

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.23
Printed on 26 February 2020 at 15:55:11

Project Information:

Assessed By: Matthew Stainrod (STRO023501)

Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 71.43m²

Site Reference : Tye Green

Plot Reference: 08-19-79354 Plot 153 - Type E

Address : Plot 153 - Type E, Tye Green

Client Details:

Name: Countryside Properties

Address : Countryside House, The Drive, Brentwood, CM13 3AT

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) 18.52 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 16.23 kg/m²

OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 48.0 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 39.7 kWh/m²

OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.24 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.16 (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 455, product index 018203): Boiler systems with radiators or underfloor heating - mains gas Brand name: Potterton Model: Assure Model qualifier: 25 Combi (Combi) Efficiency 89.0 % 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

Continuous extract system (decentralised)
 Specific fan power: 0.19 0.18
 Maximum 0.7 **OK**

9 Summertime temperature

Overheating risk (East Anglia): Slight **OK**

Based on:

Overshading: Average or unknown
 Windows facing: West 2.81m²
 Windows facing: East 5.09m²
 Ventilation rate: 3.00
 Blinds/curtains: Dark-coloured curtain or roller blind
 Closed 100% of daylight hours

10 Key features

Doors U-value 1 W/m²K
 Roofs U-value 0.11 W/m²K
 Party Walls U-value 0 W/m²K

Predicted Energy Assessment



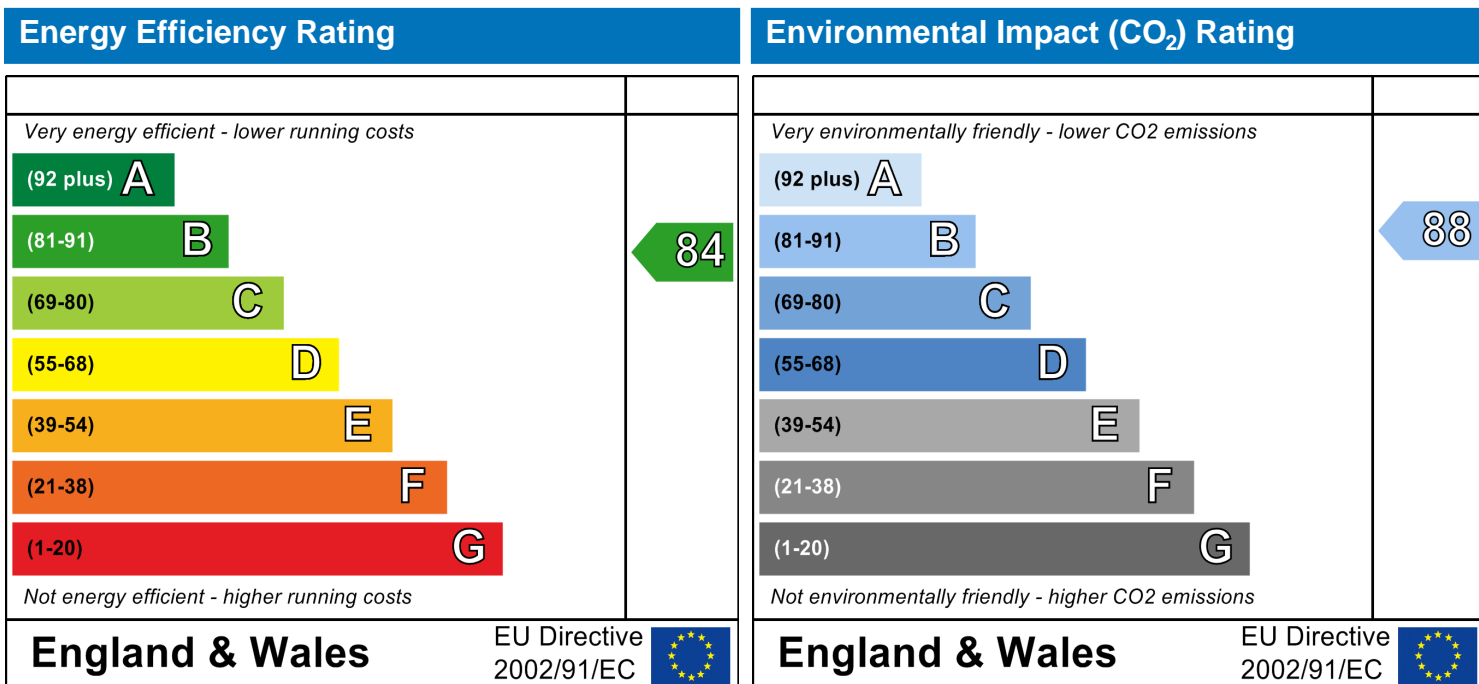
Plot 153 - Type E
Tye Green

Dwelling type:
Date of assessment:
Produced by:
Total floor area:

Top floor Flat
20 February 2020
Matthew Stainrod
71.43 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.

