(Note: The box numbering is based on that for SAP 2005. It will be rationalised in the final version).

1. Overall dwelling dimensions

	Area (m^2)			Average storey height (m)			Volume (m^3)
Ground floor		(1a)	×		(2a)	=	(3a)
First floor		(1b)	×		(2b)	=	(3b)
Second floor		(1c)	×		(2c)	=	(3c)
Third and other floors		(1d)	×		(2d)	=	(3d)

Total floor area TFA = (1a) + (1b) + (1c) + (1d) = (5)

Dwelling volume (3a) + (3b) + (3c) + (3d) = (6)

2. Ventilation rate

	main heating		secondary heating		other		total		m^3 per hour	
Number of chimneys		+		+		=		× 40 =		(9a)
Number of open flues		+		+		=		× 20 =		(9b)
Number of intermittent fans or passive vents								× 10 =		(9c)
Number of flueless gas fires								× 40 =		(9d)

Air changes per hour

Infiltration due to chimneys, flues and fans = (9a)+(9b)+(9c)+(9d) = ÷ box(6) = (10)

If a pressurisation test has been carried out, proceed to box (19), otherwise continue from box (12) to (18)

Number of storeys in the dwelling (n_s) (11)

Additional infiltration [(11) – 1] × 0.1 = (12)

Structural infiltration: *0.25 for steel or timber frame or 0.35 for masonry construction* (13)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal use 0.35

If suspended wooden floor, *enter 0.2 (unsealed) or 0.1 (sealed)*, else enter 0 (14)

If no draught lobby, enter 0.05, else enter 0 (15)

Percentage of windows and doors draught stripped (16)

Window infiltration 0.25 - [0.2 × (16) ÷ 100] = (17)

Infiltration rate (10) + (12) + (13) + (14) + (15) + (17) = (18)

Air permeability value, q_{50}, expressed in cubic metres per hour per square metre of envelope area (19)

If based on air permeability value, then [q_{50} ÷ 20]+(10) in box (19a), otherwise (19a) = (18) (19a)

Air permeability value applies if a pressurisation test has been done, or a design or specified air permeability is being used

Number of sides on which dwelling is sheltered (20)

(Enter 2 in (20) for new dwellings where location is not shown)

Shelter factor (21) = 1 - [0.075 × (20)] = (21)

Infiltration rate adjusted to include shelter factor (21a) = (19a) × (21) = (21a)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly average wind speed from Table 7													
$(22)_m$ =	$(22)_1$	$(22)_2$	$(22)_3$	$(22)_4$	$(22)_5$	$(22)_6$	$(22)_7$	$(22)_8$	$(22)_9$	$(22)_{10}$	$(22)_{11}$	$(22)_{12}$	(22)
Wind Factor $(22a)_m = (22)_m \div 4$													
$(22a)_m$ =	$(22a)_1$	$(22a)_2$	$(22a)_3$	$(22a)_4$	$(22a)_5$	$(22a)_6$	$(22a)_7$	$(22a)_8$	$(22a)_9$	$(22a)_{10}$	$(22a)_{11}$	$(22a)_{12}$	(22a)
Effective infiltration rate $= (22a)_m \times (22b)_m$													
$(22b)_m$ =	$(22b)_1$	$(22b)_2$	$(22b)_3$	$(22b)_4$	$(22b)_5$	$(22b)_6$	$(22b)_7$	$(22b)_8$	$(22b)_9$	$(22b)_{10}$	$(22b)_{11}$	$(22b)_{12}$	(22b)

Calculate effective air change rate for the applicable case:

If balanced whole house mechanical ventilation: *air throughput in ach =* 0.5 (23a)

If balanced with heat recovery: *efficiency in % allowing for in-use factor (from Table 4h) =* (23b)

a) If balanced mechanical ventilation with heat recovery (MVHR) $(24)_m = (22b)_m + (23a) \times [1 - (23b) \div 100] =$

$(24)_m$ =	$(24)_1$	$(24)_2$	$(24)_3$	$(24)_4$	$(24)_5$	$(24)_6$	$(24)_7$	$(24)_8$	$(24)_9$	$(24)_{10}$	$(24)_{11}$	$(24)_{12}$	(24)

b) If balanced mechanical ventilation without heat recovery (MV) $(24a)_m = (22b)_m + (23a) =$

$(24a)_m$ =	$(24a)_1$	$(24a)_2$	$(24a)_3$	$(24a)_4$	$(24a)_5$	$(24a)_6$	$(24a)_7$	$(24a)_8$	$(24a)_9$	$(24a)_{10}$	$(24a)_{11}$	$(24a)_{12}$	(24a)

c) If whole house extract ventilation or positive input ventilation from outside

if $(22b)_m < 0.25$*, then* $(24b) = 0.5$*;* *otherwise* $(24b) = 0.25 + (22b)_m$

$(24b)_m$ =	$(24b)_1$	$(24b)_2$	$(24b)_3$	$(24b)_4$	$(24b)_5$	$(24b)_6$	$(24b)_7$	$(24b)_8$	$(24b)_9$	$(24b)_{10}$	$(24b)_{11}$	$(24b)_{12}$	(24b)

d) If natural ventilation or whole house positive input ventilation from loft

if $(22b)_m \geq 1$*, then* $(24c)_m = (22b)_m$ *otherwise* $(24c)_m = 0.5 + [(22b)_m^2 \times 0.5]$

