

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.33

Printed on 10 March 2021 at 09:53:14

Project Information:

Assessed By: Natalie King (STRO034719)

Building Type: End-terrace House

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 105.84m²

Site Reference : Lavant View - The Spires, Chichester

Plot Reference: 116 Tweed [End] DCC2

Address :

Client Details:

Name: Redrow Homes Southern Counties Limited

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)

17 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER)

16.41 kg/m²

OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)

49.8 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE)

44.6 kWh/m²

OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.28 (max. 0.30)	0.28 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.12 (max. 0.20)	0.21 (max. 0.35)	OK
Openings	1.23 (max. 2.00)	1.50 (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

5.01 (design value)

Maximum

10.0

OK

4 Heating efficiency

Main Heating system:

Database: (rev 473, 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: Programmer, room thermostat and TRVs **OK**
 Hot water controls: No cylinder thermostat

Boiler interlock: No cylinder **OK**
 Yes

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 (South East England): Not significant **OK**

Based on:

Overshading: Average or unknown
 Windows facing: North East 1.84m²
 Windows facing: North East 1.28m²
 Windows facing: South West 1.31m²
 Windows facing: North East 2.43m²
 Windows facing: South West 1.31m²
 Windows facing: South West 1.31m²
 Ventilation rate: 4.00
 Blinds/curtains: Dark-coloured curtain or roller blind
 Closed 100% of daylight hours

10 Key features

Thermal bridging: 0.036 W/m²K
 Doors U-value: 1.1 W/m²K
 Roofs U-value: 0.11 W/m²K
 Party Walls U-value: 0 W/m²K
 Floors U-value: 0.12 W/m²K

Code for Sustainable Homes Report

For use with Nov 2010 addendum 2014 England

Assessor and House Details

Assessor Name: Natalie King **Assessor Number:** STRO034719
Property Address:

Building regulation assessment

	kg/m ² /year
TER	17
DER	16.41

ENE 1 Assessment - Dwelling Emission Rate

Total Energy Type CO₂ Emissions for Codes Levels 1 - 5

	%	kg/m ² /year	
DER from SAP 2012 DER Worksheet		16.41	(ZC1)
TER		17	
Residual CO ₂ emissions offset from biofuel CHP		0	(ZC5)
CO ₂ emissions offset from additional allowable electricity generation		0	(ZC7)
Total CO ₂ emissions offset from SAP Section 16 allowances		0	
DER accounting for SAP Section 16 allowances		16.41	
% improvement DER/TER	3.5		

Total Energy Type CO₂ Emissions for Codes Levels 6

	kg/m ² /year	
DER accounting for SAP Section 16 allowances	16.41	(ZC1)
CO ₂ emissions from appliances, equation (L14)	14.8	(ZC2)
CO ₂ emissions from cooking, equation (L16)	1.76	(ZC3)
Net CO ₂ emissions	34.4	(ZC8)

Result:

Credits awarded for ENE 1 = 0.5

Code Level = 3

ENE 2 - Fabric energy Efficiency

Fabric energy Efficiency: 44.61

Credits awarded for ENE 2 = 7.3

ENE 7 - Low or Zero Carbon (LZC) Technologies

Reduction in CO₂ Emissions

	%	kg/m ² /year	
Standard Case CO ₂ emissions		34.42	
Standard DER		17.86	
Actual Case CO ₂ emissions		34.42	
Actual DER		17.86	
Reduction in CO ₂ emissions	0		

Credits awarded for ENE 7 = 0

Technologies eligible to contribute to achieving the requirements of this issue must produce energy from renewable sources and meet all other ancillary requirements as defined by Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.

The following requirements must also be met:

- Where not provided by accredited external renewables there must be a direct supply of energy produced to the dwelling under assessment.
- Where covered by the Microgeneration Certification Scheme (MCS), technologies under 50kW_e or 300kW_{th} must be certified.
- Combined Heat and Power (CHP) schemes above 50kW_e must be certified under the CHPQA standard.
- All technologies must be accounted for by SAP.

