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Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.16
Printed on 08 February 2019 at 12:21:50

Project Information:

Assessed By: Jonathon Hill (STRO033541) **Building Type:** Detached Bungalow

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 138.45m²

Site Reference : 8470 - Adjacent to Scaleber Farm **Plot Reference:** 8470 - Adjacent to Scaleber Farm

Address :

Client Details:

Name:

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: Oil
Fuel factor: 1.17 (oil)

Target Carbon Dioxide Emission Rate (TER)	19.75 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	19.74 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	62.9 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	46.3 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.22 (max. 0.70)	**OK**
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	**OK**
Roof	0.15 (max. 0.20)	0.15 (max. 0.35)	**OK**
Openings	1.10 (max. 2.00)	1.10 (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 439, product index 017059):
Boiler systems with radiators or underfloor heating - heating oil
Brand name: Grant
Model: Vortex Pro Boilerhouse 36-46
Model qualifier:
(Regular)
Efficiency 90.7 % SEDBUK2009
Minimum 80.0 % **OK**

Secondary heating system: None

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Regulations Compliance Report

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.20 kWh/day	
	Permitted by DBSCG: 2.03 kWh/day	OK
Primary pipework insulated:	Yes	OK

6 Controls

Space heating controls	TTZC by plumbing and electrical services	OK
Hot water controls:	Cylinderstat	OK
	Independent timer for DHW	OK
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):	Slight	OK

Based on:

Overshading:	Average or unknown
Windows facing: South	31.26m²
Roof windows facing: South	17.25m²
Ventilation rate:	4.00
Blinds/curtains:	Closed 100% of daylight hours

10 Key features

Thermal bridging	0.026 W/m²K
Windows U-value	1.1 W/m²K
Doors U-value	1.1 W/m²K
Floors U-value	0.1 W/m²K

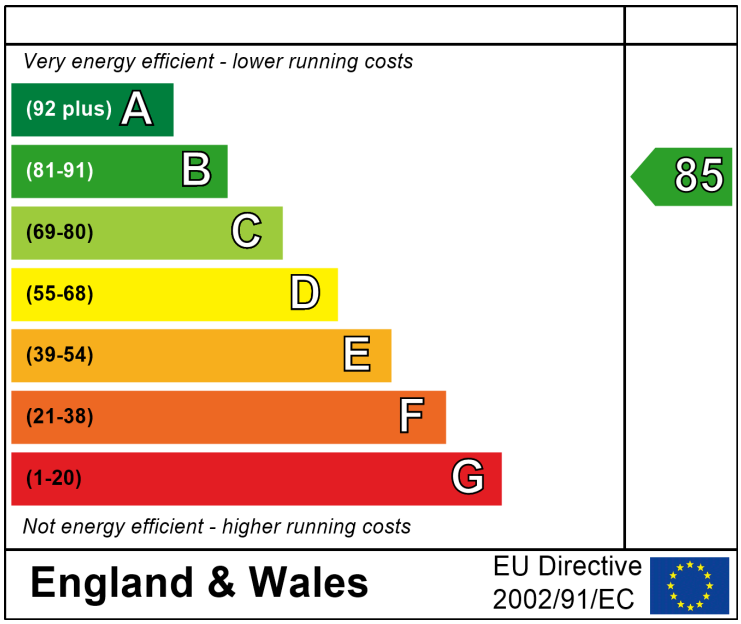
Predicted Energy Assessment

Dwelling type:	Detached Bungalow
Date of assessment:	08 February 2019
Produced by:	Jonathon Hill
Total floor area:	138.45 m²