$(24c)_m$ =	$(24c)_1$	$(24c)_2$	$(24c)_3$	$(24c)_4$	$(24c)_5$	$(24c)_6$	$(24c)_7$	$(24c)_8$	$(24c)_9$	$(24c)_{10}$	$(24c)_{11}$	$(24c)_{12}$	(24c)

Effective air change rate - enter (24) or (24a) or (24b) or (24c) in box (25)

$(25)_m$ =	$(25)_1$	$(25)_2$	$(25)_3$	$(25)_4$	$(25)_5$	$(25)_6$	$(25)_7$	$(25)_8$	$(25)_9$	$(25)_{10}$	$(25)_{11}$	$(25)_{12}$	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types.
The κ*-value is the heat capacity per unit area, see Table 1c*

Element	Gross area, m²		Openings m²		Net area A, m²		U-value W/m²K		A × U W/K	κ-value kJ/ m²·K	A × κ kJ/K	
Door						×		=				(26)
Window						×	* below	=				(27)
Roof window						×	* below	=				(27a)
Basement floor						×		=				(28)
Ground floor						×		=				(28a)
Exposed floor						×		=				(28b)
Basement wall		-		=		×		=				(29)
External wall		-		=		×		=				(29a)
Roof		-		=		×		=				(30)
Total net area of external elements ΣA, m²						(31)						
Party wall						×		=				(31a)

* *for windows and roof windows, use effective window U-value calculated using formula* 1/[(1/U-value)+0.04] *as given in paragraph 3.2*

Fabric heat loss, W/K = Σ (A × U) (26)…(30) + (31a) = (32)

Party floor				(33a)
Party ceiling				(33b)
Internal wall **				(33c)
Internal floor				(33d)
Internal ceiling				(33e)

** *include the areas on both sides of internal walls and partitions*

Heat capacity $C_m = \Sigma(\kappa \times A)$ (28)…(30) + (31a) + (33a)…(33e) = (33f)

Thermal mass parameter (TMP) in kJ/m²K = (33f) ÷ (5) = (33g)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1d can be used instead of a detailed calculation.

Thermal bridges : Σ (L×Ψ) calculated using Appendix K | | (34)

if details of thermal bridging are not known (34) = 0.15 ´ (31)

Total fabric heat loss (32) + (34) = | | (35)

Ventilation heat loss calculated monthly $(36)_m = 0.33 \times (25)_m \times (6)$

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
$(36)_m =$	$(36)_1$	$(36)_2$	$(36)_3$	$(36)_4$	$(36)_5$	$(36)_6$	$(36)_7$	$(36)_8$	$(36)_9$	$(36)_{10}$	$(36)_{11}$	$(36)_{12}$		(36)

Heat transfer coefficient, W/K $(37)_m = (35) + (36)_m$

													average	
$(37)_m =$	$(37)_1$	$(37)_2$	$(37)_3$	$(37)_4$	$(37)_5$	$(37)_6$	$(37)_7$	$(37)_8$	$(37)_9$	$(37)_{10}$	$(37)_{11}$	$(37)_{12}$	$\Sigma(37)_m /12$	(37)

Heat loss parameter (HLP), W/m²K $(38)_m = (37)_m \div (5)$

													average	
$(38)_m =$	$(38)_1$	$(38)_2$	$(38)_3$	$(38)_4$	$(38)_5$	$(38)_6$	$(38)_7$	$(38)_8$	$(38)_9$	$(38)_{10}$	$(38)_{11}$	$(38)_{12}$	$\Sigma(38)_m /12$	(38)

Number of days in month

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
$(39)_m =$	$(39)_1$	$(39)_2$	$(39)_3$	$(39)_4$	$(39)_5$	$(39)_6$	$(39)_7$	$(39)_8$	$(39)_9$	$(39)_{10}$	$(39)_{11}$	$(39)_{12}$	(39)

4. Water heating energy requirements kWh/year

Assumed occupancy, N | | (39a)

if TFA > 13.9, $N = 1 + 1.76 \times [1 - \exp(-0.000349 \times (TFA - 13.9)^2)] + 0.0013 \times (TFA - 13.9)$

if TFA ≤ 13.9, N = 1

Annual average hot water usage in litres per day $V_{d,average} = (25 \times N) + 36$ | | (39b)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

Hot water usage in litres per day for each month $V_{d,m}$ = factor from Table 1a × (39b)

													Total	
$(39c)_m =$	$(39c)_1$	$(39c)_2$	$(39c)_3$	$(39c)_4$	$(39c)_3$	$(39c)_3$	$(39c)_3$	$(39c)_3$	$(39c)_3$	$(39c)_3$	$(39c)_3$	$(39c)_{12}$	$=\Sigma(39c)_m$	(39c)

Energy content of hot water used - calculated monthly $= 4.190 \times V_{d,m} \times n_m \times \Delta T_m / 3600$ kWh/month

(ΔT_m is from Table 1b)

													Total	
$(39d)_m =$	$(39d)_1$	$(39d)_2$	$(39d)_3$	$(39d)_4$	$(39d)_5$	$(39d)_6$	$(39d)_7$	$(39d)_8$	$(39d)_9$	$(39d)_{10}$	$(39d)_{11}$	$(39d)_{12}$	$=\Sigma(39d)_m$	(39d)

