Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.33
Printed on 25 March 2021 at 11:23:27

Project Information:

Assessed By: Bradley Clarke (STRO012757) **Building Type:** End-terrace House

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 74.24m²

Site Reference : Radcliffe Street - Royton **Plot Reference:** 02-21-86514 008 2B3P [End]

Address : 008_2B3P_End_

Client Details:

Name: Brookhouse Group

Address :

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas
Fuel factor: 1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER)	19.78 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.07 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	58.0 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	49.4 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.27 (max. 0.30)	0.27 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	0.12 (max. 0.25)	0.18 (max. 0.70)	**OK**
Roof	0.09 (max. 0.20)	0.09 (max. 0.35)	**OK**
Openings	1.20 (max. 2.00)	1.20 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Database: (rev 474, product index 017929):
Boiler systems with radiators or underfloor heating - mains gas
Brand name: Ideal
Model: LOGIC COMBI
Model qualifier: ESP1 35
(Combi)
Efficiency 89.6 % SEDBUK2009
Minimum 88.0 % **OK**

Secondary heating system: None

Regulations Compliance Report

5 Cylinder insulation

Hot water Storage:	No cylinder	

6 Controls

Space heating controls	TTZC by plumbing and electrical services	**OK**
Hot water controls:	No cylinder thermostat No cylinder	
Boiler interlock:	Yes	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (West Pennines):	Not significant	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: North East	2.63m²
Windows facing: South West	2.63m²
Windows facing: North East	1.19m²
Windows facing: South West	2.13m²
Windows facing: North East	2.13m²
Windows facing: South West	1.19m²
Windows facing: South West	2.13m²
Windows facing: North West	2.63m²
Windows facing: North West	0.56m²
Ventilation rate:	4.00

10 Key features

Roofs U-value	0.09 W/m²K
Party Walls U-value	0 W/m²K
Floors U-value	0.12 W/m²K
Photovoltaic array	

Predicted Energy Assessment

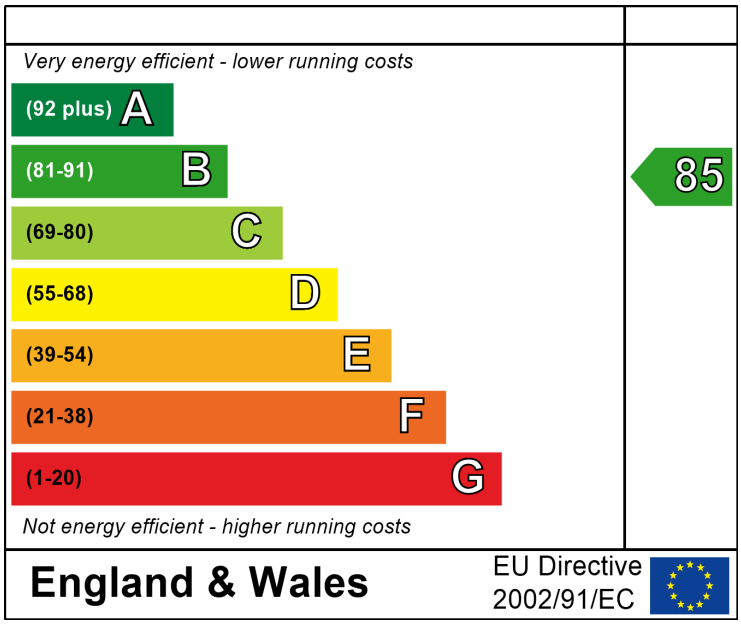
008_2B3P_End_

Dwelling type:	End-terrace House
Date of assessment:	19 March 2021
Produced by:	Bradley Clarke
Total floor area:	74.24 m²

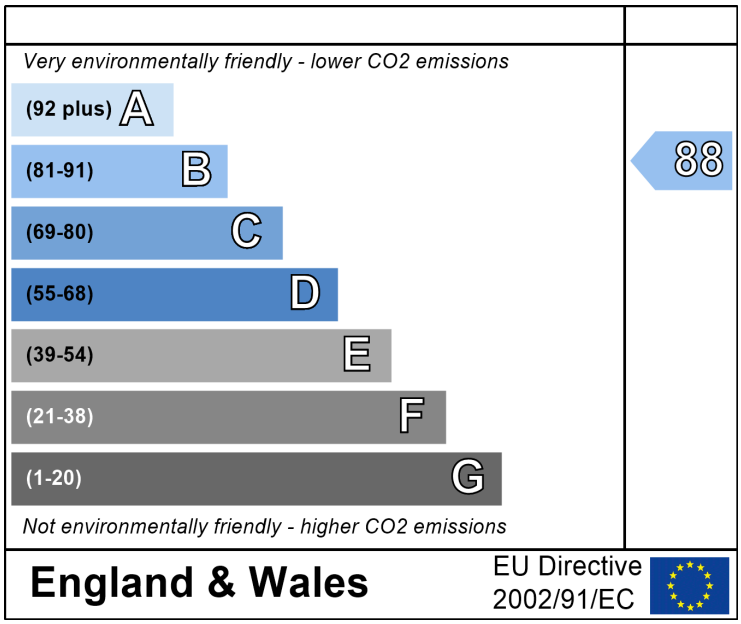
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP Input