Property Details: 08-19-79354 Plot 153 - Type E

Address: Plot 153 - Type E, Tye Green
 Located in: England
 Region: East Anglia
 UPRN:
 Date of assessment: 20 February 2020
 Date of certificate: 26 February 2020
 Assessment type: New dwelling design stage
 Transaction type: New dwelling
 Tenure type: Unknown
 Related party disclosure: No related party
 Thermal Mass Parameter: Calculated 139.03
 Water use <= 125 litres/person/day: True
 PCDF Version: 455

Property description:

Dwelling type: Flat
 Detachment:
 Year Completed: 2020
 Floor Location: Floor area: Storey height:
 Basement floor 71.43 m² 2.39 m
 Living area: 26.1 m² (fraction 0.365)
 Front of dwelling faces: West

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
Front	Manufacturer	Solid			Wood
Side	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	PVC-U
Side	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	PVC-U

Name:	Gap:	Frame Factor:	g-value:	U-value:	Area:	No. of Openings:
Front	mm	0.7	0	1	2.08	1
Side	16mm or more	0.7	0.63	1.2	2.81	1
Side	16mm or more	0.7	0.63	1.2	5.09	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
Front		Communal Wall	West	0	0
Side		External Wall	West	0	0
Side		External Wall	East	0	0

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	61.42	7.9	53.52	0.21	0	False	60
Communal Wall	7.53	2.08	5.45	0.27	0.43	False	60
Roof - flat ceiling	71.43	0	71.43	0.11	0		9
<u>Internal Elements</u>							
Timber	148.18						9
<u>Party Elements</u>							
Wall	14.17						110
Floor	71.43						40

Thermal bridges:

SAP Input

Thermal bridges:	User-defined (individual PSI-values) Y-Value = 0.0449			
	Length	Psi-value		
[Approved]	6.81	0.3	E2	Other lintels (including other steel lintels)
	4.43	0.022	E3	Sill
	17.28	0.02	E4	Jamb
	28.85	0.04	E7	Party floor between dwellings (in blocks of flats)
[Approved]	25.7	0.06	E10	Eaves (insulation at ceiling level)
	3.15	0.06	E12	Gable (insulation at ceiling level)
	7.17	0.048	E16	Corner (normal)
	2.39	0.04	E18	Party wall between dwellings
	5.93	0	P3	Intermediate floor between dwellings (in blocks of flats)
	5.93	0.083	P4	Roof (insulation at ceiling level)

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Decentralised whole house extract
	Number of fans in Wetroom: Kitchen 1 Other 1
	Ductwork: ,
	Approved Installation Scheme: False
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	1
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 455, product index 018203) Efficiency: Winter 86.7 % Summer: 89.9
	Brand name: Potterton
	Model: Assure
	Model qualifier: 25 Combi
	(Combi boiler)
	Systems with radiators
	Central heating pump : 2013 or later
	Design flow temperature: Design flow temperature >45°C
	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
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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

SAP Input

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: Matthew Stainrod **Stroma Number:** STRO023501
Software Name: Stroma FSAP 2012 **Software Version:** Version: 1.0.4.23

Property Address: 08-19-79354 Plot 153 - Type E

Address : Plot 153 - Type E, Tye Green

1. Overall dwelling dimensions:

	Area(m ²)	Av. Height(m)	Volume(m ³)
Basement	<input type="text" value="71.43"/> (1a) x	<input type="text" value="2.39"/> (2a) =	<input type="text" value="170.72"/> (3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	<input type="text" value="71.43"/> (4)		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	<input type="text" value="170.72"/> (5)