Distribution loss $(40)_m = 0.15 \times (39d)_m$

If instantaneous water heating at point of use, enter "0" in boxes (40) to (45)

For community heating include distribution loss whether or not hot water tank is present

$(40)_m =$	$(40)_1$	$(40)_2$	$(40)_3$	$(40)_4$	$(40)_5$	$(40)_6$	$(40)_7$	$(40)_8$	(409	$(40)_{10}$	$(40)_{11}$	$(40)_{12}$	(40)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): | | (41)

Temperature factor from Table 2b | | (41a)

Energy lost from water storage, kWh/day (41) × (41a) = | | (42)

b) If manufacturer's declared cylinder loss factor is not known :

Cylinder volume (litres) including any solar storage within same cylinder | | (43)

If community heating and no tank in dwelling, enter 110 litres in box (43)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in box (43)

Hot water storage loss factor from Table 2 (kWh/litre/day) | | (44)

If community heating and no tank in dwelling, use cylinder loss from Table 2 for 50 mm factory insulation in box (44)

Volume factor from Table 2a | | (44a)

Temperature factor from Table 2b | | (44b)

Energy lost from water storage, kWh/day

(43) × (44) × (44a) × (44b) = | | (45)

Enter (42) or (45) in (46) | | (46)

Water storage loss calculated for each month (46a)$_m$ = (46) × (39)$_m$

(46a)$_m$ =	(46a)$_1$	(46a)$_2$	(46a)$_3$	(46a)$_4$	(46a)$_5$	(46a)$_6$	(46a)$_7$	(46a)$_8$	(46a)$_9$	(46a)$_{10}$	(46a)$_{11}$	(46a)$_{12}$	(46a)

If dedicated solar storage is within cylinder, (47)$_m$ = (46a)$_m$ × [(43) – (H11)] ÷ (43), else (47)$_m$ = (46a)$_m$
where (H11) is from Appendix H

(47)$_m$ =	(47)$_1$	(47)$_2$	(47)$_3$	(47)$_4$	(47)$_5$	(47)$_6$	(47)$_7$	(47)$_8$	(47)$_9$	(47)$_{10}$	(47)$_{11}$	(47)$_{12}$	(47)

Primary circuit loss (annual) from Table 3 (48)

Primary circuit loss calculated for each month (48a)$_m$ = (48) ÷ 365 × (39)$_m$

(48a)$_m$ =	(48a)$_1$	(48a)$_2$	(48a)$_3$	(48a)$_4$	(48a)$_5$	(48a)$_6$	(48a)$_7$	(48a)$_8$	(48a)$_9$	(48a)$_{10}$	(48a)$_{11}$	(48a)$_{12}$	(48a)

Combi loss (annual) from Table 3a (enter "0" if not a combi boiler) (49)

Combi loss calculated for each month (49a)$_m$ = (49) ÷ 365 × (39)$_m$

(49a)$_m$ =	(49a)$_1$	(49a)$_2$	(49a)$_3$	(49a)$_3$	(49a)$_3$	(49a)$_3$	(49a)$_3$	(49a)$_3$	(49a)$_3$	(49a)$_3$	(49a)$_3$	(49a)$_{12}$	(49a)

Total heat required for water heating calculated for each month (49b)$_m$=(39d)$_m$+(47)$_m$+(48a)$_m$+(49a)$_m$

(49b)$_m$ =	(49b)$_1$	(49b)$_2$	(49b)$_3$	(49b)$_4$	(49b)$_5$	(49b)$_6$	(49b)$_7$	(49b)$_8$	(49b)$_9$	(49b)$_{10}$	(49b)$_{11}$	(49b)$_{12}$	(49b)

Solar DHW input calculated using Appendix H (enter "0" if no solar collector)

(50)$_m$ =	(50)$_1$	(50)$_2$	(50)$_3$	(50)$_4$	(50)$_5$	(50)$_6$	(50)$_7$	(50)$_8$	(50)$_9$	(50)$_{10}$	(50)$_{11}$	(50)$_{12}$	(50)

Output from water heater, kWh/month (51)$_m$ = (49b)$_m$ – (50)$_m$

													Total	
(51)$_m$ =	(51)$_1$	(51)$_2$	(51)$_3$	(51)$_4$	(51)$_5$	(516	(51)$_7$	(51)$_8$	(51)$_9$	(51)$_{10}$	(51)$_{11}$	(51)$_{12}$	=Σ(51)$_m$	(51)

if (51)$_m$ < 0 then set to 0

Heat gains from water heating, kWh/month 0.25 × [(39d)$_m$ +(49a)$_m$]+0.8 × [(40)$_m$ +(47)$_m$ +(48a)$_m$]

(52)$_m$ =	(52)$_1$	(52)$_2$	(52)$_3$	(52)$_4$	(52)$_5$	(52)$_6$	(52)$_7$	(52)$_8$	(52)$_9$	(52)$_{10}$	(52)$_{11}$	(52)$_{12}$	(52)

include (47)$_m$ in calculation of (52)$_m$ only if cylinder is in the dwelling or hot water is from community heating

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5) Watts

(53a)$_m$ =	(53a)$_1$	(53a)$_2$	(53a)$_3$	(53a)$_4$	(53a)$_5$	(53a)$_6$	(53a)$_7$	(53a)$_8$	(53a)$_9$	(53a)$_{10}$	(53a)$_{11}$	(53a)$_{12}$	(53a)