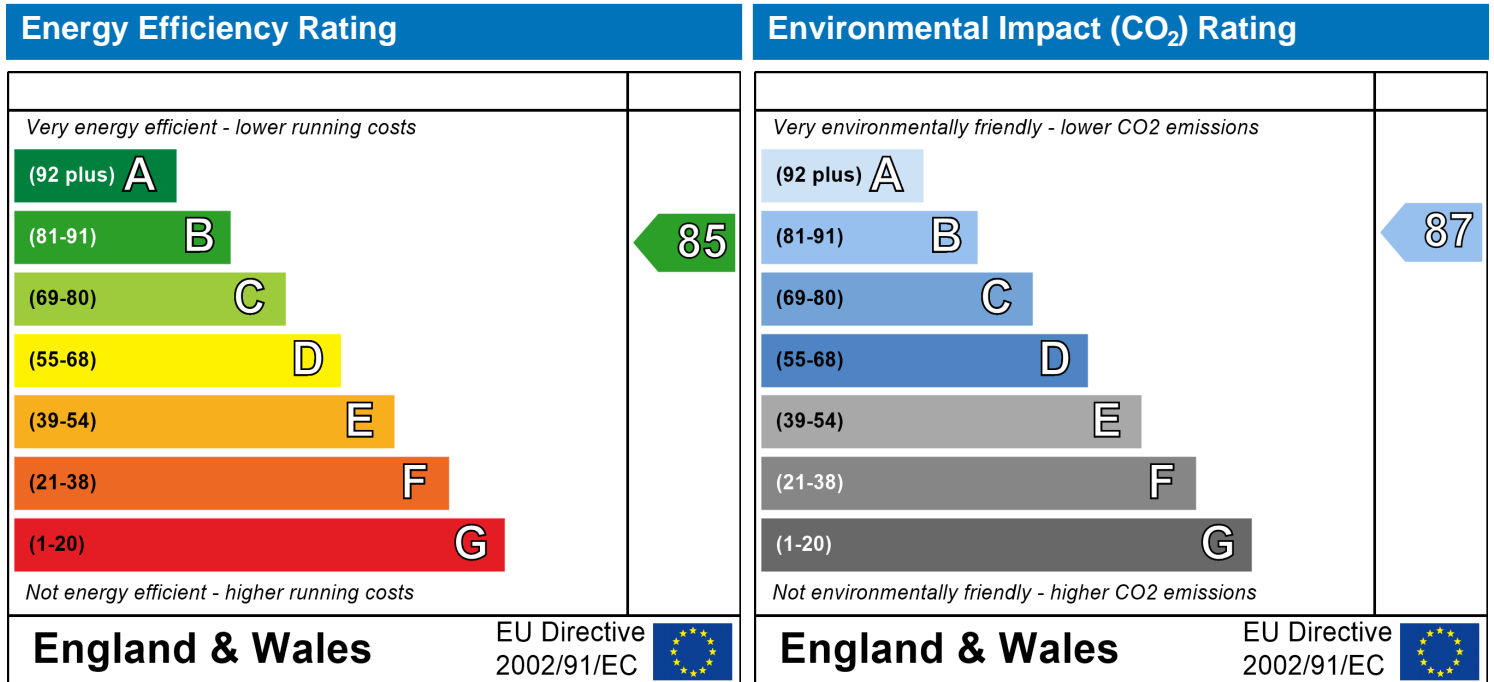
CHP schemes fuelled by mains gas are eligible to contribute to performance against this issue. Where these schemes are above 50kW_e they must be certified under the CHPQA.

It is the responsibility of the Accredited OCDEA and Code Assessor to ensure all technologies use in the calculation are appropriate before awarding credits.

Dwelling type: End-terrace House
 Date of assessment: 24 February 2021
 Produced by: Natalie King
 Total floor area: 105.84 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.



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: 116 Tweed [End] DCC2

Address:
 Located in: England
 Region: South East England
 UPRN:
 Date of assessment: 24 February 2021
 Date of certificate: 10 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 245.4
 Water use <= 125 litres/person/day: True
 PCDF Version: 473

Property description:

Dwelling type: House
 Detachment: End-terrace
 Year Completed: 2021
 Floor Location: Floor area: Storey height:
 Floor 0 52.92 m² 2.31 m
 Floor 1 52.92 m² 2.61 m
 Living area: 15.18 m² (fraction 0.143)
 Front of dwelling faces: North East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
D_28	Manufacturer	Solid	low-E, En = 0.2, hard coat	Yes	PVC-U
D_29	Manufacturer	Solid			PVC-U
W_133	Manufacturer	Windows	low-E, En = 0.2, hard coat	Yes	
W_134	Manufacturer	Windows	low-E, En = 0.2, hard coat	Yes	
W_135	Manufacturer	Windows	low-E, En = 0.2, hard coat	Yes	
W_136	Manufacturer	Windows	low-E, En = 0.2, hard coat	Yes	
W_137	Manufacturer	Windows	low-E, En = 0.2, hard coat	Yes	
W_138	Manufacturer	Windows	low-E, En = 0.2, hard coat	Yes	

