



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 2 Haines Crescent, West End
Southampton, SO30 3LG

Contact: Tobias Whiting
Abacus Energy (UK) Ltd
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Report Issue Date: 30/03/2022

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Plot 85			Issued on Date	30/03/2022
Assessment Reference	As Built	Prop Type Ref	H (H/A - A/R)		
Property	2 Haines Crescent, West End, Southampton, SO30 3LG				
SAP Rating	86 B	DER	14.65	TER	18.14
Environmental	89 B	% DER<TER	19.23		
CO ₂ Emissions (t/year)	0.93	DFEE	43.34	TFEE	52.07
General Requirements Compliance	Pass	% DFEE<TFEE	16.75		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com			Assessor ID	E477-0001
Client	Foreman Homes, FORE				

SUMMARY FOR INPUT DATA FOR New Build (As Built)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	18.14	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.65	kgCO ₂ /m ²	Pass
	-3.49 (-19.2%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	52.07	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	43.34	kWh/m ² /yr	
	-8.8 (-16.9%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	Pass
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	Pass
Openings	1.19 (max. 2.00)	1.20 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.99 (measured in this dwelling)	m ³ /(h.m ²) @ 50 Pa	
Maximum	10.0	m ³ /(h.m ²) @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

This report has been produced by an accredited Elmhurst member whose work is subject to quality assurance audits. The data used to produce the report has been verified by the Elmhurst members' portal.

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Main heating system

Boiler system with radiators or underfloor - Mains gas
Data from database
Worcester Greenstar 30Si Compact ErP
Combi boiler
Efficiency: 89.8% SEDBUK2009
Minimum: 88.0%

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100 %

Minimum

75 %

Pass

8 Mechanical ventilation

Continuous extract system

Specific fan power

0.30

Maximum

0.7

Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing East

4.65 m², No overhang

Windows facing South

1.92 m², No overhang

Windows facing West

7.40 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

3.99 (measured in this dwelling) m³/(h.m²) @ 50 Pa

Maximum

10.0 m³/(h.m²) @ 50 Pa

Pass

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BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

10 Key features

Party wall U-value	0.00	W/m ² K
Roof U-value	0.10	W/m ² K
Floor U-value	0.12	W/m ² K
Door U-value	1.10	W/m ² K
Air permeability	4.0	m ³ /m ² h
Photovoltaic array	0.64	kW

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THERMAL BRIDGING

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SAP Rating	86 B	DER	14.65	TER	18.14
Environmental	89 B	% DER<TER	19.23		
CO ₂ Emissions (t/year)	0.93	DFEE	43.34	TFEE	52.07
General Requirements Compliance	Pass	% DFEE<TFEE	16.75		

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Client	Foreman Homes, FORE
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	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.053	12.04	0.64	CD0025
External wall	E3 Sill	Independently assessed	0.034	9.52	0.32	CD0027
External wall	E4 Jamb	Independently assessed	0.039	28.50	1.11	CD0028
External wall	E5 Ground floor (normal)	Independently assessed	0.060	18.37	1.10	CBA -302
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	18.37	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	9.70	0.58	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.054	8.78	0.47	CD0031
External wall	E16 Corner (normal)	Independently assessed	0.050	10.10	0.51	CD0035
External wall	E18 Party wall between dwellings	Table K1 - Approved	0.060	10.10	0.61	
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.160	8.78	1.40	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	8.78	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Table K1 - Default	0.240	8.78	2.11	

Total: **8.85** W/mK:
Y-Value: **0.050** W/m²K:

FULL SAP CALCULATION PRINTOUT

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Calculation Type: New Build (As Built)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

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DWELLING AS BUILT

Semi-Detached House, total floor area 84 m²

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:Mains gas

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 18.14 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 14.65 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 52.1 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE) 43.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (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	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.19 (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: 3.99 (measured in this dwelling)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas

Data from database

Worcester Greenstar 30Si Compact ErP

Combi boiler

Efficiency: 89.8% SEDBUK2009

Minimum: 88.0% OK

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls:

No cylinder

Boiler interlock

Yes

OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%

Minimum 75% OK

8 Mechanical ventilation

Continuous extract system

Specific fan power: 0.30

Maximum 0.7 OK

9 Summertime temperature

Overheating risk (Southern England): Slight OK

Based on:

Overshading: Average

Windows facing East: 4.65 m², No overhang

Windows facing South: 1.92 m², No overhang

Windows facing West: 7.40 m², No overhang

Air change rate: 4.00 ach

Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K

Roof U-value 0.10 W/m²K

Floor U-value 0.12 W/m²K

Door U-value 1.10 W/m²K

Air permeability 4.0 m³/m²h

Photovoltaic array 0.64 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.1100 (1b)	x 2.3900 (2b)	= 100.6429 (1b) - (3b)
First floor	42.1100 (1c)	x 2.6700 (2c)	= 112.4337 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.0766 (5)