Property Details: 02-21-86514 008 2B3P [End]

Address:	008_2B3P_End_
Located in:	England
Region:	West Pennines
UPRN:	
Date of assessment:	19 March 2021
Date of certificate:	25 March 2021
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Calculated 170.14
Water use <= 125 litres/person/day:	True
PCDF Version:	474

Property description:

Dwelling type:	House
Detachment:	End-terrace
Year Completed:	2021

Floor Location:	Floor area:	Storey height:
Floor 0	36.51 m²	2.4 m
Floor 1	37.73 m²	2.69 m

Living area:	29.5 m² (fraction 0.397)
Front of dwelling faces:	North East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
D_3	Manufacturer	Solid			
W_17	Manufacturer	Windows	low-E, En = 0.05, soft coat	No	
W_18	Manufacturer	Windows	low-E, En = 0.05, soft coat	No	
W_19	Manufacturer	Windows	low-E, En = 0.05, soft coat	No	
W_20	Manufacturer	Windows	low-E, En = 0.05, soft coat	No	
W_21	Manufacturer	Windows	low-E, En = 0.05, soft coat	No	
W_22	Manufacturer	Windows	low-E, En = 0.05, soft coat	No	
W_23	Manufacturer	Windows	low-E, En = 0.05, soft coat	No	
W_24	Manufacturer	Windows	low-E, En = 0.05, soft coat	No	
W_25	Manufacturer	Windows	low-E, En = 0.05, soft coat	No	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
D_3	mm	0	0	1.2	2.1	1
W_17		0.7	0.63	1.2	2.63	1
W_18		0.7	0.63	1.2	2.63	1
W_19		0.7	0.63	1.2	1.19	1
W_20		0.7	0.63	1.2	2.13	1
W_21		0.7	0.63	1.2	2.13	1
W_22		0.7	0.63	1.2	1.19	1
W_23		0.7	0.63	1.2	2.13	1
W_24		0.7	0.63	1.2	2.63	1
W_25		0.7	0.63	1.2	0.56	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
D_3	Doors	External Wall	North East	2.1	1
W_17	Windows	External Wall	North East	2.63	1
W_18	Windows	External Wall	South West	2.63	1
W_19	Windows	External Wall	North East	1.19	1
W_20	Windows	External Wall	South West	2.13	1

SAP Input

W_21	Windows	External Wall	North East	2.13	1
W_22	Windows	External Wall	South West	1.19	1
W_23	Windows	External Wall	South West	2.13	1
W_24	Windows	External Wall	North West	2.63	1
W_25	Windows	External Wall	North West	0.56	1

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External Wall	90.4	19.32	71.08	0.27	0	False	60
Roof insulated at ceiling	37.73	0	37.73	0.09	0		9
Ground Floor	36.51			0.12			110
Exposed Floor	1.22			0.18			20
Internal Elements							
Stud	130						9
Ceiling	37.73						9
Floor	37.73						18
Party Elements							
Party Wall	39.95						45

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0518

Length	Psi-value	
11.15	0.024	E2
6.4	0.015	E3
34.7	0.01	E4
18.18	0.092	E5
2.34	0.32	E20
2.34	0.32	E21
15.06	0	E6
9.18	0.06	E10
8.22	0.084	E12
12.58	0.062	E16
2.4	-0.106	E17
10.18	0.079	E18
2.4	0.12	E25
0	-0.002	E11
0	0.073	E13
7.44	0.16	P1
8.22	0	P2
8.22	0.081	P4
0	0.16	P7
0	0.035	P5
0	0.08	R1
0	0.06	R2
0	0.08	R3
0	0.04	R5
0	0.04	R7
0	0.06	R8
0	0.04	R9

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Natural ventilation (extract fans)

SAP Input

Number of chimneys:	0
Number of open flues:	0
Number of fans:	4
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	5

Main heating system:

Main heating system:	Boiler systems with radiators or underfloor heating Gas boilers and oil boilers Fuel: mains gas Info Source: Boiler Database Database: (rev 474, product index 017929) Efficiency: Winter 87.3 % Summer: 90.5 Brand name: Ideal Model: LOGIC COMBI Model qualifier: ESP1 35 (Combi boiler) Systems with radiators Central heating pump : 2013 or later Design flow temperature: Unknown Boiler interlock: Yes Delayed start