Name:	Gap:	Frame Factor:	g-value:	U-value:	Area:	No. of Openings:
D_28	16mm or more mm	0.7	0.72	1.5	2.06	1
D_29	mm	0.7	0.72	1.1	1.89	1
W_133	16mm or more	0.7	0.72	1.2	1.84	1
W_134	16mm or more	0.7	0.72	1.2	1.28	1
W_135	16mm or more	0.7	0.72	1.2	1.31	1
W_136	16mm or more	0.7	0.72	1.2	2.43	1
W_137	16mm or more	0.7	0.72	1.2	1.31	1
W_138	16mm or more	0.7	0.72	1.2	1.31	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
D_28		External Wall	South West	2.06	1
D_29		External Wall	North East	1.89	1
W_133		External Wall	North East	1.84	1
W_134		External Wall	North East	1.28	1
W_135		External Wall	South West	1.31	1
W_136		External Wall	North East	2.43	1
W_137		External Wall	South West	1.31	1
W_138		External Wall	South West	1.31	1

SAP Input

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
<u>External Elements</u>							
External Wall	98.01	13.43	84.58	0.28	0	False	150
Roof	47.47	0	47.47	0.11	0		9
Sloping	6.78	0	6.78	0.21	0		9
Ground Floor	52.92			0.12			75
<u>Internal Elements</u>							
Block	36.96						75
Stud	164.14						9
Ceiling	52.92						9
Floor	52.92						18
<u>Party Elements</u>							
Party Wall	45.01						70

Thermal bridges:

Thermal bridges:	User-defined (individual PSI-values) Y-Value = 0.0365			
	Length	Psi-value		
	10.48	0.236	E1	Steel lintel with perforated steel base plate
	8.6	0.01	E3	Sill
	21.48	0.005	E4	Jamb
	20.72	0.089	E5	Ground floor (normal)
	20.72	-0.002	E6	Intermediate floor within a dwelling
	19.64	0.053	E10	Eaves (insulation at ceiling level)
	21.58	0.017	E11	Eaves (insulation at rafter level)
	9.46	0.051	E16	Corner (normal)
	9.46	0.041	E18	Party wall between dwellings
	9.14	0.043	P1	Ground floor
	9.14	0	P2	Intermediate floor within a dwelling
	8.6	0.035	P4	Roof (insulation at ceiling level)
	0.67	0.058	P5	Roof (insulation at rafter level)

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Natural ventilation (extract fans)
Number of chimneys:	0
Number of open flues:	0
Number of fans:	2
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	5.01

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 473, 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

SAP Input

Design flow temperature: Design flow temperature >45°C
Boiler interlock: Yes
Delayed start

Main heating Control:

Main heating Control: Programmer, room thermostat and TRVs
Control code: 2106

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: None
Assess Zero Carbon Home: No

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Natalie King	Stroma Number:	STRO034719
Software Name:	Stroma FSAP 2012	Software Version:	Version: 1.0.5.33

Property Address: 116 Tweed [End] DCC2

Address :

1. Overall dwelling dimensions:

	Area(m ²)		Av. Height(m)		Volume(m ³)
Ground floor	52.92	(1a) x	2.31	(2a) =	122.25 (3a)
First floor	52.92	(1b) x	2.61	(2b) =	138.12 (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	105.84	(4)			
Dwelling volume	(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =				260.37 (5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m ³ 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							2	x 10 =	20 (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) =	20	÷ (5) =	0.08 (8)
<i>If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)</i>			
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)
<i>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</i>			
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			5.01000022888184 (17)
If based on air permeability value, then (18) = [(17) ÷ 20] + (8), otherwise (18) = (16)			0.33 (18)
<i>Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used</i>			
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) =		0.28 (21)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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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
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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
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Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

	0.35	0.35	0.34	0.31	0.3	0.26	0.26	0.26	0.28	0.3	0.31	0.33
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Calculate effective air change rate for the applicable case