2. Ventilation rate

					main heating	secondary heating	other		total	m3 per hour		
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000 (8)
Pressure test											Yes	
Measured/design AP50											3.9900	
Infiltration rate											0.1995 (18)	
Number of sides sheltered											1 (19)	
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1845 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
	0.2353	0.2307	0.2261	0.2030	0.1984	0.1753	0.1753	0.1707	0.1845	0.1984	0.2076	0.2168 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			13.9700	1.1450	15.9962		(27)
Ground Floor			42.1100	0.1200	5.0532	84.0000	3537.2400 (28a)
Brick and Block	92.9500	16.0900	76.8600	0.2400	18.4464	42.2200	3245.0292 (29a)
Pitched Roof	42.1100		42.1100	0.1000	4.2110	9.1000	383.2010 (30)
Total net area of external elements Aum(A, m ²)			177.1700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.0388		(33)
Party Wall 1			44.3400	0.0000	0.0000	70.0000	3103.8000 (32)
GF Stud			74.8900			9.0000	674.0100 (32c)
First Floor			86.6000			9.0000	779.4000 (32c)
Internal Floor 1			42.1100			18.0000	757.9800 (32d)
Internal Ceiling 1			42.1100			18.0000	757.9800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13238.6402 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							157.1912 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.8546 (36)
Total fabric heat loss						(33) + (36) =	54.8934 (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	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576 (38)
Heat transfer coeff	90.0510	90.0510	90.0510	90.0510	90.0510	90.0510	90.0510	90.0510	90.0510	90.0510	90.0510	90.0510 (39)
Average = Sum(39)m / 12 =												90.0510 (39)
HLP	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692 (40)
HLP (average)												1.0692 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5381 (42)
Average daily hot water use (litres/day) 94.4792 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy conte	103.9272	100.1480	96.3688	92.5897	88.8105	85.0313	85.0313	88.8105	92.5897	96.3688	100.1480	103.9272 (44)
Energy content (annual)	154.1210	134.7952	139.0966	121.2678	116.3593	100.4092	93.0439	106.7692	108.0444	125.9153	137.4464	149.2579 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1181	20.2193	20.8645	18.1902	17.4539	15.0614	13.9566	16.0154	16.2067	18.8873	20.6170	22.3887 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	31.2429	28.2110	31.2048	30.1650	31.1464	30.1139	31.1004	31.1303	30.1418	31.1806	30.2128	31.2337 (61)
Total heat required for water heating calculated for each month	185.3639	163.0062	170.3013	151.4328	147.5057	130.5231	124.1443	137.8995	138.1862	157.0960	167.6593	180.4916 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	185.3639	163.0062	170.3013	151.4328	147.5057	130.5231	124.1443	137.8995	138.1862	157.0960	167.6593	180.4916 (64)
Heat gains from water heating, kWh/month	59.0560	51.8722	54.0508	47.8628	46.4761	40.9145	38.7122	43.2833	43.4602	49.6620	53.2542	57.4367 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.0623	18.7073	15.2138	11.5178	8.6097	7.2687	7.8541	10.2090	13.7025	17.3985	20.3066	21.6477 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.0339	230.4002	224.4373	211.7429	195.7184	180.6578	170.5963	168.2300	174.1930	186.8874	202.9118	217.9725 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229 (71)
Water heating gains (Table 5)	79.3763	77.1907	72.6489	66.4761	62.4678	56.8258	52.0325	58.1765	60.3614	66.7500	73.9641	77.1998 (72)
Total internal gains	392.5436	390.3693	376.3711	353.8079	330.8671	308.8233	294.5540	300.6867	312.3280	335.1070	361.2536	380.8911 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
East				4.6500	19.6403	0.6300	0.7000	0.7700	27.9108 (76)			
South				1.9200	46.7521	0.6300	0.7000	0.7700	27.4330 (78)			
West				7.4000	19.6403	0.6300	0.7000	0.7700	44.4172 (80)			
Solar gains	99.7610	186.4171	290.2426	404.5170	483.8831	491.2076	469.2727	410.2064	330.7867	216.3477	122.7020	83.1837 (83)
Total gains	492.3046	576.7864	666.6136	758.3249	814.7502	800.0309	763.8267	710.8931	643.1146	551.4547	483.9556	464.0747 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	40.8368	40.8368	40.8368	40.8368	40.8368	40.8368	40.8368	40.8368	40.8368	40.8368	40.8368	40.8368
alpha	3.7225	3.7225	3.7225	3.7225	3.7225	3.7225	3.7225	3.7225	3.7225	3.7225	3.7225	3.7225
util living area	0.9894	0.9803	0.9582	0.9037	0.7990	0.6449	0.4960	0.5474	0.7745	0.9376	0.9820	0.9914 (86)
MIT	19.3611	19.5744	19.9249	20.3483	20.6993	20.9027	20.9720	20.9595	20.8013	20.3239	19.7484	19.3031 (87)
Th 2	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260 (88)
util rest of house	0.9871	0.9761	0.9490	0.8822	0.7543	0.5687	0.3956	0.4452	0.7094	0.9191	0.9774	0.9896 (89)
MIT 2	18.5267	18.7379	19.0824	19.4894	19.8081	19.9718	20.0157	20.0099	19.9012	19.4748	18.9122	18.4691 (90)
Living area fraction	18.7063	18.9180	19.2638	19.6743	20.0000	20.1722	20.2216	20.2143	20.0950	19.6576	19.0922	0.2153 (91)
MIT	18.7063	18.9180	19.2638	19.6743	20.0000	20.1722	20.2216	20.2143	20.0950	19.6576	19.0922	18.6486 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7063	18.9180	19.2638	19.6743	20.0000	20.1722	20.2216	20.2143	20.0950	19.6576	19.0922	18.6486 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	483.9284	559.3870	626.7180	662.0847	613.5114	464.7425	318.1200	331.2506	459.5211	502.0736	470.1845	457.5925 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1297.3041	1262.3342	1149.3925	970.2366	747.4225	501.7850	326.1295	343.4845	539.8541	815.6443	1079.9121	1301.1145 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	605.1515	472.3806	388.8699	221.8694	99.6298	0.0000	0.0000	0.0000	0.0000	233.2965	439.0039	627.5804 (98)
Space heating												3087.7819 (98)
Space heating per m2												36.6633 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)											
Fraction of space heat from main system(s)	1.0000 (202)											
Efficiency of main space heating system 1 (in %)	90.7000 (206)											
Efficiency of secondary/supplementary heating system, %	0.0000 (208)											
Space heating requirement	3404.3902 (211)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	605.1515	472.3806	388.8699	221.8694	99.6298	0.0000	0.0000	0.0000	0.0000	233.2965	439.0039	627.5804 (98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000 (210)
Space heating fuel (main heating system)	667.2012	520.8165	428.7430	244.6189	109.8454	0.0000	0.0000	0.0000	0.0000	257.2178	484.0175	691.9299 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	185.3639	163.0062	170.3013	151.4328	147.5057	130.5231	124.1443	137.8995	138.1862	157.0960	167.6593	180.4916 (64)
Efficiency of water heater (217)m	89.8044	89.7211	89.5402	89.1618	88.4547	87.0000	87.0000	87.0000	87.0000	89.1739	89.6464	89.8465 (217)
Fuel for water heating, kWh/month	206.4084	181.6811	190.1953	169.8405	166.7585	150.0266	142.6946	158.5052	158.8347	176.1681	187.0230	200.8888 (219)
Water heating fuel used												2089.0248 (219)
Annual totals kWh/year												
Space heating fuel - main system												3404.3902 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.4200)												
mechanical ventilation fans (SFP = 0.4200)												109.1804 (230a)
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												184.1804 (231)
Electricity for lighting (calculated in Appendix L)												371.9662 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 + 0.64 + 908 + 1.00) =												-464.8214 (233)
Total delivered energy for all uses												5584.7403 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3404.3902	0.2160	735.3483 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2089.0248	0.2160	451.2294 (264)
Space and water heating			1186.5776 (265)
Pumps and fans	184.1804	0.5190	95.5897 (267)
Energy for lighting	371.9662	0.5190	193.0504 (268)
Energy saving/generation technologies			
PV Unit	-464.8214	0.5190	-241.2423 (269)
Total CO2, kg/year			1233.9755 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.6500 (273)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		14.6500 ZC1
Total Floor Area	TFA	84.2200
Assumed number of occupants	N	2.5381
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.0447 ZC2
CO2 emissions from cooking, equation (L16)		2.1362 ZC3
Total CO2 emissions		32.8309 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		32.8309 ZC8