Main heating Control:

Main heating Control:	Time and temperature zone control by suitable arrangement of plumbing and electrical services Control code: 2110

Secondary heating system:

Secondary heating system:	None

Water heating:

Water heating:	From main heating system Water code: 901 Fuel :mains gas No hot water cylinder Solar panel: False

Others:

Electricity tariff:	Standard Tariff
In Smoke Control Area:	Unknown
Conservatory:	No conservatory
Low energy lights:	100%
Terrain type:	Low rise urban / suburban
EPC language:	English
Wind turbine:	No
Photovoltaics:	Photovoltaic 1 Installed Peak power: 0.393 Tilt of collector: 30° Overshading: None or very little Collector Orientation: South West
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Bradley Clarke	**Stroma Number:**	STRO012757
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.33

Property Address: 02-21-86514 008 2B3P [End]

Address : 008_2B3P_End_

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	36.51 (1a)	x	2.4 (2a)	=	87.62	(3a)
First floor	37.73 (1b)	x	2.69 (2b)	=	101.49	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	74.24 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		189.12	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							4	x 10 =	40	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	40	÷ (5) =	0.21	(8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)			0	(9)
Additional infiltration		[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction			0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			0	(12)
If no draught lobby, enter 0.05, else enter 0			0	(13)
Percentage of windows and doors draught stripped			0	(14)
Window infiltration		0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate		(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area			5	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.46	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered			2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.39	(21)

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=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7

SAP WorkSheet: New dwelling design stage

Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.5	0.49	0.48	0.43	0.42	0.37	0.37	0.36	0.39	0.42	0.44	0.46

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0

(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0

(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0

(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.63	0.62	0.62	0.59	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61

(24d)

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

(25)m=	0.63	0.62	0.62	0.59	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61

(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.2	=	2.52			(26)
Windows Type 1			2.63	x1/[1/(1.2)+ 0.04]		=	3.01			(27)
Windows Type 2			2.63	x1/[1/(1.2)+ 0.04]		=	3.01			(27)
Windows Type 3			1.19	x1/[1/(1.2)+ 0.04]		=	1.36			(27)
Windows Type 4			2.13	x1/[1/(1.2)+ 0.04]		=	2.44			(27)
Windows Type 5			2.13	x1/[1/(1.2)+ 0.04]		=	2.44			(27)
Windows Type 6			1.19	x1/[1/(1.2)+ 0.04]		=	1.36			(27)
Windows Type 7			2.13	x1/[1/(1.2)+ 0.04]		=	2.44			(27)
Windows Type 8			2.63	x1/[1/(1.2)+ 0.04]		=	3.01			(27)
Windows Type 9			0.56	x1/[1/(1.2)+ 0.04]		=	0.64			(27)
Floor Type 1			36.51	x	0.12	=	4.3812	110	4016.1	(28)
Floor Type 2			1.22	x	0.18	=	0.2196	20	24.4	(28)
Walls	90.4	19.32	71.08	x	0.27	=	19.19	60	4264.8	(29)
Roof	37.73	0	37.73	x	0.09	=	3.4	9	339.57	(30)
Total area of elements, m²			165.86							(31)
Party wall			39.95	x	0	=	0	45	1797.75	(32)
Internal wall **			130					9	1170	(32c)

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Internal floor	37.73	18	679.14	(32d)
Internal ceiling	37.73	9	339.57	(32e)

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

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 49.43 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 12631.33 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 170.14 (35)

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

Thermal bridges : S (L x Y) calculated using Appendix K 8.6 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 58.02 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	39.01	38.71	38.41	37.01	36.75	35.54	35.54	35.31	36.01	36.75	37.28	37.83	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	97.03	96.73	96.43	95.04	94.78	93.56	93.56	93.33	94.03	94.78	95.3	95.86	

Average = Sum(39)$_{1...12}$ /12= 95.04 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.31	1.3	1.3	1.28	1.28	1.26	1.26	1.26	1.27	1.28	1.28	1.29	

Average = Sum(40)$_{1...12}$ /12= 1.28 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.34 (42)
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)
if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 89.88 (43)
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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)													
(44)m=	98.87	95.28	91.68	88.08	84.49	80.89	80.89	84.49	88.08	91.68	95.28	98.87	

Total = Sum(44)$_{1...12}$ = 1078.59 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	146.62	128.24	132.33	115.37	110.7	95.52	88.52	101.57	102.79	119.79	130.76	142	

Total = Sum(45)$_{1...12}$ = 1414.2 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	21.99	19.24	19.85	17.31	16.6	14.33	13.28	15.24	15.42	17.97	19.61	21.3	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)
Water storage loss:

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a) If manufacturer's declared loss factor is known (kWh/day):		0	(48)
Temperature factor from Table 2b		0	(49)
Energy lost from water storage, kWh/year	(48) x (49) =	0	(50)
b) If manufacturer's declared cylinder loss factor is not known:			
Hot water storage loss factor from Table 2 (kWh/litre/day)		0	(51)
If community heating see section 4.3			
Volume factor from Table 2a		0	(52)
Temperature factor from Table 2b		0	(53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0	(55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	0	0	0	0	0	0	0	0	0	0	0	0	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	0	0	0	0	0	0	0	0	0	0	0	0	(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	14.1	12.72	14.05	13.56	13.98	13.5	13.93	13.96	13.53	14.02	13.61	14.09	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	160.73	140.96	146.38	128.92	124.68	109.02	102.45	115.54	116.32	133.81	144.37	156.09	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	160.73	140.96	146.38	128.92	124.68	109.02	102.45	115.54	116.32	133.81	144.37	156.09	

Output from water heater (annual)$_{1...12}$ 1579.25 (64)

Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]

(65)m=	52.28	45.82	47.51	41.75	40.3	35.14	32.91	37.26	37.56	43.33	46.88	50.74	(65)

include (57)m in calculation of (65)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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	140.67	140.67	140.67	140.67	140.67	140.67	140.67	140.67	140.67	140.67	140.67	140.67	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	46.13	40.97	33.32	25.23	18.86	15.92	17.2	22.36	30.01	38.11	44.48	47.41	(67)

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

(68)m=	308.93	312.14	304.06	286.86	265.15	244.75	231.12	227.91	235.99	253.19	274.9	295.3	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	51.41	51.41	51.41	51.41	51.41	51.41	51.41	51.41	51.41	51.41	51.41	51.41	(69)

Pumps and fans gains (Table 5a)

(70)m=	3	3	3	3	3	3	3	3	3	3	3	3	(70)

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

(71)m=	-93.78	-93.78	-93.78	-93.78	-93.78	-93.78	-93.78	-93.78	-93.78	-93.78	-93.78	-93.78	(71)

Water heating gains (Table 5)

(72)m=	70.27	68.18	63.86	57.98	54.17	48.8	44.24	50.09	52.17	58.25	65.11	68.19	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	526.63	522.6	502.54	471.37	439.48	410.77	393.86	401.66	419.47	450.84	485.79	512.21	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	2.63	x	11.28	x	0.63	x	0.7	=	9.07	(75)
Northeast 0.9x	0.77	x	1.19	x	11.28	x	0.63	x	0.7	=	4.1	(75)
Northeast 0.9x	0.77	x	2.13	x	11.28	x	0.63	x	0.7	=	7.34	(75)
Northeast 0.9x	0.77	x	2.63	x	22.97	x	0.63	x	0.7	=	18.46	(75)
Northeast 0.9x	0.77	x	1.19	x	22.97	x	0.63	x	0.7	=	8.35	(75)
Northeast 0.9x	0.77	x	2.13	x	22.97	x	0.63	x	0.7	=	14.95	(75)
Northeast 0.9x	0.77	x	2.63	x	41.38	x	0.63	x	0.7	=	33.26	(75)
Northeast 0.9x	0.77	x	1.19	x	41.38	x	0.63	x	0.7	=	15.05	(75)
Northeast 0.9x	0.77	x	2.13	x	41.38	x	0.63	x	0.7	=	26.94	(75)
Northeast 0.9x	0.77	x	2.63	x	67.96	x	0.63	x	0.7	=	54.62	(75)
Northeast 0.9x	0.77	x	1.19	x	67.96	x	0.63	x	0.7	=	24.71	(75)
Northeast 0.9x	0.77	x	2.13	x	67.96	x	0.63	x	0.7	=	44.24	(75)
Northeast 0.9x	0.77	x	2.63	x	91.35	x	0.63	x	0.7	=	73.42	(75)
Northeast 0.9x	0.77	x	1.19	x	91.35	x	0.63	x	0.7	=	33.22	(75)
Northeast 0.9x	0.77	x	2.13	x	91.35	x	0.63	x	0.7	=	59.46	(75)
Northeast 0.9x	0.77	x	2.63	x	97.38	x	0.63	x	0.7	=	78.27	(75)
Northeast 0.9x	0.77	x	1.19	x	97.38	x	0.63	x	0.7	=	35.42	(75)
Northeast 0.9x	0.77	x	2.13	x	97.38	x	0.63	x	0.7	=	63.39	(75)
Northeast 0.9x	0.77	x	2.63	x	91.1	x	0.63	x	0.7	=	73.22	(75)
Northeast 0.9x	0.77	x	1.19	x	91.1	x	0.63	x	0.7	=	33.13	(75)
Northeast 0.9x	0.77	x	2.13	x	91.1	x	0.63	x	0.7	=	59.3	(75)
Northeast 0.9x	0.77	x	2.63	x	72.63	x	0.63	x	0.7	=	58.37	(75)
Northeast 0.9x	0.77	x	1.19	x	72.63	x	0.63	x	0.7	=	26.41	(75)
Northeast 0.9x	0.77	x	2.13	x	72.63	x	0.63	x	0.7	=	47.28	(75)
Northeast 0.9x	0.77	x	2.63	x	50.42	x	0.63	x	0.7	=	40.53	(75)
Northeast 0.9x	0.77	x	1.19	x	50.42	x	0.63	x	0.7	=	18.34	(75)
Northeast 0.9x	0.77	x	2.13	x	50.42	x	0.63	x	0.7	=	32.82	(75)
Northeast 0.9x	0.77	x	2.63	x	28.07	x	0.63	x	0.7	=	22.56	(75)
Northeast 0.9x	0.77	x	1.19	x	28.07	x	0.63	x	0.7	=	10.21	(75)
Northeast 0.9x	0.77	x	2.13	x	28.07	x	0.63	x	0.7	=	18.27	(75)