Lighting gains (calculated in Appendix L, equation L8 or L8a), also see Table 5

(53b)$_m$ =	(53b)$_1$	(53b)$_2$	(53b)$_3$	(53b)$_4$	(53b)$_5$	(53b)$_6$	(53b)$_7$	(53b)$_8$	(53b)$_9$	(53b)$_{10}$	(53b)$_{11}$	(53b)$_{12}$	(53b)

Appliances gains (calculated in Appendix L, equation L11 or L11a), also see Table 5

(53c)$_m$ =	(53c)$_1$	(53c)$_2$	(53c)$_3$	(53c)$_4$	(53c)$_5$	(53c)$_6$	(53c)$_7$	(53c)$_8$	(53c)$_9$	(53c)$_{10}$	(53c)$_{11}$	(53c)$_{12}$	(53c)

Cooking gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(53d)$_m$ =	(53d)$_1$	(53d)$_2$	(53d)$_3$	(53d)$_4$	(53d)$_5$	(53d)$_6$	(53d)$_7$	(53d)$_8$	(53d)$_9$	(53d)$_{10}$	(53d)$_{11}$	(53d)$_{12}$	(53d)

Pumps and fans gains (Table 5a)

(53e)$_m$ =	(53e)$_1$	(53e)$_2$	(53e)$_3$	(53e)$_4$	(53e)$_5$	(53e)$_6$	(53e)$_7$	(53e)$_8$	(53e)$_9$	(53e)$_{10}$	(53e)$_{11}$	(53e)$_{12}$	(53e)

Losses e.g. evaporation (negative values) (Table 5)

(53f)$_m$ =	(53f)$_1$	(53f)$_2$	(53f)$_3$	(53f)$_4$	(53f)$_5$	(53f)$_6$	(53f)$_7$	(53f)$_8$	(53f)$_9$	(53f)$_{10}$	(53f)$_{11}$	(53f)$_{12}$	(53f)

Water heating gains (Table 5)

(54)$_m$ =	(54)$_1$	(54)$_2$	(54)$_3$	(54)$_4$	(54)$_5$	(54)$_6$	(54)$_7$	(54)$_8$	(54)$_9$	(54)$_{10}$	(54)$_{11}$	(54)$_{12}$	(54)

Total internal gains = (53a)$_m$ + (53b)$_m$ + (53c)$_m$ + (53d)$_m$ + (53e)$_m$ + (53f)$_m$ + (54)$_m$

(55)$_m$ =	(55)$_1$	(55)$_2$	(55)$_3$	(55)$_4$	(55)$_5$	(55)$_6$	(55)$_7$	(55)$_8$	(55)$_9$	(55)$_{10}$	(55)$_{11}$	(55)$_{12}$	(55)

6. Solar gains

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Rows (56) to (64) are used 12 times, one for each month.

	Access factor Table 6d		Area m²		Solar flux W/m²		$g_\perp$ Specific data or Table 6b		FF Specific data or Table 6c		Gains (W)	
North		×		×		× 0.9 ×		×		=		(56)
Northeast		×		×		× 0.9 ×		×		=		(57)
East		×		×		× 0.9 ×		×		=		(58)
Southeast		×		×		× 0.9 ×		×		=		(59)
South		×		×		× 0.9 ×		×		=		(60)
Southwest		×		×		× 0.9 ×		×		=		(61)
West		×		×		× 0.9 ×		×		=		(62)
Northwest		×		×		× 0.9 ×		×		=		(63)
Rooflights	1.0	×		×		× 0.9 ×		×		=		(64)

Solar gains, watts, calculated for each month $(65)_m = \Sigma(56)_m \ldots (64)_m$

$(65)_m =$	$(65)_1$	$(65)_2$	$(65)_3$	$(65)_4$	$(65)_5$	$(65)_6$	$(65)_7$	$(65)_8$	$(65)_9$	$(65)_{10}$	$(65)_{11}$	$(65)_{12}$	(65)

Total gains – internal and solar $(66)_m = (55)_m + (65)_m$, watts

$(66)_m =$	$(66)_1$	$(66)_2$	$(66)_3$	$(66)_4$	$(66)_5$	$(66)_6$	$(66)_7$	$(66)_8$	$(66)_9$	$(66)_{10}$	$(66)_{11}$	$(66)_{12}$	(66)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, T_{h1} (°C) 21 (68)

Utilisation factor for gains for living area, $\eta_{1,m}$ (see Table 9a)

$(69)_m =$	$(69)_1$	$(69)_2$	$(69)_3$	$(69)_4$	$(69)_5$	$(69)_6$	$(69)_7$	$(69)_8$	$(69)_9$	$(69)_{10}$	$(69)_{11}$	$(69)_{12}$	(69)

Mean internal temperature in living area T_1 *(follow steps 3 to 6 in Table 9b)*

$(70)_m =$	$(70)_1$	$(70)_2$	$(70)_3$	$(70)_4$	$(70)_5$	$(70)_6$	$(70)_7$	$(70)_8$	$(70)_9$	$(70)_{10}$	$(70)_{11}$	$(70)_{12}$	(70)

Temperature during heating periods in rest of dwelling from Table 9, T_{h2} (°C)