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.1100 (1b)	x 2.3900 (2b)	= 100.6429 (1b) - (3b)
First floor	42.1100 (1c)	x 2.6700 (2c)	= 112.4337 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.0766 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1408 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3908 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3615 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4609	0.4519	0.4428	0.3976	0.3886	0.3434	0.3434	0.3344	0.3615	0.3886	0.4067	0.4247 (22b)
Effective ac	0.6062	0.6021	0.5980	0.5791	0.5755	0.5590	0.5590	0.5559	0.5653	0.5755	0.5827	0.5902 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.40)			13.9700	1.3258	18.5208		(27)
Ground Floor			42.1100	0.1300	5.4743		(28a)
Brick and Block	92.9500	16.0900	76.8600	0.1800	13.8348		(29a)
Pitched Roof	42.1100		42.1100	0.1300	5.4743		(30)
Total net area of external elements Aum(A, m ²)			177.1700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.4242		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.8220 (36)
Total fabric heat loss						(33) + (36) =	55.2462 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	42.6259	42.3359	42.0517	40.7165	40.4667	39.3038	39.3038
Heat transfer coeff	97.8721	97.5821	97.2979	95.9627	95.7129	94.5500	94.5500
Average = Sum(39)m / 12 =							
HLP	1.1621	1.1587	1.1553	1.1394	1.1365	1.1227	1.1227
HLP (average)							
Days in month	31	28	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5381 (42)
Average daily hot water use (litres/day)												94.4792 (43)
Daily hot water use	103.9272	100.1480	96.3688	92.5897	88.8105	85.0313	85.0313	88.8105	92.5897	96.3688	100.1480	103.9272 (44)
Energy conte	154.1210	134.7952	139.0966	121.2678	116.3593	100.4092	93.0439	106.7692	108.0444	125.9153	137.4464	149.2579 (45)
Energy content (annual)										Total = Sum(45)m =		1486.5263 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1181	20.2193	20.8645	18.1902	17.4539	15.0614	13.9566	16.0154	16.2067	18.8873	20.6170	22.3887 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

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Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Total heat required for water heating calculated for each month	50.9589	46.0274	49.1085	45.6606	45.2568	41.9332	43.3310	45.2568	45.6606	49.1085	49.3151	50.9589 (61)
Solar input	205.0799	180.8226	188.2051	166.9284	161.6161	142.3425	136.3749	152.0261	153.7051	175.0238	186.7615	200.2168 (62)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	205.0799	180.8226	188.2051	166.9284	161.6161	142.3425	136.3749	152.0261	153.7051	175.0238	186.7615	200.2168 (64)
Heat gains from water heating, kWh/month	63.9850	56.3262	58.5267	51.7367	50.0037	43.8694	41.7699	46.8150	47.3399	54.1440	58.0297	62.3680 (65)