2. Ventilation rate:

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/> x 40 =	<input type="text" value="0"/> (6a)
Number of open flues	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/> x 20 =	<input type="text" value="0"/> (6b)
Number of intermittent fans				<input type="text" value="0"/> x 10 =	<input type="text" value="0"/> (7a)
Number of passive vents				<input type="text" value="0"/> x 10 =	<input type="text" value="0"/> (7b)
Number of flueless gas fires				<input type="text" value="0"/> x 40 =	<input type="text" value="0"/> (7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	<input type="text" value="0"/>	÷ (5) =	<input type="text" value="0"/> (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)			<input type="text" value="0"/> (9)
Additional infiltration		[(9)-1]x0.1 =	<input type="text" value="0"/> (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction <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>			<input type="text" value="0"/> (11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			<input type="text" value="0"/> (12)
If no draught lobby, enter 0.05, else enter 0			<input type="text" value="0"/> (13)
Percentage of windows and doors draught stripped			<input type="text" value="0"/> (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =		<input type="text" value="0"/> (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =		<input type="text" value="0"/> (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area			<input type="text" value="5"/> (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			<input type="text" value="0.25"/> (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			<input type="text" value="1"/> (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		<input type="text" value="0.92"/> (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =		<input type="text" value="0.23"/> (21)

Infiltration rate modified for monthly wind speed

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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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

0.29	0.29	0.28	0.25	0.25	0.22	0.22	0.21	0.23	0.25	0.26	0.27
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Calculate effective air change rate for the applicable case

If mechanical ventilation:

0.5 (23a)

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

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

(24c)m= 0.54 0.54 0.53 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.51 0.52 (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 0 0 0 0 0 0 0 0 0 0 0 (24d)

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

(25)m= 0.54 0.54 0.53 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.51 0.52 (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			2.08	x 1	= 2.08		(26)
Windows Type 1			2.81	x 1/[1/(1.2)+ 0.04]	= 3.22		(27)
Windows Type 2			5.09	x 1/[1/(1.2)+ 0.04]	= 5.83		(27)
Walls Type1	61.42	7.9	53.52	x 0.21	= 11.24	60	3211.2 (29)
Walls Type2	7.53	2.08	5.45	x 0.24	= 1.32	60	327 (29)
Roof	71.43	0	71.43	x 0.11	= 7.86	9	642.87 (30)
Total area of elements, m²			140.38				(31)
Party wall			14.17	x 0	= 0	110	1558.7 (32)
Party floor			71.43			40	2857.2 (32a)
Internal wall **			148.18			9	1333.62 (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) = 31.54 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 9930.59 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 139.03 (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 6.3 (36)

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

Total fabric heat loss (33) + (36) = 37.84 (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
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SAP WorkSheet: New dwelling design stage

(38)m=

30.69	30.37	30.04	28.41	28.17	28.17	28.17	28.17	28.17	28.17	28.74	29.39
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 (38)

Heat transfer coefficient, W/K

(39)m = (37) + (38)m

(39)m=

68.54	68.21	67.89	66.26	66.01	66.01	66.01	66.01	66.01	66.01	66.58	67.24
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Average = Sum(39)_{1...12} / 12 =

66.73 (39)

Heat loss parameter (HLP), W/m²K

(40)m = (39)m ÷ (4)

(40)m=

0.96	0.95	0.95	0.93	0.92	0.92	0.92	0.92	0.92	0.92	0.93	0.94
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Average = Sum(40)_{1...12} / 12 =

0.93 (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

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

2.28 (42)

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

88.36 (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
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Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

(44)m=

97.19	93.66	90.13	86.59	83.06	79.52	79.52	83.06	86.59	90.13	93.66	97.19
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Total = Sum(44)_{1...12} =

1060.3 (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=

144.14	126.06	130.08	113.41	108.82	93.9	87.02	99.85	101.04	117.76	128.54	139.59
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Total = Sum(45)_{1...12} =

1390.21 (45)

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

(46)m=

21.62	18.91	19.51	17.01	16.32	14.09	13.05	14.98	15.16	17.66	19.28	20.94
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 (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:

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) 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 × (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
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 (59)

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

(61)m=

14.55	13.13	14.53	14.06	14.52	14.05	14.51	14.52	14.05	14.53	14.07	14.54
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 (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=

158.68	139.2	144.62	127.47	123.34	107.95	101.53	114.37	115.1	132.29	142.61	154.13
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 (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
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 (63)

Output from water heater

(64)m=

158.68	139.2	144.62	127.47	123.34	107.95	101.53	114.37	115.1	132.29	142.61	154.13
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Output from water heater (annual)_{1...12} 1561.28 (64)

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

(65)m=

51.56	45.2	46.89	41.22	39.81	34.73	32.56	36.83	37.11	42.79	46.26	50.05
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 (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
136.82	136.82	136.82	136.82	136.82	136.82	136.82	136.82	136.82	136.82	136.82	136.82