If mechanical ventilation:

0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x 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) x [1 - (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0
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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
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c) If whole house extract ventilation or positive input ventilation from outside

if (22b)m < 0.5 x (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 x (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0
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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=	0.56	0.56	0.56	0.55	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55
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Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.56	0.56	0.56	0.55	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55
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3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m ²)	Openings m ²	Net Area A ,m ²	U-value W/m ² K	A X U (W/K)	k-value kJ/m ² -K	A X k kJ/K
Doors Type 1			2.06	x 1.5	= 3.09		(26)
Doors Type 2			1.89	x 1.1	= 2.079		(26)
Windows Type 1			1.84	x1/[1/(1.2)+ 0.04]	= 2.11		(27)
Windows Type 2			1.28	x1/[1/(1.2)+ 0.04]	= 1.47		(27)
Windows Type 3			1.31	x1/[1/(1.2)+ 0.04]	= 1.5		(27)
Windows Type 4			2.43	x1/[1/(1.2)+ 0.04]	= 2.78		(27)
Windows Type 5			1.31	x1/[1/(1.2)+ 0.04]	= 1.5		(27)
Windows Type 6			1.31	x1/[1/(1.2)+ 0.04]	= 1.5		(27)
Floor			52.92	x 0.12	= 6.350399	75	3969 (28)
Walls	98.01	13.43	84.58	x 0.28	= 23.68	150	12687 (29)
Roof Type1	47.47	0	47.47	x 0.11	= 5.22	9	427.23 (30)
Roof Type2	6.78	0	6.78	x 0.21	= 1.42	9	61.02 (30)
Total area of elements, m ²			205.18				(31)
Party wall			45.01	x 0	= 0	70	3150.7 (32)
Internal wall **			36.96			75	2772 (32c)
Internal wall **			164.14			9	1477.26 (32c)
Internal floor			52.92			18	952.5599 (32d)

SAP WorkSheet: New dwelling design stage

Internal ceiling 52.92 9 476.28 (32e)

* for windows and roof windows, use effective window U-value calculated using formula $1/[(1/U\text{-value})+0.04]$ 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) = 52.7 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 25973.05 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 245.4 (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 7.48 (36)

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

Total fabric heat loss (33) + (36) = 60.18 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	48.37	48.16	47.95	46.98	46.8	45.96	45.96	45.81	46.29	46.8	47.17	47.55	(38)

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

(39)m=	108.55	108.34	108.13	107.17	106.99	106.14	106.14	105.99	106.47	106.99	107.35	107.73	
Average = Sum(39) _{1...12} / 12 =												107.17 (39)	

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

(40)m=	1.03	1.02	1.02	1.01	1.01	1	1	1	1.01	1.01	1.01	1.02	
Average = Sum(40) _{1...12} / 12 =												1.01 (40)	

Number of days in month (Table 1a)

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

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.79 (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) + 36 100.4 (43)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(44)m=	110.44	106.43	102.41	98.39	94.38	90.36	90.36	94.38	98.39	102.41	106.43	110.44	
Total = Sum(44) _{1...12} =												1204.81 (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=	163.78	143.24	147.81	128.87	123.65	106.7	98.88	113.46	114.82	133.81	146.06	158.61	
Total = Sum(45) _{1...12} =												1579.7 (45)	

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

(46)m=	24.57	21.49	22.17	19.33	18.55	16.01	14.83	17.02	17.22	20.07	21.91	23.79	(46)
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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:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

SAP WorkSheet: New dwelling design stage

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) x (41)m
(56)m=

0	0	0	0	0	0	0	0	0	0	0	0
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(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
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(57)

Primary circuit loss (annual) from Table 3

0

(58)

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

14.15	12.77	14.11	13.62	14.04	13.54	13.97	14.01	13.58	14.08	13.66	14.14
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(61)

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

177.93	156.01	161.93	142.49	137.69	120.25	112.85	127.47	128.4	147.89	159.72	172.75
--------	--------	--------	--------	--------	--------	--------	--------	-------	--------	--------	--------

(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=

177.93	156.01	161.93	142.49	137.69	120.25	112.85	127.47	128.4	147.89	159.72	172.75
--------	--------	--------	--------	--------	--------	--------	--------	-------	--------	--------	--------

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

1745.37

(64)