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	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.0623	18.7073	15.2138	11.5178	8.6097	7.2687	7.8541	10.2090	13.7025	17.3985	20.3066	21.6477	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.0339	230.4002	224.4373	211.7429	195.7184	180.6578	170.5963	168.2300	174.1930	186.8874	202.9118	217.9725	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	(71)
Water heating gains (Table 5)	86.0013	83.8188	78.6650	71.8565	67.2092	60.9297	56.1423	62.9234	65.7499	72.7742	80.5968	83.8279	(72)
Total internal gains	399.1686	396.9974	382.3871	359.1883	335.6085	312.9272	298.6637	305.4335	317.7165	341.1311	367.8863	387.5192	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d			Gains W	
East				4.6500	19.6403	0.6300	0.7000	0.7700			27.9108 (76)	
South				1.9200	46.7521	0.6300	0.7000	0.7700			27.4330 (78)	
West				7.4000	19.6403	0.6300	0.7000	0.7700			44.4172 (80)	
Solar gains	99.7610	186.4171	290.2426	404.5170	483.8831	491.2076	469.2727	410.2064	330.7867	216.3477	122.7020	83.1837 (83)
Total gains	498.9296	583.4145	672.6297	763.7053	819.4916	804.1349	767.9364	715.6399	648.5031	557.4789	490.5883	470.7028 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.7577	59.9353	60.1104	60.9467	61.1058	61.8573	61.8573	61.9985	61.5656	61.1058	60.7848	60.4529	
alpha	4.9838	4.9957	5.0074	5.0631	5.0737	5.1238	5.1238	5.1332	5.1044	5.0737	5.0523	5.0302	
util living area	0.9981	0.9955	0.9870	0.9555	0.8679	0.6999	0.5307	0.5872	0.8406	0.9761	0.9960	0.9986	(86)
MIT	19.7355	19.8975	20.1679	20.5179	20.8000	20.9526	20.9905	20.9846	20.8765	20.4955	20.0522	19.7114	(87)
Th 2	19.9504	19.9532	19.9559	19.9688	19.9712	19.9824	19.9824	19.9845	19.9781	19.9712	19.9663	19.9612	(88)
util rest of house	0.9975	0.9940	0.9824	0.9388	0.8206	0.6091	0.4137	0.4671	0.7680	0.9641	0.9944	0.9981	(89)
MIT 2	18.2652	18.5035	18.8978	19.4039	19.7760	19.9511	19.9789	19.9781	19.8790	19.3826	18.7394	18.2377	(90)
Living area fraction	18.5817	18.8036	19.1712	19.6437	19.9964	20.1667	20.1967	20.1948	20.0937	19.6222	19.0220	0.2153	(91)
MIT	18.5817	18.8036	19.1712	19.6437	19.9964	20.1667	20.1967	20.1948	20.0937	19.6222	19.0220	18.5549	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5817	18.8036	19.1712	19.6437	19.9964	20.1667	20.1967	20.1948	20.0937	19.6222	19.0220	18.5549	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	497.0353	578.4761	657.5245	711.9947	673.5583	503.9305	337.1298	352.7981	504.1518	534.4095	486.7232	469.3539	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1397.7843	1356.7414	1232.8847	1030.9959	794.0771	526.3274	340.0669	357.9818	569.3940	863.5392	1147.1157	1388.7917	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	670.1572	522.9943	428.0680	229.6809	89.6660	0.0000	0.0000	0.0000	0.0000	244.8725	475.4826	684.0617	(98)
Space heating												3344.9832	(98)
Space heating per m2												39.7172	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												93.4000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												3581.3525 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	670.1572	522.9943	428.0680	229.6809	89.6660	0.0000	0.0000	0.0000	0.0000	244.8725	475.4826	684.0617 (98)
Space heating efficiency (main heating system 1)	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000 (210)
Space heating fuel (main heating system)	717.5131	559.9511	458.3169	245.9110	96.0022	0.0000	0.0000	0.0000	0.0000	262.1761	509.0821	732.4001 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	205.0799	180.8226	188.2051	166.9284	161.6161	142.3425	136.3749	152.0261	153.7051	175.0238	186.7615	200.2168 (64)
Efficiency of water heater	87.8120	87.5702	87.0560	85.8550	83.6343	80.3000	80.3000	80.3000	80.3000	85.8966	87.3033	80.3000 (216)
(217)m	87.8120	87.5702	87.0560	85.8550	83.6343	80.3000	80.3000	80.3000	80.3000	85.8966	87.3033	87.8968 (217)
Fuel for water heating, kWh/month	233.5441	206.4887	216.1884	194.4307	193.2415	177.2634	169.8318	189.3227	191.4135	203.7610	213.9227	227.7862 (219)
Water heating fuel used												2417.1947 (219)
Annual totals kWh/year												
Space heating fuel - main system												3581.3525 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												75.0000 (231)
Electricity for lighting (calculated in Appendix L)												371.9662 (232)
Total delivered energy for all uses												6445.5134 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3581.3525	0.2160	773.5721 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2417.1947	0.2160	522.1141 (264)
Space and water heating			1295.6862 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	371.9662	0.5190	193.0504 (268)
Total CO2, kg/m2/year			1527.6616 (272)
Emissions per m2 for space and water heating			15.3845 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.2922 (272b)
Emissions per m2 for pumps and fans			0.4622 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.3845 * 1.00) + 2.2922 + 0.4622, rounded to 2 d.p.			18.1400 (273)