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Northeast	0.9x	0.77	x	2.63	x	14.2	x	0.63	x	0.7	=	11.41	(75)
Northeast	0.9x	0.77	x	1.19	x	14.2	x	0.63	x	0.7	=	5.16	(75)
Northeast	0.9x	0.77	x	2.13	x	14.2	x	0.63	x	0.7	=	9.24	(75)
Northeast	0.9x	0.77	x	2.63	x	9.21	x	0.63	x	0.7	=	7.41	(75)
Northeast	0.9x	0.77	x	1.19	x	9.21	x	0.63	x	0.7	=	3.35	(75)
Northeast	0.9x	0.77	x	2.13	x	9.21	x	0.63	x	0.7	=	6	(75)
Southwest	0.9x	0.77	x	2.63	x	36.79		0.63	x	0.7	=	29.57	(79)
Southwest	0.9x	0.77	x	2.13	x	36.79		0.63	x	0.7	=	23.95	(79)
Southwest	0.9x	0.77	x	1.19	x	36.79		0.63	x	0.7	=	13.38	(79)
Southwest	0.9x	0.77	x	2.13	x	36.79		0.63	x	0.7	=	23.95	(79)
Southwest	0.9x	0.77	x	2.63	x	62.67		0.63	x	0.7	=	50.37	(79)
Southwest	0.9x	0.77	x	2.13	x	62.67		0.63	x	0.7	=	40.8	(79)
Southwest	0.9x	0.77	x	1.19	x	62.67		0.63	x	0.7	=	22.79	(79)
Southwest	0.9x	0.77	x	2.13	x	62.67		0.63	x	0.7	=	40.8	(79)
Southwest	0.9x	0.77	x	2.63	x	85.75		0.63	x	0.7	=	68.92	(79)
Southwest	0.9x	0.77	x	2.13	x	85.75		0.63	x	0.7	=	55.82	(79)
Southwest	0.9x	0.77	x	1.19	x	85.75		0.63	x	0.7	=	31.19	(79)
Southwest	0.9x	0.77	x	2.13	x	85.75		0.63	x	0.7	=	55.82	(79)
Southwest	0.9x	0.77	x	2.63	x	106.25		0.63	x	0.7	=	85.4	(79)
Southwest	0.9x	0.77	x	2.13	x	106.25		0.63	x	0.7	=	69.17	(79)
Southwest	0.9x	0.77	x	1.19	x	106.25		0.63	x	0.7	=	38.64	(79)
Southwest	0.9x	0.77	x	2.13	x	106.25		0.63	x	0.7	=	69.17	(79)
Southwest	0.9x	0.77	x	2.63	x	119.01		0.63	x	0.7	=	95.66	(79)
Southwest	0.9x	0.77	x	2.13	x	119.01		0.63	x	0.7	=	77.47	(79)
Southwest	0.9x	0.77	x	1.19	x	119.01		0.63	x	0.7	=	43.28	(79)
Southwest	0.9x	0.77	x	2.13	x	119.01		0.63	x	0.7	=	77.47	(79)
Southwest	0.9x	0.77	x	2.63	x	118.15		0.63	x	0.7	=	94.96	(79)
Southwest	0.9x	0.77	x	2.13	x	118.15		0.63	x	0.7	=	76.91	(79)
Southwest	0.9x	0.77	x	1.19	x	118.15		0.63	x	0.7	=	42.97	(79)
Southwest	0.9x	0.77	x	2.13	x	118.15		0.63	x	0.7	=	76.91	(79)
Southwest	0.9x	0.77	x	2.63	x	113.91		0.63	x	0.7	=	91.56	(79)
Southwest	0.9x	0.77	x	2.13	x	113.91		0.63	x	0.7	=	74.15	(79)
Southwest	0.9x	0.77	x	1.19	x	113.91		0.63	x	0.7	=	41.43	(79)
Southwest	0.9x	0.77	x	2.13	x	113.91		0.63	x	0.7	=	74.15	(79)
Southwest	0.9x	0.77	x	2.63	x	104.39		0.63	x	0.7	=	83.91	(79)
Southwest	0.9x	0.77	x	2.13	x	104.39		0.63	x	0.7	=	67.95	(79)
Southwest	0.9x	0.77	x	1.19	x	104.39		0.63	x	0.7	=	37.96	(79)
Southwest	0.9x	0.77	x	2.13	x	104.39		0.63	x	0.7	=	67.95	(79)
Southwest	0.9x	0.77	x	2.63	x	92.85		0.63	x	0.7	=	74.63	(79)
Southwest	0.9x	0.77	x	2.13	x	92.85		0.63	x	0.7	=	60.44	(79)
Southwest	0.9x	0.77	x	1.19	x	92.85		0.63	x	0.7	=	33.77	(79)