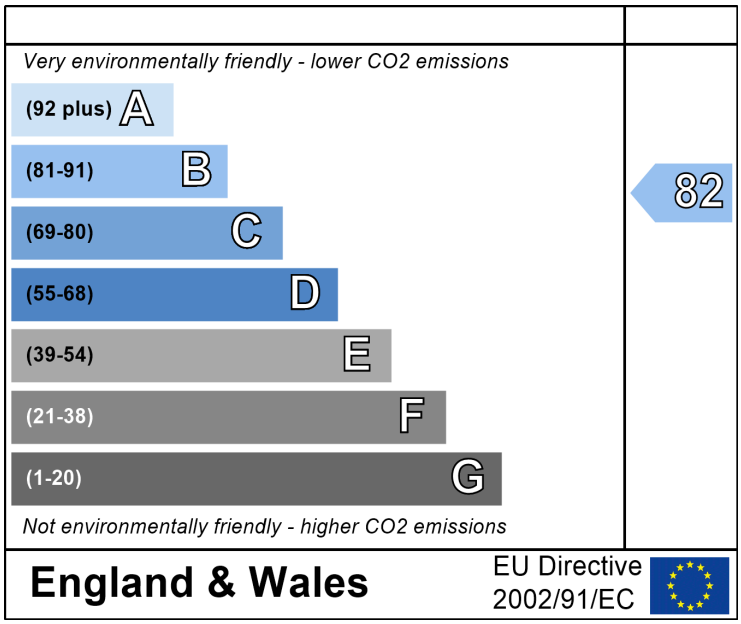
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about 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 carbonn dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

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SAP Input

Property Details: 8470 - Adjacent to Scaleber Farm

Address:	
Located in:	England
Region:	West Pennines
UPRN:	
Date of assessment:	08 February 2019
Date of certificate:	08 February 2019
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Calculated 394.67
Water use <= 125 litres/person/day:	True
PCDF Version:	439

Property description:

Dwelling type:	Bungalow
Detachment:	Detached
Year Completed:	2019

Floor Location:	Floor area:	Storey height:
Floor 0	138.45 m²	3.1 m

Living area:	60.67 m² (fraction 0.438)
Front of dwelling faces:	South

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
Door	Manufacturer	Solid			
Window South	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	PVC-U
Roof Lights	Manufacturer	Roof Windows	low-E, En = 0.05, soft coat	Yes	PVC-U

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
Door	mm	0	0	1.1	1.96	1
Window South	16mm or more	0.7	0.7	1.1	31.26	1
Roof Lights	16mm or more	0.7	0.7	1.1	17.25	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
Door		Wall to Log Store	West	0	0
Window South		External Walls	South	0	0
Roof Lights		Roof	South	0	0

Overshading:	Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External Walls	96.5	31.26	65.24	0.22	0	False	70
Basement wall	57.11	0	57.11	0.17	0	False	150
Wall to Log Store	26.22	1.96	24.26	0.22	0.82	False	70
Roof	143.33	17.25	126.08	0.15	0		9
GF	138.45			0.1			110
Internal Elements							
Internal Walls	234.46						100
Party Elements							

Thermal bridges:

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SAP Input

Thermal bridges:	User-defined (individual PSI-values) Y-Value = 0.026				
		Length	**Psi-value**		
		13	0.05	E2	Other lintels (including other steel lintels)
	[Approved]	23.4	0.05	E4	Jamb
	[Approved]	14.57	0.16	E5	Ground floor (normal)
		8.49	0.11	E5	Ground floor (normal)
		26.3	0.07	E22	Basement floor
	[Approved]	40.85	0.04	E11	Eaves (insulation at rafter level)
	[Approved]	12.4	0.09	E16	Corner (normal)
		7.6	0.08	R1	Head
		7.6	0.06	R2	Sill
		15.8	0.08	R3	Jamb

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Natural ventilation (extract fans)
Number of chimneys:	0
Number of open flues:	0
Number of fans:	5
Number of passive stacks:	0
Number of sides sheltered:	3
Pressure test:	5

Main heating system:

Main heating system:

Boiler systems with radiators or underfloor heating
Gas boilers and oil boilers
Fuel: heating oil
Info Source: Boiler Database
Database: (rev 439, product index 017059) Efficiency: Winter 80.1 % Summer: 91.8
Brand name: Grant
Model: Vortex Pro Boilerhouse 36-46
Model qualifier:
(Regular boiler)
Systems with radiators
Central heating pump : Unknown
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 :heating oil
Hot water cylinder
Cylinder volume: 170 litres
Cylinder insulation: Measured loss, 1.2kWh/day
Primary pipework insulation: True
Cylinderstat: True
Cylinder in heated space: True
Solar panel: False

Others:

Electricity tariff:	Standard Tariff
In Smoke Control Area:	Unknown

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SAP Input

Conservatory:	No conservatory
Low energy lights:	100%
Terrain type:	Rural
EPC language:	English
Wind turbine:	No
Photovoltaics:	None
Assess Zero Carbon Home:	No

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SAP WorkSheet: New dwelling design stage

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User Details:

Assessor Name:	Jonathon Hill	**Stroma Number:**	STRO033541
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.16

Property Address: 8470 - Adjacent to Scaleber Farm

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	138.45	(1a) x	3.1	(2a) =	429.19	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	138.45	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		429.19	(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							5	x 10 =	50	(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) =	50	÷ (5) =	0.12	(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)			0.37	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered			3	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.78	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.28	(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
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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SAP WorkSheet: New dwelling design stage

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

0.36	0.36	0.35	0.31	0.31	0.27	0.27	0.26	0.28	0.31	0.32	0.33

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=	0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.56	(24d)

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

(25)m=	0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.56	(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			1.96	x	1.1	=	2.156			(26)
Windows			31.26	x	1/[1/(1.1)+ 0.04]	=	32.94			(27)
Rooflights			17.25	x	1/[1/(1.1) + 0.04]	=	18.975			(27b)
Floor			138.45	x	0.1	=	13.845	110	15229.5	(28)
Walls Type1	96.5	31.26	65.24	x	0.22	=	14.35	70	4566.8	(29)
Walls Type2	57.11	0	57.11	x	0.17	=	9.71	150	8566.5	(29)
Walls Type3	26.22	1.96	24.26	x	0.19	=	4.52	70	1698.2	(29)
Roof	143.33	17.25	126.08	x	0.15	=	18.91	9	1134.72	(30)
Total area of elements, m²			461.61							(31)
Internal wall **			234.46					100	23446	(32c)

** 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) = 114.61 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 54641.72 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 394.67 (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 12 (36)

if details of thermal bridging are not known (36) = 0.15 x (31)

Total fabric heat loss (33) + (36) = 126.61 (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=	80.1	79.74	79.39	77.73	77.42	75.97	75.97	75.71	76.53	77.42	78.05	78.71	(38)

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

(39)m=	206.72	206.36	206	204.34	204.03	202.59	202.59	202.32	203.14	204.03	204.66	205.32	

Average = Sum(39)$_{1...12}$ /12= 204.34 (39)

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

(40)m=	1.49	1.49	1.49	1.48	1.47	1.46	1.46	1.46	1.47	1.47	1.48	1.48	

Average = Sum(40)$_{1...12}$ /12= 1.48 (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 2.91 (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) + 36 103.41 (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	
(44)m=	113.75	109.61	105.48	101.34	97.2	93.07	93.07	97.2	101.34	105.48	109.61	113.75	

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

Total = Sum(44)$_{1...12}$ = 1240.91 (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=	168.69	147.54	152.24	132.73	127.36	109.9	101.84	116.86	118.26	137.82	150.44	163.37	

Total = Sum(45)$_{1...12}$ = 1627.03 (45)

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

(46)m=	25.3	22.13	22.84	19.91	19.1	16.48	15.28	17.53	17.74	20.67	22.57	24.5	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 170 (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): 1.2 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.65 (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) 0.65 (55)

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

(56)m=	20.09	18.14	20.09	19.44	20.09	19.44	20.09	20.09	19.44	20.09	19.44	20.09	(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=	20.09	18.14	20.09	19.44	20.09	19.44	20.09	20.09	19.44	20.09	19.44	20.09	(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=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

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

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(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=	212.04	186.69	195.59	174.68	170.71	151.85	145.19	160.21	160.21	181.17	192.39	206.72	(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=	212.04	186.69	195.59	174.68	170.71	151.85	145.19	160.21	160.21	181.17	192.39	206.72	

Output from water heater (annual)$_{1...12}$ | 2137.45 | (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=	90.77	80.38	85.3	77.69	77.03	70.1	68.54	73.54	72.88	80.5	83.58	89	(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=	174.84	174.84	174.84	174.84	174.84	174.84	174.84	174.84	174.84	174.84	174.84	174.84	(66)