Heat gains from water heating, kWh/month $0.25 \cdot [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m + (57)m + (59)m]$
(65)m=

57.99	50.82	52.68	46.25	44.62	38.86	36.37	41.23	41.57	48.01	51.98	56.27
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(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
(66)m=

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
167.24	167.24	167.24	167.24	167.24	167.24	167.24	167.24	167.24	167.24	167.24	167.24

(66)

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

69.87	62.06	50.47	38.21	28.56	24.11	26.06	33.87	45.46	57.72	67.37	71.82
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(67)

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

396.18	400.29	389.93	367.87	340.03	313.87	296.39	292.28	302.64	324.69	352.53	378.7
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	-------

(68)

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

54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(69)

Pumps and fans gains (Table 5a)
(70)m=

3	3	3	3	3	3	3	3	3	3	3	3
---	---	---	---	---	---	---	---	---	---	---	---

(70)

Losses e.g. evaporation (negative values) (Table 5)
(71)m=

-111.5	-111.5	-111.5	-111.5	-111.5	-111.5	-111.5	-111.5	-111.5	-111.5	-111.5	-111.5
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

(71)

SAP WorkSheet: New dwelling design stage

Water heating gains (Table 5)

(72)m=	77.95	75.63	70.8	64.24	59.98	53.98	48.88	55.42	57.74	64.53	72.2	75.64	(72)
--------	-------	-------	------	-------	-------	-------	-------	-------	-------	-------	------	-------	------

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

(73)m=	657.26	651.23	624.46	583.58	541.83	505.22	484.59	494.82	519.09	560.2	605.35	639.41	(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 m ²	Flux Table 6a	g_ Table 6b	FF Table 6c	Gains (W)
Northeast 0.9x	0.77	1.84	11.28	0.72	0.7	7.25 (75)
Northeast 0.9x	0.77	1.28	11.28	0.72	0.7	5.04 (75)
Northeast 0.9x	0.77	2.43	11.28	0.72	0.7	9.58 (75)
Northeast 0.9x	0.77	1.84	22.97	0.72	0.7	14.76 (75)
Northeast 0.9x	0.77	1.28	22.97	0.72	0.7	10.27 (75)
Northeast 0.9x	0.77	2.43	22.97	0.72	0.7	19.49 (75)
Northeast 0.9x	0.77	1.84	41.38	0.72	0.7	26.59 (75)
Northeast 0.9x	0.77	1.28	41.38	0.72	0.7	18.5 (75)
Northeast 0.9x	0.77	2.43	41.38	0.72	0.7	35.12 (75)
Northeast 0.9x	0.77	1.84	67.96	0.72	0.7	43.67 (75)
Northeast 0.9x	0.77	1.28	67.96	0.72	0.7	30.38 (75)
Northeast 0.9x	0.77	2.43	67.96	0.72	0.7	57.68 (75)
Northeast 0.9x	0.77	1.84	91.35	0.72	0.7	58.7 (75)
Northeast 0.9x	0.77	1.28	91.35	0.72	0.7	40.84 (75)
Northeast 0.9x	0.77	2.43	91.35	0.72	0.7	77.53 (75)
Northeast 0.9x	0.77	1.84	97.38	0.72	0.7	62.59 (75)
Northeast 0.9x	0.77	1.28	97.38	0.72	0.7	43.54 (75)
Northeast 0.9x	0.77	2.43	97.38	0.72	0.7	82.65 (75)
Northeast 0.9x	0.77	1.84	91.1	0.72	0.7	58.55 (75)
Northeast 0.9x	0.77	1.28	91.1	0.72	0.7	40.73 (75)
Northeast 0.9x	0.77	2.43	91.1	0.72	0.7	77.32 (75)
Northeast 0.9x	0.77	1.84	72.63	0.72	0.7	46.67 (75)
Northeast 0.9x	0.77	1.28	72.63	0.72	0.7	32.47 (75)
Northeast 0.9x	0.77	2.43	72.63	0.72	0.7	61.64 (75)
Northeast 0.9x	0.77	1.84	50.42	0.72	0.7	32.4 (75)
Northeast 0.9x	0.77	1.28	50.42	0.72	0.7	22.54 (75)
Northeast 0.9x	0.77	2.43	50.42	0.72	0.7	42.79 (75)
Northeast 0.9x	0.77	1.84	28.07	0.72	0.7	18.04 (75)
Northeast 0.9x	0.77	1.28	28.07	0.72	0.7	12.55 (75)
Northeast 0.9x	0.77	2.43	28.07	0.72	0.7	23.82 (75)
Northeast 0.9x	0.77	1.84	14.2	0.72	0.7	9.12 (75)
Northeast 0.9x	0.77	1.28	14.2	0.72	0.7	6.35 (75)