$(71)_m =$	$(71)_1$	$(71)_2$	$(71)_3$	$(71)_4$	$(71)_5$	$(71)_6$	$(71)_7$	$(71)_8$	$(71)_9$	$(71)_{10}$	$(71)_{11}$	$(71)_{12}$	(71)

Utilisation factor for gains for rest of dwelling, $\eta_{2,m}$ (see Table 9a)

$(72)_m =$	$(72)_1$	$(72)_2$	$(72)_3$	$(72)_4$	$(72)_5$	$(72)_6$	$(72)_7$	$(72)_8$	$(72)_9$	$(72)_{10}$	$(72)_{11}$	$(72)_{12}$	(72)

Mean internal temperature in the rest of dwelling T_2 *(follow steps 3 to 6 in Table 9b)*

$(73)_m =$	$(73)_1$	$(73)_2$	$(73)_3$	$(73)_4$	$(73)_5$	$(73)_6$	$(73)_7$	$(73)_8$	$(73)_9$	$(73)_{10}$	$(73)_{11}$	$(73)_{12}$	(73)

Living area fraction f_{LA} = Living area ÷ (5) = (74)

Mean internal temperature (for the whole dwelling) $= f_{LA} \times T_1 + (1 - f_{LA}) \times T_2$

$(75)_m =$	$(75)_1$	$(75)_2$	$(75)_3$	$(75)_4$	$(75)_5$	$(75)_6$	$(75)_7$	$(75)_8$	$(75)_9$	$(75)_{10}$	$(75)_{11}$	$(75)_{12}$	(75)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

Adjusted mean internal temperature:

$(76)_m =$	$(76)_1$	$(76)_2$	$(76)_3$	$(76)_4$	$(76)_5$	$(76)_6$	$(76)_7$	$(76)_8$	$(76)_9$	$(76)_{10}$	$(76)_{11}$	$(76)_{12}$	(76)

8. Space heating requirement

Set T_i to the mean internal temperature obtained at step 11 of Table 9b, so that $T_{i,m} = (76)_m$ and re-calculate the utilisation factor for gains using Table 9a

Utilisation factor for gains, η_m:

$(77)_m =$	$(77)_1$	$(77)_2$	$(77)_3$	$(77)_4$	$(77)_5$	$(77)_6$	$(77)_7$	$(77)_8$	$(77)_9$	$(77)_{10}$	$(77)_{11}$	$(77)_{12}$	(77)

Useful gains, $\eta_m G_m$, W $= (77)_m \times (66)_m$

$(78)_m =$	$(78)_1$	$(78)_2$	$(78)_3$	$(78)_4$	$(78)_5$	$(78)_6$	$(78)_7$	$(78)_8$	$(78)_9$	$(78)_{10}$	$(78)_{11}$	$(78)_{12}$	(78)

Monthly average external temperature from Table 8

$(78a)_m =$	$(78a)_1$	$(78a)_2$	$(78a)_3$	$(78a)_4$	$(78a)_5$	$(78a)_6$	$(78a)_7$	$(78a)_8$	$(78a)_9$	$(78a)_{10}$	$(78a)_{11}$	$(78a)_{12}$	(78a)

Heat loss rate for mean internal temperature, L_m , W $=[(37)_m \times [(76)_m - (78a)_m]$

$(79)_m =$	$(79)_1$	$(79)_2$	$(79)_3$	$(79)_4$	$(79)_5$	$(79)_6$	$(79)_7$	$(79)_8$	$(79)_9$	$(79)_{10}$	$(79)_{11}$	$(79)_{12}$	(79)

Space heating requirement for month (kWh) = 0.024 × [$(79)_m$ − $(78)_m$] × $(39)_m$

$(81)_m$ =	$(81)_1$	$(81)_2$	$(81)_3$	$(81)_4$	$(81)_5$	0	0	0	0	$(81)_{10}$	$(81)_{11}$	$(81)_{12}$	=Σ$(81)_{1...5,9..12}$	(81)

For range cooker boilers where efficiency is obtained from the Boiler Efficiency Database or manufacturer's declared value, multiply the results in box $(81)_m$ by (1 – Φ_{case}/Φ_{water}) where Φ_{case} is the heat emission from the case of the range cooker at full load (in kW); and Φ_{water} is the heat transferred to water at full load (in kW). Φ_{case} and Φ_{water} are obtained from the database record for the range cooker boiler or manufacturer's declared value.

8c. Space cooling requirement when there is a fixed cooling system

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat loss rate L_m (calculated using 25°C internal temperature and external temperature from Table 10)														
$(c70)_m$ =	0	0	0	0	0	$(c70)_6$	$(c70)_7$	$(c70)_8$	0	0	0	0		(c70)
Utilisation factor for loss η_m														
$(c71)_m$ =	0	0	0	0	0	$(c71)_6$	$(c71)_7$	$(c71)_8$	0	0	0	0		(c71)
Useful loss, $\eta_m L_m$ (Watts) = $(c70)_m$ × $(c71)_m$														
$(c72)_m$ =	0	0	0	0	0	$(c72)_6$	$(c72)_7$	$(c72)_8$	0	0	0	0		(c72)
Gains (solar gains calculated for applicable weather region, see Table 10)														
$(c73)_m$ =	0	0	0	0	0	$(c73)_6$	$(c73)_7$	$(c73)_8$	0	0	0	0		(c73)
Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 × [$(73)_m$ − $(72)_m$] × $(39)_m$														
$(c74)_m$ =	0	0	0	0	0	$(c74)_6$	$(c74)_7$	$(c74)_8$	0	0	0	0	=Σ$(c74)_{6..8}$	(c74)
Cooled fraction									f_C = cooled area ÷ (5)					(c75)
Intermittency factor (Table 10b)														
$(c76)_m$	0	0	0	0	0	$(c76)_6$	$(c76)_7$	$(c76)_8$	0	0	0	0	=Σ$(c76)_{6..8}$	(c76)
Space cooling requirement for month = $(c74)_m$ × (c75) × $(c76)_m$														
$(c81)_m$	0	0	0	0	0	$(c81)_6$	$(c81)_7$	$(c81)_8$	0	0	0	0	=Σ$(c81)_{6..8}$	(c81)