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

(67)m=	68.57	60.9	49.53	37.5	28.03	23.66	25.57	33.23	44.61	56.64	66.11	70.47	(67)

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

(68)m=	459.17	463.93	451.93	426.36	394.1	363.77	343.51	338.75	350.75	376.32	408.58	438.91	(68)

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

(69)m=	55.4	55.4	55.4	55.4	55.4	55.4	55.4	55.4	55.4	55.4	55.4	55.4	(69)

Pumps and fans gains (Table 5a)

(70)m=	20	20	20	20	20	20	20	20	20	20	20	20	(70)

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

(71)m=	-116.56	-116.56	-116.56	-116.56	-116.56	-116.56	-116.56	-116.56	-116.56	-116.56	-116.56	-116.56	(71)

Water heating gains (Table 5)

(72)m=	122	119.61	114.65	107.91	103.53	97.37	92.13	98.84	101.22	108.2	116.09	119.62	(72)

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

(73)m=	783.42	778.13	749.79	705.45	659.34	618.48	594.89	604.5	630.27	674.84	724.46	762.68	(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)	
South	0.9x 0.77	x	31.26	x	46.75	x	0.7	x	0.7	=	496.27	(78)
South	0.9x 0.77	x	31.26	x	76.57	x	0.7	x	0.7	=	812.76	(78)

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South	0.9x	0.77	x	31.26	x	97.53	x	0.7	x	0.7	=	1035.32	(78)
South	0.9x	0.77	x	31.26	x	110.23	x	0.7	x	0.7	=	1170.13	(78)
South	0.9x	0.77	x	31.26	x	114.87	x	0.7	x	0.7	=	1219.35	(78)
South	0.9x	0.77	x	31.26	x	110.55	x	0.7	x	0.7	=	1173.46	(78)
South	0.9x	0.77	x	31.26	x	108.01	x	0.7	x	0.7	=	1146.54	(78)
South	0.9x	0.77	x	31.26	x	104.89	x	0.7	x	0.7	=	1113.45	(78)
South	0.9x	0.77	x	31.26	x	101.89	x	0.7	x	0.7	=	1081.51	(78)
South	0.9x	0.77	x	31.26	x	82.59	x	0.7	x	0.7	=	876.64	(78)
South	0.9x	0.77	x	31.26	x	55.42	x	0.7	x	0.7	=	588.25	(78)
South	0.9x	0.77	x	31.26	x	40.4	x	0.7	x	0.7	=	428.82	(78)
Rooflights	0.9x	1	x	17.25	x	34.89	x	0.7	x	0.7	=	265.39	(82)
Rooflights	0.9x	1	x	17.25	x	67.5	x	0.7	x	0.7	=	513.45	(82)
Rooflights	0.9x	1	x	17.25	x	110.42	x	0.7	x	0.7	=	839.98	(82)
Rooflights	0.9x	1	x	17.25	x	161.6	x	0.7	x	0.7	=	1229.3	(82)
Rooflights	0.9x	1	x	17.25	x	199.64	x	0.7	x	0.7	=	1518.7	(82)
Rooflights	0.9x	1	x	17.25	x	205.33	x	0.7	x	0.7	=	1562	(82)
Rooflights	0.9x	1	x	17.25	x	195.07	x	0.7	x	0.7	=	1483.94	(82)
Rooflights	0.9x	1	x	17.25	x	166.3	x	0.7	x	0.7	=	1265.09	(82)
Rooflights	0.9x	1	x	17.25	x	128.45	x	0.7	x	0.7	=	977.16	(82)
Rooflights	0.9x	1	x	17.25	x	79.79	x	0.7	x	0.7	=	607.01	(82)
Rooflights	0.9x	1	x	17.25	x	43.34	x	0.7	x	0.7	=	329.68	(82)
Rooflights	0.9x	1	x	17.25	x	28.81	x	0.7	x	0.7	=	219.15	(82)

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

(83)m=	761.66	1326.22	1875.3	2399.44	2738.06	2735.46	2630.48	2378.54	2058.67	1483.65	917.93	647.97	(83)

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

(84)m=	1545.08	2104.34	2625.08	3104.89	3397.39	3353.94	3225.37	2983.04	2688.93	2158.49	1642.38	1410.65	(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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	1	0.97	0.9	0.74	0.55	0.39	0.28	0.31	0.52	0.85	0.98	1	(86)

