an allowance of 0.1 for thermal bridging within the curtain wall)
Thermal mass	Medium (250 $\text{kJ/m}^2\text{K}$)
Living area	Same as actual dwelling
Number of sheltered sides	Same as actual dwelling

Element or system	Value
Allowance for thermal bridging	<p>1. If the thermal bridging in the actual dwelling has been specified by using the default y-value of $0.15 \text{ W/m}^2\text{K}$, the thermal bridging is defined by $y = 0.05 \text{ W/m}^2\text{K}$.</p> <p>2. Otherwise the thermal bridging allowance is calculated using the lengths of junctions in the actual dwelling and the ψ values in Table R2.</p> <p>Note. Where the area of openings is $> 25\%$ of the total floor area the lengths of junctions in the notional dwellings remain the same as the lengths in the actual dwelling, even though window area is reduced as described for -Opening areas\varnothingabove.</p>
Ventilation system	Natural ventilation with intermittent extract fans
Air permeability	$5 \text{ m}^3/\text{h}\cdot\text{m}^2$ at 50 Pa
Chimneys	None
Open flues	None
Extract fans / passive vents	2 extract fans for total floor area up to 70 m^2 , 3 for total floor area $> 70 \text{ m}^2$ and up to 100 m^2 , 4 for total floor area $> 100 \text{ m}^2$
Main heating fuel (space and water)	Mains gas
Heating system	Boiler and radiators Central heating pump in heated space
Boiler	<p>If gas or oil combi boiler in actual dwelling combi boiler</p> <p>Otherwise regular boiler</p> <p>Efficiency, SEDBUK(2009) = 89.5%</p> <p>Room-sealed, fan-assisted flue</p> <p>Modulating burner control</p> <p>No hot water test for combi boiler</p>
Heating system controls	<p>1. For a single storey dwelling in which the living area is greater than 70% of total floor area, programmer and room thermostat;</p> <p>2. For any other dwelling, time and temperature zone control.</p> <p>And in all cases:</p> <p>Boiler interlock</p> <p>Weather compensation providing +3% boiler efficiency adjustment</p>
Hot water system	Heated by boiler (regular or combi as above) Separate time control for space and water heating
Hot water cylinder	<p>If cylinder specified in actual dwelling: volume of cylinder in actual dwelling</p> <p>If combi boiler: no cylinder</p> <p>Otherwise: 150 litres</p> <p>If cylinder, declared loss factor = $0.85 \times (0.2 + 0.051 V^{2/3}) \text{ kWh/day}$, where V is the volume of the cylinder in litres</p>
Primary water heating losses	Fully insulated primary pipework Cylinder temperature controlled by thermostat Cylinder in heated space
Water use limited to 125 litres per person per day	Yes
Secondary space heating	None
Low energy light fittings	100% of fixed outlets
Air conditioning	None

Table R2 : Reference values of psi for junctions (England)

	Ref	Junction detail	Ψ (W/m ² ·K)
Junctions with an external wall	E1	Steel lintel with perforated steel base plate	0.05
	E2	Other lintels (including other steel lintels)	0.05
	E3	Sill	0.05
	E4	Jamb	0.05
	E5	Ground floor (normal)	0.16
	E19	Ground floor (inverted)	0.07
	E20	Exposed floor (normal)	0.32
	E21	Exposed floor (inverted)	0.32
	E22	Basement floor	0.07
	E6	Intermediate floor within a dwelling	0.0
	E7	Party floor between dwellings (in blocks of flats) ^{a)}	0.07
	E8	Balcony within a dwelling, wall insulation continuous ^{b)}	0.0
	E9	Balcony between dwellings, wall insulation continuous ^{b) c)}	0.02
	E23	Balcony within or between dwellings, balcony support penetrates wall insulation	0.02
	E10	Eaves (insulation at ceiling level)	0.06
	E24	Eaves (insulation at ceiling level - inverted)	0.24
	E11	Eaves (insulation at rafter level)	0.04
	E12	Gable (insulation at ceiling level)	0.06
	E13	Gable (insulation at rafter level)	0.08
	E14	Flat roof	0.08
	E15	Flat roof with parapet	0.56
	E16	Corner (normal)	0.09
	E17	Corner (inverted if internal area greater than external area)	-0.09
	E18	Party wall between dwellings ^{c)}	0.06
	E25	Staggered party wall between dwellings ^{c)}	0.06
Junctions with a party wall ^{c)}	P1	Ground floor	0.08
	P6	Ground floor (inverted)	0.07
	P2	Intermediate floor within a dwelling	0.0
	P3	Intermediate floor between dwellings (in blocks of flats)	0.0
	P7	Exposed floor (normal)	0.16
	P8	Exposed floor (inverted)	0.24
	P4	Roof (insulation at ceiling level)	0.12
	P5	Roof (insulation at rafter level)	0.08

^{a)} Value of Ψ is applied to both sides of the party floor

^{b)} This is an externally supported balcony (the balcony slab is not a continuation of the floor slab) where the wall insulation is continuous and not bridged by the balcony slab or its supports

^{c)} Value of Ψ is applied to each dwelling

Table R2 (continued) : Values of psi for junctions in notional dwelling (England)

	Ref	Junction detail	Ψ (W/m·K)
Junctions within a roof or with a room-in-roof	R1	Head	0.08
	R2	Sill	0.06
	R3	Jamb	0.08
	R4	Ridge (vaulted ceiling)	0.08
	R5	Ridge (inverted)	0.04
	R6	Flat ceiling	0.06
	R7	Flat ceiling(inverted)	0.04
	R8	Roof wall (rafter)	0.06
	R9	Roof wall (flat ceiling)	0.04