9a. Energy requirements - individual heating systems, including micro-CHP

Note: when space and water heating is provided by community heating use the alternative worksheet 9b

Space heating:

Fraction of heat from secondary/supplementary system (Table 11)			(82)
Fraction of heat from main system(s)	1 – (82) =		(82a)

(From database or Table 4a or 4b, adjusted where appropriate by the amount shown in the 'efficiency adjustment' column of Table 4c)

Efficiency of main heating system 1 (expressed in %) , for gas and oil boilers see 9.2.2		(83)
If there is a second main system complete (83a) and (83b)		
Efficiency of main heating system 2 (expressed in %) , for gas and oil boilers see 9.2.2		(83a)
Fraction of main heating from system 2		(83b)
Efficiency of secondary/supplementary heating system, % *(use value from Table 4a or Appendix E)*		(84)
Cooling System Energy Efficiency Ratio (see Table 10c)		(84a)

Space heating fuel requirement (main heating system 1), kWh/month

$(85)_m = (82a) \times [1 - (83b)] \times (81)_m \times 100 \div (83)$ kWh/year

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
$(85)_m$ =	$(85)_1$	$(85)_2$	$(85)_3$	$(85)_4$	$(85)_5$	0	0	0	0	$(85)_{10}$	$(85)_{11}$	$(85)_{12}$	$=\Sigma(85)_{1...5,9...12}$	(85)

Space heating fuel requirement (main heating system 2), kWh/month

$(85)_m = (82a) \times (83b) \times (81)_m \times 100 \div (83a)$

$(85a)_m$ =	$(85a)_1$	$(85a)_2$	$(85a)_3$	$(85a)_4$	$(85a)_5$	0	0	0	0	$(85a)_{10}$	$(85a)_{11}$	$(85a)_{12}$	$=\Sigma(85a)_{1...5,9...12}$	(85a)

Space heating fuel requirement (secondary), kWh/month $(85b)_m = [(82) \times (81)_m \times 100 \div (84)]$

$(85b)_m$	$(85b)_1$	$(85b)_2$	$(85b)_3$	$(85b)_4$	$(85b)_5$	0	0	0	0	$(85b)_{10}$	$(85b)_{11}$	$(85b)_{12}$	$=\Sigma(85b)_{1...5,9...12}$	(85b)

Water heating

Efficiency of water heater, % (for gas and oil boilers see section 9.2.2)

adjusted where appropriate by the amount shown in the 'efficiency adjustment' column of Table 4c

$(86)_m$ =	$(86)_1$	$(86)_2$	$(86)_3$	$(86)_4$	$(86)_5$	$(86)_6$	$(86)_7$	$(86)_8$	$(86)_9$	$(86)_{10}$	$(86)_{11}$	$(86)_{12}$	(86)

Energy required for water heating, kWh/month

$(86a)_m = (51)_m \times 100 \div (86)_m$

$(86a)_m$ =	$(86a)_1$	$(86a)_2$	$(86a)_3$	$(86a)_4$	$(86a)_5$	$(86a)_6$	$(86a)_7$	$(86a)_8$	$(86a)_9$	$(86a)_{10}$	$(86a)_{11}$	$(86a)_{12}$	$=\Sigma(86a)_m$	(86a)

Space cooling fuel requirement, kWh/month $(86b)_m = [(c81) \div (84a)]$

$(86b)_m$ =	0	0	0	0	0	$(86b)_6$	$(86b)_7$	$(86b)_8$	0	0	0	0	$=\Sigma(86b)_{6...8}$	(86b)

Electricity for pumps and fans (Table 4f):

central heating pump		(87a)
oil boiler pump		(87b)
boiler with a fan-assisted flue		(87c)
warm air heating system fans		(87d)
mechanical ventilation - balanced, extract or positive input from outside		(87e)
pump for solar water heating		(87f)
Total electricity for the above, kWh/year (87a) + (87b) + (87c) + (87d) + (87e)+ (87f) =		(87)

Other energy

Maintaining electric keep-hot facility for gas combi boiler		(87g)
Energy for lighting (calculated in Appendix L)		(87h)

Energy saving/generation technologies (Appendices M ,N and Q)

	Fuel		
Electricity generated by PVs (Appendix M) (negative quantity)			(87i)
Electricity generated by wind turbine (Appendix M) (negative quantity)			(87j)
Electricity consumed or net electricity generated by µCHP (App N) (negative if net generation)			(87k)
Appendix Q items:			
<item 1 description> (enter kWh/year as negative quantity if energy saved or generated)			(87m)
<item 2 description> (enter kWh/year as negative quantity if energy saved or generated)			(87n)
(continue this list if additional items)			