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Southwest	0.9x	0.77	x	2.13	x	92.85		0.63	x	0.7	=	60.44	(79)
Southwest	0.9x	0.77	x	2.63	x	69.27		0.63	x	0.7	=	55.67	(79)
Southwest	0.9x	0.77	x	2.13	x	69.27		0.63	x	0.7	=	45.09	(79)
Southwest	0.9x	0.77	x	1.19	x	69.27		0.63	x	0.7	=	25.19	(79)
Southwest	0.9x	0.77	x	2.13	x	69.27		0.63	x	0.7	=	45.09	(79)
Southwest	0.9x	0.77	x	2.63	x	44.07		0.63	x	0.7	=	35.42	(79)
Southwest	0.9x	0.77	x	2.13	x	44.07		0.63	x	0.7	=	28.69	(79)
Southwest	0.9x	0.77	x	1.19	x	44.07		0.63	x	0.7	=	16.03	(79)
Southwest	0.9x	0.77	x	2.13	x	44.07		0.63	x	0.7	=	28.69	(79)
Southwest	0.9x	0.77	x	2.63	x	31.49		0.63	x	0.7	=	25.31	(79)
Southwest	0.9x	0.77	x	2.13	x	31.49		0.63	x	0.7	=	20.5	(79)
Southwest	0.9x	0.77	x	1.19	x	31.49		0.63	x	0.7	=	11.45	(79)
Southwest	0.9x	0.77	x	2.13	x	31.49		0.63	x	0.7	=	20.5	(79)
Northwest	0.9x	0.77	x	2.63	x	11.28	x	0.63	x	0.7	=	9.07	(81)
Northwest	0.9x	0.77	x	0.56	x	11.28	x	0.63	x	0.7	=	1.93	(81)
Northwest	0.9x	0.77	x	2.63	x	22.97	x	0.63	x	0.7	=	18.46	(81)
Northwest	0.9x	0.77	x	0.56	x	22.97	x	0.63	x	0.7	=	3.93	(81)
Northwest	0.9x	0.77	x	2.63	x	41.38	x	0.63	x	0.7	=	33.26	(81)
Northwest	0.9x	0.77	x	0.56	x	41.38	x	0.63	x	0.7	=	7.08	(81)
Northwest	0.9x	0.77	x	2.63	x	67.96	x	0.63	x	0.7	=	54.62	(81)
Northwest	0.9x	0.77	x	0.56	x	67.96	x	0.63	x	0.7	=	11.63	(81)
Northwest	0.9x	0.77	x	2.63	x	91.35	x	0.63	x	0.7	=	73.42	(81)
Northwest	0.9x	0.77	x	0.56	x	91.35	x	0.63	x	0.7	=	15.63	(81)
Northwest	0.9x	0.77	x	2.63	x	97.38	x	0.63	x	0.7	=	78.27	(81)
Northwest	0.9x	0.77	x	0.56	x	97.38	x	0.63	x	0.7	=	16.67	(81)
Northwest	0.9x	0.77	x	2.63	x	91.1	x	0.63	x	0.7	=	73.22	(81)
Northwest	0.9x	0.77	x	0.56	x	91.1	x	0.63	x	0.7	=	15.59	(81)
Northwest	0.9x	0.77	x	2.63	x	72.63	x	0.63	x	0.7	=	58.37	(81)
Northwest	0.9x	0.77	x	0.56	x	72.63	x	0.63	x	0.7	=	12.43	(81)
Northwest	0.9x	0.77	x	2.63	x	50.42	x	0.63	x	0.7	=	40.53	(81)
Northwest	0.9x	0.77	x	0.56	x	50.42	x	0.63	x	0.7	=	8.63	(81)
Northwest	0.9x	0.77	x	2.63	x	28.07	x	0.63	x	0.7	=	22.56	(81)
Northwest	0.9x	0.77	x	0.56	x	28.07	x	0.63	x	0.7	=	4.8	(81)
Northwest	0.9x	0.77	x	2.63	x	14.2	x	0.63	x	0.7	=	11.41	(81)
Northwest	0.9x	0.77	x	0.56	x	14.2	x	0.63	x	0.7	=	2.43	(81)
Northwest	0.9x	0.77	x	2.63	x	9.21	x	0.63	x	0.7	=	7.41	(81)
Northwest	0.9x	0.77	x	0.56	x	9.21	x	0.63	x	0.7	=	1.58	(81)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	122.37	218.92	327.34	452.19	549.04	563.78	535.76	460.65	370.12	249.45	148.48	103.49	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	649.01	741.51	829.88	923.57	988.52	974.55	929.62	862.31	789.59	700.29	634.27	615.7	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) | 21 | (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.97	0.96	0.92	0.85	0.73	0.57	0.43	0.48	0.7	0.89	0.96	0.98	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.39	19.62	19.97	20.4	20.74	20.92	20.98	20.97	20.84	20.4	19.82	19.35	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.84	19.84	19.84	19.86	19.86	19.87	19.87	19.87	19.87	19.86	19.85	19.85	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.97	0.95	0.91	0.82	0.67	0.48	0.32	0.37	0.62	0.85	0.95	0.97	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	17.73	18.06	18.57	19.17	19.6	19.82	19.86	19.86	19.73	19.19	18.38	17.69	(90)