 (66)

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

(67)m=

50.53	44.88	36.5	27.63	20.65	17.44	18.84	24.49	32.87	41.74	48.71	51.93
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 (67)

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

(68)m=

299.42	302.53	294.7	278.03	256.99	237.21	224	220.89	228.72	245.39	266.43	286.21
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 (68)

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

(69)m=

50.96	50.96	50.96	50.96	50.96	50.96	50.96	50.96	50.96	50.96	50.96	50.96
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 (69)

Pumps and fans gains (Table 5a)

(70)m=

3	3	3	3	3	3	3	3	3	3	3	3
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 (70)

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

(71)m=

-91.21	-91.21	-91.21	-91.21	-91.21	-91.21	-91.21	-91.21	-91.21	-91.21	-91.21	-91.21
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

 (71)

Water heating gains (Table 5)

(72)m=

69.3	67.26	63.02	57.25	53.51	48.24	43.76	49.5	51.54	57.51	64.25	67.27
------	-------	-------	-------	-------	-------	-------	------	-------	-------	-------	-------

 (72)

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

(73)m=

518.82	514.23	493.78	462.48	430.72	402.46	386.18	394.46	412.71	444.21	478.96	504.98
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

 (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)						
East	0.9x <table border="1" style="display: inline-table;"><tr><td>0.77</td></tr></table>	0.77	x <table border="1" style="display: inline-table;"><tr><td>5.09</td></tr></table>	5.09	x <table border="1" style="display: inline-table;"><tr><td>19.64</td></tr></table>	19.64	x <table border="1" style="display: inline-table;"><tr><td>0.63</td></tr></table>	0.63	x <table border="1" style="display: inline-table;"><tr><td>0.7</td></tr></table>	0.7	= <table border="1" style="display: inline-table;"><tr><td>30.55</td></tr></table> (76)	30.55
0.77												
5.09												
19.64												
0.63												
0.7												
30.55												
East	0.9x <table border="1" style="display: inline-table;"><tr><td>0.77</td></tr></table>	0.77	x <table border="1" style="display: inline-table;"><tr><td>5.09</td></tr></table>	5.09	x <table border="1" style="display: inline-table;"><tr><td>38.42</td></tr></table>	38.42	x <table border="1" style="display: inline-table;"><tr><td>0.63</td></tr></table>	0.63	x <table border="1" style="display: inline-table;"><tr><td>0.7</td></tr></table>	0.7	= <table border="1" style="display: inline-table;"><tr><td>59.77</td></tr></table> (76)	59.77
0.77												
5.09												
38.42												
0.63												
0.7												
59.77												

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East	0.9x	0.77	x	5.09	x	63.27	x	0.63	x	0.7	=	98.43	(76)
East	0.9x	0.77	x	5.09	x	92.28	x	0.63	x	0.7	=	143.55	(76)
East	0.9x	0.77	x	5.09	x	113.09	x	0.63	x	0.7	=	175.92	(76)
East	0.9x	0.77	x	5.09	x	115.77	x	0.63	x	0.7	=	180.09	(76)
East	0.9x	0.77	x	5.09	x	110.22	x	0.63	x	0.7	=	171.45	(76)
East	0.9x	0.77	x	5.09	x	94.68	x	0.63	x	0.7	=	147.27	(76)
East	0.9x	0.77	x	5.09	x	73.59	x	0.63	x	0.7	=	114.47	(76)
East	0.9x	0.77	x	5.09	x	45.59	x	0.63	x	0.7	=	70.92	(76)
East	0.9x	0.77	x	5.09	x	24.49	x	0.63	x	0.7	=	38.09	(76)
East	0.9x	0.77	x	5.09	x	16.15	x	0.63	x	0.7	=	25.12	(76)
West	0.9x	0.77	x	2.81	x	19.64	x	0.63	x	0.7	=	16.87	(80)
West	0.9x	0.77	x	2.81	x	38.42	x	0.63	x	0.7	=	32.99	(80)
West	0.9x	0.77	x	2.81	x	63.27	x	0.63	x	0.7	=	54.34	(80)
West	0.9x	0.77	x	2.81	x	92.28	x	0.63	x	0.7	=	79.25	(80)
West	0.9x	0.77	x	2.81	x	113.09	x	0.63	x	0.7	=	97.12	(80)
West	0.9x	0.77	x	2.81	x	115.77	x	0.63	x	0.7	=	99.42	(80)
West	0.9x	0.77	x	2.81	x	110.22	x	0.63	x	0.7	=	94.65	(80)
West	0.9x	0.77	x	2.81	x	94.68	x	0.63	x	0.7	=	81.31	(80)
West	0.9x	0.77	x	2.81	x	73.59	x	0.63	x	0.7	=	63.2	(80)
West	0.9x	0.77	x	2.81	x	45.59	x	0.63	x	0.7	=	39.15	(80)
West	0.9x	0.77	x	2.81	x	24.49	x	0.63	x	0.7	=	21.03	(80)
West	0.9x	0.77	x	2.81	x	16.15	x	0.63	x	0.7	=	13.87	(80)