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Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.1100 (1b)	x 2.3900 (2b)	= 100.6429 (1b) - (3b)
First floor	42.1100 (1c)	x 2.6700 (2c)	= 112.4337 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.0766 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1408 (8)
Pressure test					Yes
Measured/design AP50					3.9900
Infiltration rate					0.3403 (18)
Number of sides sheltered					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3148 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4013	0.3935	0.3856	0.3462	0.3384	0.2990	0.2990	0.2912	0.3148	0.3384	0.3541	0.3699 (22b)
Effective ac	0.5805	0.5774	0.5743	0.5599	0.5573	0.5447	0.5447	0.5424	0.5495	0.5573	0.5627	0.5684 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			13.9700	1.1450	15.9962		(27)
Ground Floor			42.1100	0.1200	5.0532	84.0000	3537.2400 (28a)
Brick and Block	92.9500	16.0900	76.8600	0.2400	18.4464	42.2200	3245.0292 (29a)
Pitched Roof	42.1100		42.1100	0.1000	4.2110	9.1000	383.2010 (30)
Total net area of external elements Aum(A, m ²)			177.1700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.0388		(33)
Party Wall 1			44.3400	0.0000	0.0000	70.0000	3103.8000 (32)
GF Stud			74.8900			9.0000	674.0100 (32c)
First Floor			86.6000			9.0000	779.4000 (32c)
Internal Floor 1			42.1100			18.0000	757.9800 (32d)
Internal Ceiling 1			42.1100			9.0000	378.9900 (32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			12859.6502 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							152.6912 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.8546 (36)
Total fabric heat loss						(33) + (36) =	54.8934 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	40.8205	40.6006	40.3850	39.3726	39.1832	38.3015	38.3015	38.1382	38.6411	39.1832	39.5664	39.9670 (38)
Average = Sum(39)m / 12 =	95.7139	95.4940	95.2784	94.2660	94.0766	93.1949	93.1949	93.0316	93.5345	94.0766	94.4598	94.8604 (39)
												94.2651 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1365	1.1339	1.1313	1.1193	1.1170	1.1066	1.1066	1.1046	1.1106	1.1170	1.1216	1.1263 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5381 (42)
Average daily hot water use (litres/day)												94.4792 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	103.9272	100.1480	96.3688	92.5897	88.8105	85.0313	85.0313	88.8105	92.5897	96.3688	100.1480	103.9272 (44)
Energy conte	154.1210	134.7952	139.0966	121.2678	116.3593	100.4092	93.0439	106.7692	108.0444	125.9153	137.4464	149.2579 (45)
Energy content (annual)										Total = Sum(45)m =		1486.5263 (45)

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Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	32.7507	28.6440	29.5580	25.7694	24.7264	21.3370	19.7718	22.6885	22.9594	26.7570	29.2074	31.7173 (65)

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	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.0623	18.7073	15.2138	11.5178	8.6097	7.2687	7.8541	10.2090	13.7025	17.3985	20.3066	21.6477	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.0339	230.4002	224.4373	211.7429	195.7184	180.6578	170.5963	168.2300	174.1930	186.8874	202.9118	217.9725	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	(71)
Water heating gains (Table 5)	44.0198	42.6250	39.7285	35.7908	33.2343	29.6347	26.5750	30.4952	31.8881	35.9637	40.5658	42.6308	(72)
Total internal gains	354.1871	352.8036	340.4507	320.1226	298.6336	278.6322	266.0965	270.0054	280.8547	301.3207	324.8553	343.3220	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g Specific data or Table 6c	FF	Access factor Table 6d	Gains W
East	4.6500	19.6403	0.6300	0.7000	0.7700	27.9108	(76)
South	1.9200	46.7521	0.6300	0.7000	0.7700	27.4330	(78)
West	7.4000	19.6403	0.6300	0.7000	0.7700	44.4172	(80)

Solar gains	99.7610	186.4171	290.2426	404.5170	483.8831	491.2076	469.2727	410.2064	330.7867	216.3477	122.7020	83.1837	(83)
Total gains	453.9480	539.2206	630.6932	724.6396	782.5167	769.8398	735.3692	680.2118	611.6413	517.6684	447.5572	426.5057	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	37.3209	37.4068	37.4914	37.8941	37.9704	38.3296	38.3296	38.3969	38.1904	37.9704	37.8163	37.6566	
alpha	3.4881	3.4938	3.4994	3.5263	3.5314	3.5553	3.5553	3.5598	3.5460	3.5314	3.5211	3.5104	
util living area	0.9911	0.9832	0.9640	0.9155	0.8206	0.6723	0.5244	0.5781	0.8005	0.9473	0.9850	0.9928	(86)
MIT	19.1434	19.3705	19.7478	20.2251	20.6218	20.8715	20.9602	20.9435	20.7464	20.2071	19.5846	19.1032	(87)
Th 2	19.9712	19.9733	19.9753	19.9851	19.9869	19.9955	19.9955	19.9971	19.9922	19.9869	19.9832	19.9794	(88)
util rest of house	0.9892	0.9795	0.9559	0.8958	0.7779	0.5950	0.4178	0.4711	0.7377	0.9311	0.9811	0.9913	(89)
MIT 2	18.2723	18.4992	18.8730	19.3424	19.7092	19.9225	19.9805	19.9740	19.8296	19.3352	18.7209	18.2385	(90)
Living area fraction	18.4598	18.6868	19.0613	19.5324	19.9057	20.1268	20.1914	20.1827	20.0270	19.5229	18.9068	18.4246	(91)
Temperature adjustment												0.0000	(92)
adjusted MIT	18.4598	18.6868	19.0613	19.5324	19.9057	20.1268	20.1914	20.1827	20.0270	19.5229	18.9068	18.4246	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	447.2467	524.8847	597.1076	641.5404	605.6633	466.4304	323.2769	334.7971	452.7406	477.1393	436.6204	421.3603	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1355.2929	1316.5551	1196.8200	1002.2730	771.9621	515.0665	334.6993	351.9074	554.3760	839.4383	1115.2692	1349.3547	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	675.5864	532.0025	446.1861	259.7274	123.7263	0.0000	0.0000	0.0000	0.0000	269.5504	488.6272	690.4279	(98)
Space heating												3485.8341	(98)
Space heating per m2												41.3896	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	876.0319	689.6421	707.0401	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8273	0.8864	0.8606	0.0000	0.0000	0.0000	0.0000	(101)