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

(87)m=	20.15	20.43	20.73	20.93	20.99	21	21	21	20.99	20.87	20.45	20.09	(87)

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

(88)m=	19.69	19.69	19.7	19.71	19.71	19.72	19.72	19.72	19.71	19.71	19.7	19.7	(88)

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

(89)m=	0.99	0.96	0.87	0.68	0.48	0.31	0.2	0.22	0.42	0.79	0.97	1	(89)

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

(90)m=	18.62	19.02	19.41	19.65	19.7	19.71	19.72	19.72	19.71	19.6	19.06	18.54	(90)

fLA = Living area ÷ (4) = 0.44 (91)

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

(92)m=	19.29	19.64	19.99	20.21	20.26	20.28	20.28	20.28	20.27	20.16	19.67	19.22	(92)

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

(93)m=	19.14	19.49	19.84	20.06	20.11	20.13	20.13	20.13	20.12	20.01	19.52	19.07	(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	0.96	0.87	0.7	0.5	0.33	0.22	0.25	0.45	0.8	0.97	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	1531.49	2020.85	2294.56	2170.69	1702.17	1118.74	714.68	754.27	1217.37	1730.14	1596.87	1402.8	(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=	3066.83	3010.82	2747.65	2279.8	1716.84	1119.78	714.75	754.42	1223.4	1919.29	2541.99	3052.26	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	1142.3	665.26	337.09	78.56	10.91	0	0	0	0	140.72	680.49	1227.2	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 4282.53 (98)

Space heating requirement in kWh/m²/year 30.93 (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 91.8 (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)													
	1142.3	665.26	337.09	78.56	10.91	0	0	0	0	140.72	680.49	1227.2	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	1244.33	724.68	367.21	85.57	11.89	0	0	0	0	153.29	741.27	1336.82	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 4665.06 (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)

	212.04	186.69	195.59	174.68	170.71	151.85	145.19	160.21	160.21	181.17	192.39	206.72	

Efficiency of water heater 80.1 (216)

(217)m=	89.75	88.95	87.13	83.4	80.72	80.1	80.1	80.1	80.1	84.83	88.94	89.91	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	236.26	209.88	224.49	209.46	211.49	189.58	181.26	200.01	200.01	213.57	216.32	229.92	

Total = Sum(219a)$_{1...12}$ = 2522.26 (219)

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Annual totals	kWh/year	kWh/year	
Space heating fuel used, main system 1		4665.06	
Water heating fuel used		2522.26	
Electricity for pumps, fans and electric keep-hot			
central heating pump:	120		(230c)
oil boiler pump	100		(230d)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	220	(231)
Electricity for lighting		484.36	(232)

10a. Fuel costs - individual heating systems:

	Fuel kWh/year		Fuel Price (Table 12)		Fuel Cost £/year	
Space heating - main system 1	(211)	x	5.44	x 0.01 =	253.78	(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)		5.44	x 0.01 =	137.21	(247)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	29.02	(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 =	63.89	(250)
Additional standing charges (Table 12)					0	(251)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =				483.9	(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] =	1.11	(257)
SAP rating (Section 12)	84.55	(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	0.298	=	1390.19	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.298	=	751.63	(264)
Space and water heating	(261) + (262) + (263) + (264) =				2141.82	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	114.18	(267)
Electricity for lighting	(232)	x	0.519	=	251.38	(268)
Total CO2, kg/year	sum of (265)…(271) =				2507.38	(272)
CO2 emissions per m²	(272) ÷ (4) =				18.11	(273)

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EI rating (section 14)	82	(274)

13a. Primary Energy

	Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211) x		1.1	=	5131.57	(261)
Space heating (secondary)	(215) x		3.07	=	0	(263)
Energy for water heating	(219) x		1.1	=	2774.48	(264)
Space and water heating	(261) + (262) + (263) + (264) =				7906.05	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		3.07	=	675.4	(267)
Electricity for lighting	(232) x		0	=	1486.99	(268)
'Total Primary Energy		sum of (265)…(271) =			10068.44	(272)
Primary energy kWh/m²/year		(272) ÷ (4) =			72.72	(273)