Solar gains in watts, calculated for each month

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

(83)m=	47.42	92.76	152.76	222.8	273.04	279.51	266.1	228.58	177.67	110.07	59.13	38.99	(83)
--------	-------	-------	--------	-------	--------	--------	-------	--------	--------	--------	-------	-------	------

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

(84)m=	566.24	606.99	646.55	685.28	703.77	681.97	652.28	623.04	590.38	554.28	538.09	543.97	(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

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=	0.96	0.95	0.92	0.85	0.73	0.58	0.43	0.47	0.68	0.87	0.94	0.97	(86)

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

(87)m=	19.71	19.88	20.16	20.52	20.79	20.94	20.98	20.98	20.88	20.55	20.1	19.7	(87)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------	------	------

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

(88)m=	20.12	20.12	20.12	20.14	20.15	20.15	20.15	20.15	20.15	20.15	20.14	20.13	(88)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

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

(89)m=	0.95	0.94	0.9	0.82	0.69	0.51	0.35	0.39	0.62	0.84	0.93	0.96	(89)
--------	------	------	-----	------	------	------	------	------	------	------	------	------	------

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

(90)m=	18.41	18.65	19.05	19.57	19.92	20.09	20.14	20.13	20.04	19.62	18.98	18.4	(90)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------	------

fLA = Living area ÷ (4) =

0.37

Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$

(92)m=	18.89	19.1	19.46	19.92	20.24	20.4	20.45	20.44	20.35	19.96	19.39	18.88	(92)
--------	-------	------	-------	-------	-------	------	-------	-------	-------	-------	-------	-------	------

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

(93)m=	18.74	18.95	19.31	19.77	20.09	20.25	20.3	20.29	20.2	19.81	19.24	18.73	(93)
--------	-------	-------	-------	-------	-------	-------	------	-------	------	-------	-------	-------	------

8. Space heating requirement

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

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

Utilisation factor for gains, hm :

(94)m=	0.94	0.92	0.89	0.81	0.69	0.52	0.37	0.4	0.62	0.83	0.92	0.95	(94)
--------	------	------	------	------	------	------	------	-----	------	------	------	------	------

Useful gains, $hmGm$, $W = (94)m \times (84)m$

(95)m=	532.8	560.38	573.07	554.89	483.95	354.83	240.28	251.51	366.66	457.88	492.59	515.08	(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 , $W = [(39)m \times ((93)m - (96)m)]$

(97)m=	989.59	958.26	869.35	720.1	553.72	373.07	244	256.86	402.38	608.18	808.09	976.62	(97)
--------	--------	--------	--------	-------	--------	--------	-----	--------	--------	--------	--------	--------	------

Space heating requirement for each month, $kWh/month = 0.024 \times [(97)m - (95)m] \times (41)m$

(98)m=	339.85	267.38	220.43	118.95	51.91	0	0	0	0	111.82	227.16	343.38	
Total per year ($kWh/year$) = $Sum(98)_{1...5,9...12} =$												1680.9	(98)

Space heating requirement in $kWh/m^2/year$

23.53	(99)
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9a. Energy requirements – Individual heating systems including micro-CHP

Space heating:

Fraction of space heat from secondary/supplementary system

0	(201)
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Fraction of space heat from main system(s)

$$(202) = 1 - (201) =$$

1	(202)
---	-------

Fraction of total heating from main system 1

$$(204) = (202) \times [1 - (203)] =$$

1	(204)
---	-------

Efficiency of main space heating system 1

89.9	(206)
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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)

339.85	267.38	220.43	118.95	51.91	0	0	0	0	111.82	227.16	343.38
--------	--------	--------	--------	-------	---	---	---	---	--------	--------	--------

$$(211)m = \{[(98)m \times (204)]\} \times 100 \div (206)$$

378.03	297.42	245.2	132.32	57.74	0	0	0	0	124.39	252.68	381.96
--------	--------	-------	--------	-------	---	---	---	---	--------	--------	--------