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Calculation Type: New Build (As Built)

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Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	724.7395	611.3276	608.4770	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	995.1116	952.8600	890.0974	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	194.6679	254.1001	209.5256	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												658.2936 (104)
Cooled fraction									FC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	48.6670	63.5250	52.3814	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												164.5734 (107)
Space cooling per m2												1.9541 (108)
Energy for space heating												41.3896 (99)
Energy for space cooling												1.9541 (108)
Total												43.3437 (109)
Dwelling Fabric Energy Efficiency (DFEE)												43.3 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.1100 (1b)	x 2.3900 (2b)	= 100.6429 (1b) - (3b)
First floor	42.1100 (1c)	x 2.6700 (2c)	= 112.4337 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.0766 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																3 * 10 =	30.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
										Air changes per hour							
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000	/ (5) =	0.1408 (8)
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.3908 (18)							
Number of sides sheltered										1 (19)							
Shelter factor										(20) = 1 - [0.075 x (19)] =					0.9250 (20)		
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =					0.3615 (21)		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)				
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)				
Adj infilt rate	0.4609	0.4519	0.4428	0.3976	0.3886	0.3434	0.3434	0.3344	0.3615	0.3886	0.4067	0.4247	(22b)				
Effective ac	0.6062	0.6021	0.5980	0.5791	0.5755	0.5590	0.5590	0.5559	0.5653	0.5755	0.5827	0.5902	(25)				

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.1200	1.0000	2.1200		(26)					
TER Opening Type (Uw = 1.40)			13.9700	1.3258	18.5208		(27)					
Ground Floor			42.1100	0.1300	5.4743		(28a)					
Brick and Block	92.9500	16.0900	76.8600	0.1800	13.8348		(29a)					
Pitched Roof	42.1100		42.1100	0.1300	5.4743		(30)					
Total net area of external elements Aum(A, m2)			177.1700				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.4242		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.8220 (36)					
Total fabric heat loss						(33) + (36) =	55.2462 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 42.6259	Feb 42.3359	Mar 42.0517	Apr 40.7165	May 40.4667	Jun 39.3038	Jul 39.3038	Aug 39.0885	Sep 39.7517	Oct 40.4667	Nov 40.9720	Dec 41.5004 (38)
Heat transfer coeff	97.8721	97.5821	97.2979	95.9627	95.7129	94.5500	94.5500	94.3347	94.9980	95.7129	96.2183	96.7466 (39)
Average = Sum(39)m / 12 =												95.9615 (39)
HLP	Jan 1.1621	Feb 1.1587	Mar 1.1553	Apr 1.1394	May 1.1365	Jun 1.1227	Jul 1.1227	Aug 1.1201	Sep 1.1280	Oct 1.1365	Nov 1.1425	Dec 1.1487 (40)
HLP (average)												1.1394 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5381 (42)
Average daily hot water use (litres/day)												94.4792 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	103.9272	100.1480	96.3688	92.5897	88.8105	85.0313	85.0313	88.8105	92.5897	96.3688	100.1480	103.9272 (44)
Energy conte	154.1210	134.7952	139.0966	121.2678	116.3593	100.4092	93.0439	106.7692	108.0444	125.9153	137.4464	149.2579 (45)
Energy content (annual)											Total = Sum(45)m =	1486.5263 (45)
Distribution loss	(46)m = 0.15 x (45)m											
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

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CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	32.7507	28.6440	29.5580	25.7694	24.7264	21.3370	19.7718	22.6885	22.9594	26.7570	29.2074	31.7173 (65)