9b. Energy requirements - Community heating scheme

This part should used when space and water heating is provided by community heating. If boilers or heat pumps only, enter "0" in (83), and "1.0" in (84*)*

Fraction of space heat from secondary/supplementary system (Table 11)			(82*)
Fraction of space heat from community system	1 – (82*) =		(82a*)
Efficiency of secondary/supplementary heating system, % *(use value from Table 4a or Appendix E)*			(82b*)
Factor for control and charging method (Table 4c(3))			(82c*)
Fraction of heat from CHP/power station/geothermal *(from operational records or the plant design specification)*			(83*)
Fraction of heat from boilers or heat pump	1 - (83*) =		(84*)
Distribution loss factor (Table 12c)			(85*)
		kWh/year	
Space heating from CHP or recovered/geothermal heat	[(81) × (82a*) × (83*) × (85*)] ÷ (82c*) =		(86*)
Space heating from boilers or heat pump	[(81) × (82a*) × (84*) × (85*)] ÷ (82c*) =		(86a*)
Space heating from secondary/supplementary system	[(81) × (82*) × 100] ÷ (82b*) =		(87*)
If DHW from community scheme:			
Water heated by CHP or recovered/geothermal heat	[(51) × (83*) × (85*)] ÷ (82c*) =		(87a*)
Water heated by boilers or heat pump	[(51) × (84*) × (85*)] ÷ (82c*) =		(87b*)
If DHW by immersion or instantaneous heater:			
Efficiency of water heater			(87c*)
Water heated by immersion or instantaneous heater	[(51) × 100] ÷ (87a*) =		(87d*)
Electrical energy for heat distribution	0.01 × [(86*) + (86a*) + (87a*) + (87b*)] =		(87e*)
Cooling System Energy Efficiency Ratio			(87f*)
Space cooling	(c81) ÷ (87f*) =		(87g*)
Electricity for pumps and fans: from Table 4f for dwellings with mechanical ventilation, otherwise 0			(88*)
Energy for lighting (calculated in Appendix L)			(88h*)
Energy saving/generation technologies (Appendices M and Q)			
Electricity generated by PVs (Appendix M) (negative quantity)			(88i*)
Electricity generated by wind turbine (Appendix M) (negative quantity)			(88j*)
Appendix Q items:	Fuel		
<item 1 description> (enter kWh/year as negative quantity if energy saved or generated)			(88m*)
<item 2 description> (enter kWh/year as negative quantity if energy saved or generated)			(88n*)
(continue this list if additional items)			

10a. Fuel costs - individual heating systems

	Fuel kWh/year		Fuel price (Table 12)		Fuel cost £/year	
Space heating - main system 1	(85)	×		× 0.01 =		(88)
Space heating - main system 2	(85a)	×		× 0.01 =		(88a)
Space heating - secondary	(85b)	×		× 0.01 =		(89)
Water heating (electric off-peak tariff)						
On-peak fraction (Table 13, or Appendix F for electric CPSU)						(90)
Off-peak fraction	1.0 - (90) =					(90a)
			Fuel price			
On-peak cost	(51) × (90)	×		× 0.01 =		(91)
Off-peak cost	(51) × (90a)	×		× 0.01 =		(91a)
Water heating cost (other fuel)	(86a)	×		× 0.01 =		(91b)
Space cooling	(86b)	×		× 0.01 =		(91c)
Pump and fan energy cost	[(87) + (87g)]	×		× 0.01 =		(92)
Energy for lighting	(87h)	×		× 0.01 =		(93)

Additional standing charges (Table 12)					(94)
Energy saving/generation technologies	(87i) to (87n) as applicable, repeat lines as needed				
Cost of energy produced or saved, £/year	one of (87i) to (87n)	×		× 0.01 =	(95)
Cost of energy used, £/year	one of (87i) to (87n)	×		× 0.01 =	(96)
Total energy cost	(88)+(88a)+(89)+(91)+(91a)+(91b)+(91c)+(92)+(93)+(94)+(95)+(96) =				(97)

11a. SAP rating - individual heating systems

Energy cost deflator (Table 12):		0.51	(98)
Energy cost factor (ECF)	[(97) × (98)] ÷ [(5) + 45.0] =		(99)
SAP rating (Section 12)			(100)

10b. Fuel costs - Community heating scheme

Space heating	Fuel required kWh/year		Fuel price (Table 12)	=	Fuel cost £/year	
Space heating (CHP or recovered/geothermal)	(86*)	×		× 0.01 =		(89*)
Space heating (community boilers or heat pump)	(86a*)	×		× 0.01 =		(90*)
Space heating (secondary)	(87*)	×		× 0.01 =		(90a*)
Water heating						
Water heated by CHP or recovered/geothermal heat	(87a*)	×		× 0.01 =		(91*)
Water heated by boilers or heat pump	(87b*)	×		× 0.01 =		(92*)
Water heated by immersion heater or instantaneous water heater; *if heated by community system, go to box (93d*)*						
On-peak fraction (Table 13) (enter 1.0 for an instantaneous water heater)					(93*)	
Off-peak fraction	1.0 - (93*) =				(93a*)	
			Fuel price			
On-peak cost , or cost for an instantaneous water heater	(87b*) × (93*)	×		× 0.01 =		(93b*)
Off-peak cost	(87b*) × (93a*)	×		× 0.01 =		(93c*)
Space cooling	(87d*)	×		× 0.01 =		(93d**)
Pumps and fans	(88*)	×		× 0.01 =		(94*)
Energy for lighting	(88h*)	×		× 0.01 =		(94a*)
Additional standing charges (Table 12)						(94b*)
Energy saving/generation technologies	(88i*) to (88n*) as applicable, repeat lines as needed					
Cost of energy produced or saved, £/year	one of (88i*) to (88n*)	×		× 0.01 =		(95*)
Cost of energy consumed, £/year	one of (88i*) to (88n*)	×		× 0.01 =		(96*)
Total energy cost	(89*)…(92*) + (93b*)…(96*) =					(97*)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12)		0.51	(98*)
Energy cost factor (ECF)	[(97*) × (98*)] ÷ [(5) + 45] =		(99*)
SAP rating (Section 12)			(100*)