SAP WorkSheet: New dwelling design stage

Northeast 0.9x	0.77	x	2.43	x	14.2	x	0.72	x	0.7	=	12.05	(75)
Northeast 0.9x	0.77	x	1.84	x	9.21	x	0.72	x	0.7	=	5.92	(75)
Northeast 0.9x	0.77	x	1.28	x	9.21	x	0.72	x	0.7	=	4.12	(75)
Northeast 0.9x	0.77	x	2.43	x	9.21	x	0.72	x	0.7	=	7.82	(75)
Southwest0.9x	0.77	x	1.31	x	36.79		0.72	x	0.7	=	16.83	(79)
Southwest0.9x	0.77	x	1.31	x	36.79		0.72	x	0.7	=	16.83	(79)
Southwest0.9x	0.77	x	1.31	x	36.79		0.72	x	0.7	=	16.83	(79)
Southwest0.9x	0.77	x	1.31	x	62.67		0.72	x	0.7	=	28.68	(79)
Southwest0.9x	0.77	x	1.31	x	62.67		0.72	x	0.7	=	28.68	(79)
Southwest0.9x	0.77	x	1.31	x	62.67		0.72	x	0.7	=	28.68	(79)
Southwest0.9x	0.77	x	1.31	x	85.75		0.72	x	0.7	=	39.24	(79)
Southwest0.9x	0.77	x	1.31	x	85.75		0.72	x	0.7	=	39.24	(79)
Southwest0.9x	0.77	x	1.31	x	85.75		0.72	x	0.7	=	39.24	(79)
Southwest0.9x	0.77	x	1.31	x	106.25		0.72	x	0.7	=	48.62	(79)
Southwest0.9x	0.77	x	1.31	x	106.25		0.72	x	0.7	=	48.62	(79)
Southwest0.9x	0.77	x	1.31	x	106.25		0.72	x	0.7	=	48.62	(79)
Southwest0.9x	0.77	x	1.31	x	119.01		0.72	x	0.7	=	54.45	(79)
Southwest0.9x	0.77	x	1.31	x	119.01		0.72	x	0.7	=	54.45	(79)
Southwest0.9x	0.77	x	1.31	x	119.01		0.72	x	0.7	=	54.45	(79)
Southwest0.9x	0.77	x	1.31	x	118.15		0.72	x	0.7	=	54.06	(79)
Southwest0.9x	0.77	x	1.31	x	118.15		0.72	x	0.7	=	54.06	(79)
Southwest0.9x	0.77	x	1.31	x	118.15		0.72	x	0.7	=	54.06	(79)
Southwest0.9x	0.77	x	1.31	x	113.91		0.72	x	0.7	=	52.12	(79)
Southwest0.9x	0.77	x	1.31	x	113.91		0.72	x	0.7	=	52.12	(79)
Southwest0.9x	0.77	x	1.31	x	113.91		0.72	x	0.7	=	52.12	(79)
Southwest0.9x	0.77	x	1.31	x	104.39		0.72	x	0.7	=	47.76	(79)
Southwest0.9x	0.77	x	1.31	x	104.39		0.72	x	0.7	=	47.76	(79)
Southwest0.9x	0.77	x	1.31	x	104.39		0.72	x	0.7	=	47.76	(79)
Southwest0.9x	0.77	x	1.31	x	92.85		0.72	x	0.7	=	42.48	(79)
Southwest0.9x	0.77	x	1.31	x	92.85		0.72	x	0.7	=	42.48	(79)
Southwest0.9x	0.77	x	1.31	x	92.85		0.72	x	0.7	=	42.48	(79)
Southwest0.9x	0.77	x	1.31	x	69.27		0.72	x	0.7	=	31.69	(79)
Southwest0.9x	0.77	x	1.31	x	69.27		0.72	x	0.7	=	31.69	(79)
Southwest0.9x	0.77	x	1.31	x	69.27		0.72	x	0.7	=	31.69	(79)
Southwest0.9x	0.77	x	1.31	x	44.07		0.72	x	0.7	=	20.16	(79)
Southwest0.9x	0.77	x	1.31	x	44.07		0.72	x	0.7	=	20.16	(79)
Southwest0.9x	0.77	x	1.31	x	44.07		0.72	x	0.7	=	20.16	(79)
Southwest0.9x	0.77	x	1.31	x	31.49		0.72	x	0.7	=	14.41	(79)
Southwest0.9x	0.77	x	1.31	x	31.49		0.72	x	0.7	=	14.41	(79)
Southwest0.9x	0.77	x	1.31	x	31.49		0.72	x	0.7	=	14.41	(79)