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	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.0623	18.7073	15.2138	11.5178	8.6097	7.2687	7.8541	10.2090	13.7025	17.3985	20.3066	21.6477	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.0339	230.4002	224.4373	211.7429	195.7184	180.6578	170.5963	168.2300	174.1930	186.8874	202.9118	217.9725	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	(71)
Water heating gains (Table 5)	44.0198	42.6250	39.7285	35.7908	33.2343	29.6347	26.5750	30.4952	31.8881	35.9637	40.5658	42.6308	(72)
Total internal gains	354.1871	352.8036	340.4507	320.1226	298.6336	278.6322	266.0965	270.0054	280.8547	301.3207	324.8553	343.3220	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
East				4.6500	19.6403	0.6300	0.7000	0.7700	27.9108 (76)			
South				1.9200	46.7521	0.6300	0.7000	0.7700	27.4330 (78)			
West				7.4000	19.6403	0.6300	0.7000	0.7700	44.4172 (80)			
Solar gains	99.7610	186.4171	290.2426	404.5170	483.8831	491.2076	469.2727	410.2064	330.7867	216.3477	122.7020	83.1837 (83)
Total gains	453.9480	539.2206	630.6932	724.6396	782.5167	769.8398	735.3692	680.2118	611.6413	517.6684	447.5572	426.5057 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil, m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.7577	59.9353	60.1104	60.9467	61.1058	61.8573	61.8573	61.9985	61.5656	61.1058	60.7848	60.4529	
alpha	4.9838	4.9957	5.0074	5.0631	5.0737	5.1238	5.1238	5.1332	5.1044	5.0737	5.0523	5.0302	
util living area	0.9988	0.9969	0.9901	0.9634	0.8842	0.7225	0.5520	0.6134	0.8637	0.9823	0.9974	0.9991	(86)
MIT	19.6859	19.8493	20.1239	20.4826	20.7784	20.9452	20.9887	20.9813	20.8576	20.4557	20.0050	19.6624	(87)
Th 2	19.9504	19.9532	19.9559	19.9688	19.9712	19.9824	19.9824	19.9845	19.9781	19.9712	19.9663	19.9612	(88)
util rest of house	0.9984	0.9958	0.9865	0.9492	0.8402	0.6319	0.4314	0.4901	0.7959	0.9730	0.9963	0.9988	(89)
MIT 2	18.7504	18.9156	19.1905	19.5505	19.8211	19.9572	19.9795	19.9791	19.8979	19.5316	19.0818	18.7356	(90)
Living area fraction									fLA = Living area / (4) =			0.2153	(91)
MIT	18.9518	19.1166	19.3914	19.7511	20.0272	20.1699	20.1968	20.1948	20.1045	19.7305	19.2805	18.9351	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9518	19.1166	19.3914	19.7511	20.0272	20.1699	20.1968	20.1948	20.1045	19.7305	19.2805	18.9351	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9978	0.9945	0.9838	0.9454	0.8429	0.6498	0.4576	0.5169	0.8057	0.9702	0.9952	0.9984	(94)
Ext temp.	452.9422	536.2741	620.5017	685.1004	659.6069	500.2759	336.5284	351.5748	492.7870	502.2183	445.4146	425.8143	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1433.9987	1387.2825	1254.3096	1041.3039	797.0203	526.6324	340.0744	357.9854	570.4129	873.9078	1171.9905	1425.5718	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	(98a)
Space heating kWh	729.9060	571.8776	471.5531	256.4665	102.2356	0.0000	0.0000	0.0000	0.0000	276.5370	523.1347	743.8196	(98)
Space heating												3675.5301	(98)
Space heating per m2										(98) / (4) =		43.6420	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	888.7704	699.6703	716.9437	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8801	0.9357	0.9128	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	782.2039	654.6877	654.4120	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	995.1116	952.8600	890.0974	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	153.2935	221.8402	175.3499	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												550.4837	(104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Cooled fraction											FC = cooled area / (4) =	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	38.3234	55.4601	43.8375	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												137.6209 (107)
Space cooling per m2												1.6341 (108)
Energy for space heating												43.6420 (99)
Energy for space cooling												1.6341 (108)
Total												45.2761 (109)
Target Fabric Energy Efficiency (TFEE)												52.1 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
CALCULATION OF HEAT DEMAND 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.1100 (1b)	x 2.3900 (2b)	= 100.6429 (1b) - (3b)
First floor	42.1100 (1c)	x 2.6700 (2c)	= 112.4337 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.0766 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.9900
Infiltration rate					0.1995 (18)
Number of sides sheltered					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.1845 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate	0.2168	0.2030	0.2030	0.1845	0.1892	0.1799	0.1799	0.1753	0.1753	0.1892	0.1845	0.1892 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			13.9700	1.1450	15.9962		(27)
Ground Floor			42.1100	0.1200	5.0532	84.0000	3537.2400 (28a)
Brick and Block	92.9500	16.0900	76.8600	0.2400	18.4464	42.2200	3245.0292 (29a)
Pitched Roof	42.1100		42.1100	0.1000	4.2110	9.1000	383.2010 (30)
Total net area of external elements Aum(A, m ²)			177.1700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.0388		(33)
Party Wall 1			44.3400	0.0000	0.0000	70.0000	3103.8000 (32)
GF Stud			74.8900			9.0000	674.0100 (32c)
First Floor			86.6000			9.0000	779.4000 (32c)
Internal Floor 1			42.1100			18.0000	757.9800 (32d)
Internal Ceiling 1			42.1100			18.0000	757.9800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13238.6402 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							157.1912 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.8546 (36)
Total fabric heat loss						(33) + (36) =	54.8934 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576 (38)
Average = Sum(39)m / 12 =	90.0510	90.0510	90.0510	90.0510	90.0510	90.0510	90.0510	90.0510	90.0510	90.0510	90.0510	90.0510 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5381 (42)
Average daily hot water use (litres/day)												94.4792 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Energy conte	103.9272	100.1480	96.3688	92.5897	88.8105	85.0313	85.0313	88.8105	92.5897	96.3688	100.1480	103.9272 (44)
Energy content (annual)	154.1210	134.7952	139.0966	121.2678	116.3593	100.4092	93.0439	106.7692	108.0444	125.9153	137.4464	149.2579 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1181	20.2193	20.8645	18.1902	17.4539	15.0614	13.9566	16.0154	16.2067	18.8873	20.6170	22.3887 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	31.2429	28.2110	31.2048	30.1650	31.1464	30.1139	31.1004	31.1303	30.1418	31.1806	30.2128	31.2337 (61)
Total heat required for water heating calculated for each month	185.3639	163.0062	170.3013	151.4328	147.5057	130.5231	124.1443	137.8995	138.1862	157.0960	167.6593	180.4916 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	185.3639	163.0062	170.3013	151.4328	147.5057	130.5231	124.1443	137.8995	138.1862	157.0960	167.6593	180.4916 (64)
RHI water heating demand	59.0560	51.8722	54.0508	47.8628	46.4761	40.9145	38.7122	43.2833	43.4602	49.6620	53.2542	57.4367 (65)
Heat gains from water heating, kWh/month												
	59.0560	51.8722	54.0508	47.8628	46.4761	40.9145	38.7122	43.2833	43.4602	49.6620	53.2542	57.4367 (65)