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

1869.74	(211)
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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
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$$Total (kWh/year) = Sum(215)_{1...5,10...12} =$$

0	(215)
---	-------

Water heating

Output from water heater (calculated above)

158.68	139.2	144.62	127.47	123.34	107.95	101.53	114.37	115.1	132.29	142.61	154.13
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Efficiency of water heater

86.7	(216)
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(217)m=	88.86	88.78	88.6	88.22	87.62	86.7	86.7	86.7	86.7	88.14	88.64	88.88	(217)
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Fuel for water heating, $kWh/month$

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

(219)m=	178.58	156.79	163.22	144.5	140.76	124.51	117.1	131.91	132.75	150.09	160.89	173.41
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$$Total = Sum(219a)_{1...12} =$$

1774.52	(219)
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SAP WorkSheet: New dwelling design stage

Annual totals

	kWh/year	kWh/year
Space heating fuel used, main system 1		1869.74
Water heating fuel used		1774.52
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	50.41	(230a)
central heating pump:	30	(230c)
boiler with a fan-assisted flue	45	(230e)
Total electricity for the above, kWh/year	sum of (230a)...(230g) =	125.41 (231)
Electricity for lighting		356.93 (232)

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 = 65.07 (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 = 61.75 (247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 = 16.54 (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 = 47.08 (250)
Additional standing charges (Table 12)			120 (251)
Appendix Q items: repeat lines (253) and (254) as needed			
Total energy cost	(245)...(247) + (250)...(254) =		310.44 (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] =	1.12 (257)
SAP rating (Section 12)		84.38 (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	= 403.86 (261)
Space heating (secondary)	(215) x	0.519	= 0 (263)
Water heating	(219) x	0.216	= 383.3 (264)
Space and water heating	(261) + (262) + (263) + (264) =		787.16 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	= 65.09 (267)
Electricity for lighting	(232) x	0.519	= 185.25 (268)
Total CO2, kg/year		sum of (265)...(271) =	1037.49 (272)

SAP WorkSheet: New dwelling design stage

CO2 emissions per m²

(272) ÷ (4) =

14.52

(273)

El 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	=	2281.08	(261)
Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	1.22	=	2164.91	(264)
Space and water heating	(261) + (262) + (263) + (264) =			4445.99	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	385.02	(267)
Electricity for lighting	(232) x	0	=	1095.77	(268)
'Total Primary Energy		sum of (265)...(271) =		5926.77	(272)
Primary energy kWh/m²/year		(272) ÷ (4) =		82.97	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 26 February 2020

Property Details: 08-19-79354 Plot 153 - Type E

Dwelling type:	Flat
Located in:	England
Region:	East Anglia
Cross ventilation possible:	Yes
Number of storeys:	1
Front of dwelling faces:	West
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Calculated 139.03
Night ventilation:	False
Blinds, curtains, shutters:	Dark-coloured curtain or roller blind
Ventilation rate during hot weather (ach):	3 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	169.01	(P1)
Transmission heat loss coefficient:	37.8	
Summer heat loss coefficient:	206.85	(P2)

Overhangs:

Orientation:	Ratio:	Z_overhangs:
West (Side)	0	1
East (Side)	0	1

Solar shading:

Orientation:	Z blinds:	Solar access:	Overhangs:	Z summer:	
West (Side)	0.85	0.9	1	0.76	(P8)
East (Side)	0.85	0.9	1	0.76	(P8)

Solar gains:

Orientation		Area	Flux	g_	FF	Shading	Gains
West (Side)	0.9 x	2.81	119.47	0.63	0.7	0.76	101.93
East (Side)	0.9 x	5.09	119.47	0.63	0.7	0.76	184.64
Total							286.57 (P3/P4)

Internal gains:

	June	July	August
Internal gains	399.46	383.18	391.46
Total summer gains	703.34	669.75	640.01 (P5)
Summer gain/loss ratio	3.4	3.24	3.09 (P6)
Mean summer external temperature (East Anglia)	15.4	17.6	17.6
Thermal mass temperature increment	1.03	1.03	1.03
Threshold temperature	19.83	21.86	21.72 (P7)
Likelihood of high internal temperature	Not significant	Slight	Slight

Assessment of likelihood of high internal temperature: Slight