Solar gains in watts, calculated for each month

(83)m = Sum(74)m ... (82)m

(83)m=	72.38	130.55	197.92	277.57	340.43	350.95	332.95	284.07	225.19	149.49	88.01	61.08	(83)
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SAP WorkSheet: New dwelling design stage

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

(84)m=	729.64	781.78	822.38	861.16	882.26	856.17	817.54	778.89	744.28	709.69	693.37	700.49	(84)
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	------

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)

(86)m=	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(86)
	1	0.99	0.99	0.96	0.89	0.73	0.56	0.61	0.84	0.97	0.99	1	

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

(87)m=	20	20.11	20.3	20.57	20.81	20.95	20.99	20.99	20.9	20.61	20.26	19.97	(87)
--------	----	-------	------	-------	-------	-------	-------	-------	------	-------	-------	-------	------

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

(88)m=	20.06	20.06	20.07	20.07	20.07	20.08	20.08	20.08	20.08	20.07	20.07	20.07	(88)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

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

(89)m=	0.99	0.99	0.98	0.95	0.85	0.65	0.45	0.5	0.77	0.95	0.99	1	(89)
--------	------	------	------	------	------	------	------	-----	------	------	------	---	------

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

(90)m=	19.15	19.26	19.46	19.72	19.94	20.06	20.08	20.08	20.02	19.76	19.42	19.13	(90)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

fLA = Living area ÷ (4) = 0.14 (91)

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

(92)m=	19.28	19.38	19.58	19.84	20.07	20.19	20.21	20.21	20.15	19.88	19.54	19.25	(92)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

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

(93)m=	19.13	19.23	19.43	19.69	19.92	20.04	20.06	20.06	20	19.73	19.39	19.1	(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=	0.99	0.99	0.98	0.94	0.84	0.65	0.45	0.49	0.77	0.95	0.99	0.99	(94)
--------	------	------	------	------	------	------	------	------	------	------	------	------	------

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

(95)m=	724.17	772.39	802.93	810.02	745.04	554.15	364.78	383.62	570.57	671.39	683.53	696.23	(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=	1609.24	1552.96	1397.89	1156.56	878.96	577.12	367.21	387.76	627.95	977.17	1319.23	1605.73	(97)
--------	---------	---------	---------	---------	--------	--------	--------	--------	--------	--------	---------	---------	------

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

(98)m=	658.5	524.54	442.65	249.51	99.64	0	0	0	0	227.5	457.7	676.67	(98)
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Total per year (kWh/year) = Sum(98)_{1...5,9...12} = 3336.71 (98)

Space heating requirement in kWh/m²/year

31.53 (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)

SAP WorkSheet: New dwelling design stage

Efficiency of main space heating system 1 90.5 (206)

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----------

Space heating requirement (calculated above)

658.5	524.54	442.65	249.51	99.64	0	0	0	0	227.5	457.7	676.67
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(211)m = $\{[(98)m \times (204)]\} \times 100 \div (206)$ (211)

727.62	579.61	489.12	275.7	110.1	0	0	0	0	251.38	505.75	747.7
--------	--------	--------	-------	-------	---	---	---	---	--------	--------	-------

Total (kWh/year) = Sum(211)_{1..5,10...12} = 3686.98 (211)

Space heating fuel (secondary), kWh/month

= $\{[(98)m \times (201)]\} \times 100 \div (208)$

(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)

177.93	156.01	161.93	142.49	137.69	120.25	112.85	127.47	128.4	147.89	159.72	172.75
--------	--------	--------	--------	--------	--------	--------	--------	-------	--------	--------	--------

Efficiency of water heater 87.3 (216)