12a. CO_2 Emissions for individual heating systems (including micro-CHP) and community heating without CHP

		Energy kWh/year		Emission factor kg CO_2/kWh		Emissions kg CO_2/year	
Individual system:							
Space heating (main system 1)		(85)	×		=		(101)
Space heating (main system 2)		(85a)	×		=		(101a)
Space heating (secondary)		(85b)	×		=		(102)
Energy for water heating		(86)	×		=		(103)
Community scheme:							
Efficiency of community boilers %		(104)	*use actual efficiency if known, or value in Table 4a*				
Space heating		[(87*) × 100 ÷ (104)]	×		=		(105)
Water heating		[(87b*) × 100 ÷ (104)]	×		=		(106)
Electrical energy for heat distribution		(87e*)	×		=		(106a)
Community space and water heating	*(if negative, enter "0")*			[(105) + (106) + (106a)]	=		(106b)
Space heating (secondary)		(87*)	×		=		(106c)
Space and water heating	[(101) + (101a) + (102) + (103)] or [(106b) + (106c)]				=		(107)
Space cooling		(86b)	×		=		(108)
Electricity for pumps and fans within dwelling		(87) or (88*)	×		=		(108a)
Energy for lighting		(87h) or (88h*)	×		=		(109)
Energy saving/generation technologies	(87i) to (87n) as applicable, repeat lines as needed						
Energy produced or saved		one of (87i) to (87n)	×		=		(110)
Energy consumed		one of (87i) to (87n)	×		=		(111)
Total CO_2, kg/year	(107) + (108) + (108a) + (109) + (110) + (111)				=		(112)
Dwelling CO_2 Emission Rate				(112) ÷ (5)	=		(113)

12b. CO_2 Emissions for community heating schemes with CHP or heat recovered from power stations or geothermal source

(for community schemes that recover heat from power stations refer to C4 in Appendix C and omit (101) to (106*))*

Electrical efficiency of CHP unit (e.g. 30%)	*from operational records or the CHP design specification*		(101*)
Heat efficiency of CHP unit (e.g. 50%)	*from operational records or the CHP design specification*		(102*)
CO_2 emission factor for the CHP fuel from Table 12			(103*)
CO_2 emission factor for electricity generated by CHP (from Table 12)			(104*)
CO_2 emitted by CHP per kWh of generated electricity	(103*) ÷ (101*) × 100 =		(105*)
Heat to Power ratio	*enter if known, otherwise* *(102*) ÷ (101*)*		(106*)
CO_2 emission factor for heat	[(105*) - (104*)] ÷ (106*) =		(107*)

Note: with CHP the value in (107) can be negative;*
with heat recovered from power station or geothermal enter emission factor for waste heat or geothermal from Table 12 in (107)*

	Energy kWh/year		Emission factor kg CO_2/kWh		Emissions (kg CO_2/year)	
Water heated by CHP or recovered/geothermal heat:	(87a*)	×	(107*)	=		(108*))
Efficiency of community boilers/heat pump %	(109*)					
use actual efficiency if known (see Appendix C2), or value in Table 4a						
Water heated by boilers/heat pump:	(87b*) × 100 ÷ (109*)	×		=		(110*)
If water heated by immersion heater or instantaneous heater	(87b*)	×		=		(111*)
Space heating from CHP or recovered/geothermal heat	(86*)	×	(107*)	=		(112*)
Space heating from boilers/heat pump	(86a*) × 100 ÷ (109*)	×		=		(113*)
Electrical energy for heat distribution	(87e*)	×		=		(113a*)
Total CO_2 associated with boilers, CHP or recovered/geothermal heat	(108*) + (110*)...(113a*)			=		(114*)

If negative, enter "0" in (114)*

Space heating (secondary)	(87*)	×		=		(114a*)
Space and water heating	(114*) + (114a*)			=		(115*)
Space cooling	(87d*)	×		=		(115a*)
Electricity for pumps and fans within dwelling	(88*)	×		=		(115b*)
Energy for lighting	(88h*)	×		=		(116*)
Energy saving/generation technologies	(88i*) to (88n*) as applicable, repeat lines as needed					
Energy produced or saved	one of (88i*) to (88n*)	×		=		(117*)
Energy consumed	one of (88i*) to (88n*)	×		=		(118*)
Total CO_2, kg/year	(115*) +…+ (118*)			=		(119*)
Dwelling CO_2 Emission Rate	(119*) ÷ (5)			=		(120*)