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User Details:

Assessor Name:	Jonathon Hill	**Stroma Number:**	STRO033541
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.16

Property Address: 8470 - Adjacent to Scaleber Farm

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	138.45	(1a) x	3.1	(2a) =	429.19	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	138.45	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		429.19	(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							5	x 10 =	50	(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) =	50	÷ (5) =	0.12 (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)		0.37 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used			
Number of sides sheltered			3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.78 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =		0.28 (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
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

0.36	0.36	0.35	0.31	0.31	0.27	0.27	0.26	0.28	0.31	0.32	0.33

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=	0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.56	(24d)

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

(25)m=	0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.56	(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			1.96	x	1.1	=	2.156			(26)
Windows			31.26	x	1/[1/(1.1)+ 0.04]	=	32.94			(27)
Rooflights			17.25	x	1/[1/(1.1) + 0.04]	=	18.975			(27b)
Floor			138.45	x	0.1	=	13.845	110	15229.5	(28)
Walls Type1	96.5	31.26	65.24	x	0.22	=	14.35	70	4566.8	(29)
Walls Type2	57.11	0	57.11	x	0.17	=	9.71	150	8566.5	(29)
Walls Type3	26.22	1.96	24.26	x	0.19	=	4.52	70	1698.2	(29)
Roof	143.33	17.25	126.08	x	0.15	=	18.91	9	1134.72	(30)
Total area of elements, m²			461.61							(31)
Internal wall **			234.46					100	23446	(32c)

** 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) = 114.61 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 54641.72 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 394.67 (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 12 (36)

if details of thermal bridging are not known (36) = 0.15 x (31)

Total fabric heat loss (33) + (36) = 126.61 (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=	80.1	79.74	79.39	77.73	77.42	75.97	75.97	75.71	76.53	77.42	78.05	78.71	(38)

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

(39)m=	206.72	206.36	206	204.34	204.03	202.59	202.59	202.32	203.14	204.03	204.66	205.32	

Average = Sum(39)$_{1...12}$ /12= 204.34 (39)

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

(40)m=	1.49	1.49	1.49	1.48	1.47	1.46	1.46	1.46	1.47	1.47	1.48	1.48	

Average = Sum(40)$_{1...12}$ /12= 1.48 (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 2.91 (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) + 36 103.41 (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	
(44)m=	113.75	109.61	105.48	101.34	97.2	93.07	93.07	97.2	101.34	105.48	109.61	113.75	

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

Total = Sum(44)$_{1...12}$ = 1240.91 (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=	168.69	147.54	152.24	132.73	127.36	109.9	101.84	116.86	118.26	137.82	150.44	163.37	

Total = Sum(45)$_{1...12}$ = 1627.03 (45)

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

(46)m=	25.3	22.13	22.84	19.91	19.1	16.48	15.28	17.53	17.74	20.67	22.57	24.5	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 170 (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): 1.2 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.65 (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) 0.65 (55)

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

(56)m=	20.09	18.14	20.09	19.44	20.09	19.44	20.09	20.09	19.44	20.09	19.44	20.09	(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=	20.09	18.14	20.09	19.44	20.09	19.44	20.09	20.09	19.44	20.09	19.44	20.09	(57)

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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=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

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

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(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=	212.04	186.69	195.59	174.68	170.71	151.85	145.19	160.21	160.21	181.17	192.39	206.72	(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=	212.04	186.69	195.59	174.68	170.71	151.85	145.19	160.21	160.21	181.17	192.39	206.72	

Output from water heater (annual)$_{1...12}$ | 2137.45 | (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=	90.77	80.38	85.3	77.69	77.03	70.1	68.54	73.54	72.88	80.5	83.58	89	(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=	145.7	145.7	145.7	145.7	145.7	145.7	145.7	145.7	145.7	145.7	145.7	145.7	(66)

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

(67)m=	27.43	24.36	19.81	15	11.21	9.47	10.23	13.29	17.84	22.66	26.44	28.19	(67)

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

(68)m=	307.64	310.84	302.79	285.66	264.05	243.73	230.15	226.96	235.01	252.13	273.75	294.07	(68)