(217)m =

89.8	89.75	89.62	89.31	88.62	87.3	87.3	87.3	87.3	89.21	89.65	89.83
------	-------	-------	-------	-------	------	------	------	------	-------	-------	-------

(217)

Fuel for water heating, kWh/month

(219)m = $(64)m \times 100 \div (217)m$

(219)m =

198.14	173.84	180.68	159.54	155.38	137.74	129.26	146.02	147.08	165.77	178.16	192.31
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

Total = Sum(219a)_{1..12} = 1963.92 (219)

Annual totals

Space heating fuel used, main system 1 3686.98 kWh/year

Water heating fuel used 1963.92 kWh/year

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 493.59 (232)

Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) = 6306.79 (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 =	128.31 (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 =	68.34 (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 =	65.1 (250)

SAP WorkSheet: New dwelling design stage

Additional standing charges (Table 12) 120 (251)

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

Total energy cost (245)...(247) + (250)...(254) = 391.65 (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] = 1.09 (257)

SAP rating (Section 12) 84.79 (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	=	796.39	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	424.21	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1220.59	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	256.17	(268)
Total CO2, kg/year	sum of (265)...(271) =			1515.69	(272)
CO2 emissions per m²	(272) ÷ (4) =			14.32	(273)
El rating (section 14)				87	(274)

13a. Primary Energy

	Energy kWh/year		Primary factor		P. Energy kWh/year
Space heating (main system 1)	(211) x	1.22	=	4498.11	(261)
Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	1.22	=	2395.99	(264)
Space and water heating	(261) + (262) + (263) + (264) =			6894.1	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	230.25	(267)
Electricity for lighting	(232) x	0	=	1515.33	(268)
'Total Primary Energy	sum of (265)...(271) =			8639.68	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =			81.63	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 10 March 2021

Property Details: 116 Tweed [End] DCC2

Dwelling type:	End-terrace House
Located in:	England
Region:	South East England
Cross ventilation possible:	Yes
Number of storeys:	2
Front of dwelling faces:	North East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Calculated 245.4
Night ventilation:	False
Blinds, curtains, shutters:	Dark-coloured curtain or roller blind
Ventilation rate during hot weather (ach):	4 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	343.68	(P1)
Transmission heat loss coefficient:	60.2	
Summer heat loss coefficient:	403.87	(P2)

Overhangs:

Orientation:	Ratio:	Z_overhangs:
North East (W_133)	0	1
North East (W_134)	0	1
South West (W_135)	0	1
North East (W_136)	0	1
South West (W_137)	0	1
South West (W_138)	0	1

Solar shading:

Orientation:	Z blinds:	Solar access:	Overhangs:	Z summer:	
North East (W_133)	0.85	0.9	1	0.76	(P8)
North East (W_134)	0.85	0.9	1	0.76	(P8)
South West (W_135)	0.85	0.9	1	0.76	(P8)
North East (W_136)	0.85	0.9	1	0.76	(P8)
South West (W_137)	0.85	0.9	1	0.76	(P8)
South West (W_138)	0.85	0.9	1	0.76	(P8)

Solar gains:

Orientation	Area	Flux	g_	FF	Shading	Gains
North East (W_133)	0.9 x	1.84	105.45	0.72	0.7	67.33
North East (W_134)	0.9 x	1.28	105.45	0.72	0.7	46.84
South West (W_135)	0.9 x	1.31	126.97	0.72	0.7	57.72
North East (W_136)	0.9 x	2.43	105.45	0.72	0.7	88.92
South West (W_137)	0.9 x	1.31	126.97	0.72	0.7	57.72
South West (W_138)	0.9 x	1.31	126.97	0.72	0.7	57.72
					Total	376.24 (P3/P4)

Internal gains:

	June	July	August
Internal gains	502.22	481.59	491.82
Total summer gains	903.48	857.83	815.5 (P5)

SAP 2012 Overheating Assessment

Summer gain/loss ratio	2.24	2.12	2.02	(P6)
Mean summer external temperature (South East England)	15.4	17.4	17.5	
Thermal mass temperature increment	0.28	0.28	0.28	
Threshold temperature	17.92	19.81	19.8	(P7)
Likelihood of high internal temperature	Not significant	Not significant	Not significant	
Assessment of likelihood of high internal temperature:	<u>Not significant</u>			