fLA = Living area ÷ (4) = | 0.4 | (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.39	18.68	19.12	19.66	20.05	20.26	20.31	20.3	20.17	19.67	18.95	18.35	(92)

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

(93)m=	18.24	18.53	18.97	19.51	19.9	20.11	20.16	20.15	20.02	19.52	18.8	18.2	(93)

8. Space heating requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

Utilisation factor for gains, hm:

(94)m=	0.96	0.93	0.89	0.81	0.68	0.5	0.35	0.4	0.63	0.84	0.93	0.96	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	620.31	692.27	740.42	746.91	667.72	487.43	326.72	340.98	495.39	590.33	591.9	592.12	(95)

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	1352.8	1318.53	1202.86	1008.63	777.33	515.05	332.63	349.94	556.7	845.42	1115.24	1341.77	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	544.98	420.85	344.06	188.44	81.55	0	0	0	0	189.79	376.8	557.75	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = | 2704.21 | (98)

Space heating requirement in kWh/m²/year | 36.43 | (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system | 0 | (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = | 1 | (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = | 1 | (204)

Efficiency of main space heating system 1 | 90.5 | (206)

Efficiency of secondary/supplementary heating system, % | 0 | (208)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	544.98	420.85	344.06	188.44	81.55	0	0	0	0	189.79	376.8	557.75	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	602.18	465.03	380.17	208.22	90.11	0	0	0	0	209.71	416.36	616.29	
Total (kWh/year) =Sum(211)$_{1...5,10...12}$=													2988.08 (211)
Space heating fuel (secondary), kWh/month													
= {[(98)m x (201)] } x 100 ÷ (208)													
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0	
Total (kWh/year) =Sum(215)$_{1...5,10...12}$=													0 (215)

Water heating

Output from water heater (calculated above)													
	160.73	140.96	146.38	128.92	124.68	109.02	102.45	115.54	116.32	133.81	144.37	156.09	
Efficiency of water heater													87.3 (216)
(217)m=	89.75	89.68	89.52	89.17	88.54	87.3	87.3	87.3	87.3	89.15	89.59	89.78	(217)
Fuel for water heating, kWh/month													
(219)m = (64)m x 100 ÷ (217)m													
(219)m=	179.08	157.18	163.51	144.58	140.82	124.88	117.35	132.34	133.24	150.1	161.15	173.86	
Total = Sum(219a)$_{1...12}$ =													1778.09 (219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		2988.08	
Water heating fuel used		1778.09	
Electricity for pumps, fans and electric keep-hot			
central heating pump:	30		(230c)
boiler with a fan-assisted flue	45		(230e)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		75	(231)
Electricity for lighting		325.88	(232)
Electricity generated by PVs		-323.58	(233)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		4930.77	(338)

10a. Fuel costs - individual heating systems:

	Fuel kWh/year		**Fuel Price** (Table 12)		**Fuel Cost** £/year	
Space heating - main system 1	(211) x	3.48	x 0.01 =	103.99		(240)
Space heating - main system 2	(213) x	0	x 0.01 =	0		(241)
Space heating - secondary	(215) x	13.19	x 0.01 =	0		(242)
Water heating cost (other fuel)	(219)	3.48	x 0.01 =	61.88		(247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	9.89		(249)
(if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a						
Energy for lighting	(232)	13.19	x 0.01 =	42.98		(250)
Additional standing charges (Table 12)				120		(251)

SAP WorkSheet: New dwelling design stage

	one of (233) to (235) x)	13.19	x 0.01 =	-42.68	(252)

Appendix Q items: repeat lines (253) and (254) as needed

Total energy cost	(245)...(247) + (250)...(254) =	296.06	(255)

11a. SAP rating - individual heating systems

Energy cost deflator (Table 12)		0.42	(256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =	1.04	(257)
SAP rating (Section 12)		85.45	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211) x	0.216	=	645.42	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	384.07	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1029.49	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	169.13	(268)
Energy saving/generation technologies Item 1		0.519	=	-167.94	(269)
Total CO2, kg/year	sum of (265)…(271) =			1069.61	(272)
CO2 emissions per m²	(272) ÷ (4) =			14.41	(273)
EI rating (section 14)				88	(274)

13a. Primary Energy

	Energy kWh/year	**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211) x	1.22	=	3645.46	(261)
Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	1.22	=	2169.26	(264)
Space and water heating	(261) + (262) + (263) + (264) =			5814.72	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	230.25	(267)
Electricity for lighting	(232) x	0	=	1000.46	(268)
Energy saving/generation technologies Item 1		3.07	=	-993.38	(269)
'Total Primary Energy	sum of (265)…(271) =			6052.05	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =			81.52	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 25 March 2021

Property Details: 02-21-86514 008 2B3P [End]

Dwelling type:	End-terrace House
Located in:	England
Region:	West Pennines
Cross ventilation possible:	Yes
Number of storeys:	2
Front of dwelling faces:	North East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Calculated 170.14
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	4 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	249.64	**(P1)**
Transmission heat loss coefficient:	58	
Summer heat loss coefficient:	307.66	**(P2)**

Overhangs:

Orientation:	Ratio:	Z_overhangs:
North East (W_17)	0	1
South West (W_18)	0	1
North East (W_19)	0	1
South West (W_20)	0	1
North East (W_21)	0	1
South West (W_22)	0	1
South West (W_23)	0	1
North West (W_24)	0	1
North West (W_25)	0	1

Solar shading:

Orientation:	Z blinds:	Solar access:	Overhangs:	Z summer:	
North East (W_17)	1	0.9	1	0.9	**(P8)**
South West (W_18)	1	0.9	1	0.9	**(P8)**
North East (W_19)	1	0.9	1	0.9	**(P8)**
South West (W_20)	1	0.9	1	0.9	**(P8)**
North East (W_21)	1	0.9	1	0.9	**(P8)**
South West (W_22)	1	0.9	1	0.9	**(P8)**
South West (W_23)	1	0.9	1	0.9	**(P8)**
North West (W_24)	1	0.9	1	0.9	**(P8)**
North West (W_25)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		Area	Flux	g_	FF	Shading	Gains
North East (W_17)	0.9 x	2.63	89.66	0.63	0.7	0.9	84.23
South West (W_18)	0.9 x	2.63	112.1	0.63	0.7	0.9	105.31
North East (W_19)	0.9 x	1.19	89.66	0.63	0.7	0.9	38.11
South West (W_20)	0.9 x	2.13	112.1	0.63	0.7	0.9	85.29
North East (W_21)	0.9 x	2.13	89.66	0.63	0.7	0.9	68.21
South West (W_22)	0.9 x	1.19	112.1	0.63	0.7	0.9	47.65

SAP 2012 Overheating Assessment

South West (W_23)	0.9 x	2.13	112.1	0.63	0.7	0.9	85.29	
North West (W_24)	0.9 x	2.63	89.66	0.63	0.7	0.9	84.23	
North West (W_25)	0.9 x	0.56	89.66	0.63	0.7	0.9	17.93	
						Total	616.27	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	407.77	390.86	398.66	
Total summer gains	1076.62	1007.13	919.93	**(P5)**
Summer gain/loss ratio	3.5	3.27	2.99	**(P6)**
Mean summer external temperature (West Pennines)	14.7	16.4	16.3	
Thermal mass temperature increment	0.81	0.81	0.81	
Threshold temperature	19.01	20.48	20.1	**(P7)**
Likelihood of high internal temperature	**Not significant**	**Not significant**	**Not significant**	

Assessment of likelihood of high internal temperature: Not significant