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

(69)m=	37.57	37.57	37.57	37.57	37.57	37.57	37.57	37.57	37.57	37.57	37.57	37.57	(69)

Pumps and fans gains (Table 5a)

(70)m=	20	20	20	20	20	20	20	20	20	20	20	20	(70)

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

(71)m=	-116.56	-116.56	-116.56	-116.56	-116.56	-116.56	-116.56	-116.56	-116.56	-116.56	-116.56	-116.56	(71)

Water heating gains (Table 5)

(72)m=	122	119.61	114.65	107.91	103.53	97.37	92.13	98.84	101.22	108.2	116.09	119.62	(72)

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

(73)m=	543.78	541.52	523.96	495.28	465.5	437.27	419.22	425.81	440.78	469.7	502.99	528.59	(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)	
South	0.9x 0.77	x	31.26	x	46.75	x	0.7	x	0.7	=	496.27	(78)
South	0.9x 0.77	x	31.26	x	76.57	x	0.7	x	0.7	=	812.76	(78)

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South	0.9x	0.77	x	31.26	x	97.53	x	0.7	x	0.7	=	1035.32	(78)
South	0.9x	0.77	x	31.26	x	110.23	x	0.7	x	0.7	=	1170.13	(78)
South	0.9x	0.77	x	31.26	x	114.87	x	0.7	x	0.7	=	1219.35	(78)
South	0.9x	0.77	x	31.26	x	110.55	x	0.7	x	0.7	=	1173.46	(78)
South	0.9x	0.77	x	31.26	x	108.01	x	0.7	x	0.7	=	1146.54	(78)
South	0.9x	0.77	x	31.26	x	104.89	x	0.7	x	0.7	=	1113.45	(78)
South	0.9x	0.77	x	31.26	x	101.89	x	0.7	x	0.7	=	1081.51	(78)
South	0.9x	0.77	x	31.26	x	82.59	x	0.7	x	0.7	=	876.64	(78)
South	0.9x	0.77	x	31.26	x	55.42	x	0.7	x	0.7	=	588.25	(78)
South	0.9x	0.77	x	31.26	x	40.4	x	0.7	x	0.7	=	428.82	(78)
Rooflights	0.9x	1	x	17.25	x	34.89	x	0.7	x	0.7	=	265.39	(82)
Rooflights	0.9x	1	x	17.25	x	67.5	x	0.7	x	0.7	=	513.45	(82)
Rooflights	0.9x	1	x	17.25	x	110.42	x	0.7	x	0.7	=	839.98	(82)
Rooflights	0.9x	1	x	17.25	x	161.6	x	0.7	x	0.7	=	1229.3	(82)
Rooflights	0.9x	1	x	17.25	x	199.64	x	0.7	x	0.7	=	1518.7	(82)
Rooflights	0.9x	1	x	17.25	x	205.33	x	0.7	x	0.7	=	1562	(82)
Rooflights	0.9x	1	x	17.25	x	195.07	x	0.7	x	0.7	=	1483.94	(82)
Rooflights	0.9x	1	x	17.25	x	166.3	x	0.7	x	0.7	=	1265.09	(82)
Rooflights	0.9x	1	x	17.25	x	128.45	x	0.7	x	0.7	=	977.16	(82)
Rooflights	0.9x	1	x	17.25	x	79.79	x	0.7	x	0.7	=	607.01	(82)
Rooflights	0.9x	1	x	17.25	x	43.34	x	0.7	x	0.7	=	329.68	(82)
Rooflights	0.9x	1	x	17.25	x	28.81	x	0.7	x	0.7	=	219.15	(82)

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

(83)m=	761.66	1326.22	1875.3	2399.44	2738.06	2735.46	2630.48	2378.54	2058.67	1483.65	917.93	647.97	(83)

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

(84)m=	1305.44	1867.74	2399.26	2894.72	3203.55	3172.73	3049.7	2804.35	2499.45	1953.36	1420.92	1176.56	(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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	1	0.99	0.93	0.78	0.58	0.41	0.29	0.33	0.55	0.89	0.99	1	(86)

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

(87)m=	20.04	20.34	20.66	20.91	20.98	21	21	21	20.99	20.83	20.36	19.98	(87)

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

(88)m=	19.69	19.69	19.7	19.71	19.71	19.72	19.72	19.72	19.71	19.71	19.7	19.7	(88)

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

(89)m=	1	0.98	0.9	0.72	0.51	0.33	0.21	0.24	0.45	0.83	0.99	1	(89)

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

(90)m=	18.46	18.89	19.34	19.62	19.7	19.71	19.72	19.72	19.71	19.56	18.93	18.39	(90)

fLA = Living area ÷ (4) = 0.44 (91)

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

(92)m=	19.15	19.53	19.92	20.19	20.26	20.28	20.28	20.28	20.27	20.11	19.56	19.09	(92)

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

(93)m=	19	19.38	19.77	20.04	20.11	20.13	20.13	20.13	20.12	19.96	19.41	18.94	(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=	1	0.98	0.9	0.74	0.53	0.35	0.23	0.27	0.49	0.85	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	1300.32	1822.2	2170.73	2132.5	1696.64	1118.32	714.65	754.2	1214.28	1653.82	1399.92	1173.9	(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=	3039.7	2987.24	2733.13	2275.54	1716.22	1119.73	714.74	754.41	1223.03	1910.56	2518.86	3025.62	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	1294.1	782.91	418.43	102.99	14.56	0	0	0	0	191.02	805.64	1377.68	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 4987.32 (98)

Space heating requirement in kWh/m²/year 36.02 (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 91.8 (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)													
	1294.1	782.91	418.43	102.99	14.56	0	0	0	0	191.02	805.64	1377.68	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	1409.69	852.84	455.8	112.19	15.86	0	0	0	0	208.08	877.6	1500.74	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 5432.81 (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)

	212.04	186.69	195.59	174.68	170.71	151.85	145.19	160.21	160.21	181.17	192.39	206.72	

Efficiency of water heater 80.1 (216)

(217)m=	89.95	89.29	87.72	84.07	80.91	80.1	80.1	80.1	80.1	85.71	89.29	90.08	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	235.73	209.09	222.98	207.77	210.98	189.58	181.26	200.01	200.01	211.38	215.48	229.47	

Total = Sum(219a)$_{1...12}$ = 2513.74 (219)

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Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		5432.81	
Water heating fuel used		2513.74	
Electricity for pumps, fans and electric keep-hot			
central heating pump:	120		(230c)
oil boiler pump	100		(230d)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	220	(231)
Electricity for lighting		484.36	(232)

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	0.298	=	1618.98	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.298	=	749.09	(264)
Space and water heating	(261) + (262) + (263) + (264) =				2368.07	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	114.18	(267)
Electricity for lighting	(232)	x	0.519	=	251.38	(268)
Total CO2, kg/year	sum of (265)…(271) =				2733.63	(272)
Dwelling CO2 Emission Rate	(272) ÷ (4) =				19.74	(273)
EI rating (section 14)					80	(274)

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SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 08 February 2019

Property Details: 8470 - Adjacent to Scaleber Farm

Dwelling type:	Detached Bungalow
Located in:	England
Region:	West Pennines
Cross ventilation possible:	Yes
Number of storeys:	1
Front of dwelling faces:	South
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Calculated 394.67
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:	566.54	**(P1)**
Transmission heat loss coefficient:	126.6	
Summer heat loss coefficient:	693.15	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
South (Window South)	0	1
South (Roof Lights)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
South (Window South)	1	0.9	1	0.9	**(P8)**
South (Roof Lights)	1	1	1	1	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
South (Window South)	0.9 x	31.26	106.3	0.7	0.7	0.9	1318.84	
	1 x	17.25	191.97	0.7	0.7	1	1460.39	
						Total	2779.23	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	598.48	574.89	584.5	
Total summer gains	3576.06	3354.11	3069.29	**(P5)**
Summer gain/loss ratio	5.16	4.84	4.43	**(P6)**
Mean summer external temperature (West Pennines)	14.7	16.4	16.3	
Thermal mass temperature increment	0	0	0	
Threshold temperature	19.86	21.24	20.73	**(P7)**
Likelihood of high internal temperature	**Not significant**	**Slight**	**Slight**	

Assessment of likelihood of high internal temperature: Slight