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	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	52.6557	46.7683	38.0345	28.7946	21.5243	18.1717	19.6352	25.5225	34.2563	43.4963	50.7665	54.1191 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.3491	343.8809	334.9810	316.0341	292.1171	269.6384	254.6213	251.0896	259.9895	278.9364	302.8534	325.3320 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229 (71)
Water heating gains (Table 5)	79.3763	77.1907	72.6489	66.4761	62.4678	56.8258	52.0325	58.1765	60.3614	66.7500	73.9641	77.1998 (72)
Total internal gains	578.9091	574.3679	552.1924	517.8328	482.6372	451.1639	432.8170	441.3166	461.1352	495.7106	534.1120	563.1790 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
East				4.6500	25.1733		0.6300	0.7000	0.7700		35.7737 (76)	
South				1.9200	56.5862		0.6300	0.7000	0.7700		33.2035 (78)	
West				7.4000	25.1733		0.6300	0.7000	0.7700		56.9302 (80)	

Solar gains	125.9074	200.3825	317.4661	443.4279	498.4772	559.6738	513.8067	469.0755	378.5200	250.9403	154.3978	99.3503 (83)
Total gains	704.8165	774.7504	869.6585	961.2606	981.1144	1010.8377	946.6237	910.3921	839.6552	746.6509	688.5099	662.5293 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	40.8368	40.8368	40.8368	40.8368	40.8368	40.8368	40.8368	40.8368	40.8368	40.8368	40.8368	40.8368
alpha	3.7225	3.7225	3.7225	3.7225	3.7225	3.7225	3.7225	3.7225	3.7225	3.7225	3.7225	3.7225
util living area	0.9587	0.9419	0.8952	0.7964	0.6479	0.4409	0.3110	0.3135	0.5611	0.8152	0.9294	0.9649 (86)
MIT	19.8538	19.9990	20.3098	20.6518	20.8780	20.9780	20.9956	20.9956	20.9465	20.6893	20.2316	19.8096 (87)
Th 2	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260 (88)
util rest of house	0.9503	0.9304	0.8747	0.7587	0.5871	0.3619	0.2206	0.2196	0.4770	0.7701	0.9128	0.9575 (89)
MIT 2	19.0116	19.1520	19.4485	19.7608	19.9492	20.0168	20.0251	20.0251	20.0002	19.8024	19.3805	18.9691 (90)
Living area fraction	19.1929	19.3344	19.6339	19.9526	20.1491	20.2237	20.2340	20.2340	20.2039	19.9933	19.5637	19.1500 (91)
Temperature adjustment												0.0000
adjusted MIT	19.1929	19.3344	19.6339	19.9526	20.1491	20.2237	20.2340	20.2340	20.2039	19.9933	19.5637	19.1500 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9413	0.9205	0.8653	0.7556	0.5952	0.3783	0.2401	0.2398	0.4931	0.7684	0.9033	0.9491 (94)
Ext temp.	663.4588	713.1788	752.4770	726.3116	583.9699	382.4144	227.3201	218.3571	414.0238	573.7536	621.9024	628.8089 (95)
Heat loss rate W	5.6000	6.0000	7.6000	10.1000	13.1000	15.9000	17.7000	17.8000	15.4000	12.1000	8.6000	5.7000 (96)
Month fracti	1224.0586	1200.7722	1083.6690	887.2381	634.7797	389.3580	228.1891	219.1883	432.5969	710.8031	987.2939	1211.1875 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating	417.0863	327.6628	246.4069	115.8671	37.8026	0.0000	0.0000	0.0000	0.0000	101.9648	263.0819	433.2897 (98)
RHI space heating demand												1943.1619 (98)
												1943 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
CALCULATION OF ENERGY RATINGS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.1100 (1b)	x 2.3900 (2b)	= 100.6429 (1b) - (3b)
First floor	42.1100 (1c)	x 2.6700 (2c)	= 112.4337 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.0766 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.9900
Infiltration rate					0.1995 (18)
Number of sides sheltered					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.1845 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.2353	0.2307	0.2261	0.2030	0.1984	0.1753	0.1753	0.1707	0.1845	0.1984	0.2076	0.2168 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			13.9700	1.1450	15.9962		(27)
Ground Floor			42.1100	0.1200	5.0532	84.0000	3537.2400 (28a)
Brick and Block	92.9500	16.0900	76.8600	0.2400	18.4464	42.2200	3245.0292 (29a)
Pitched Roof	42.1100		42.1100	0.1000	4.2110	9.1000	383.2010 (30)
Total net area of external elements Aum(A, m ²)			177.1700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.0388		(33)
Party Wall 1			44.3400	0.0000	0.0000	70.0000	3103.8000 (32)
GF Stud			74.8900			9.0000	674.0100 (32c)
First Floor			86.6000			9.0000	779.4000 (32c)
Internal Floor 1			42.1100			18.0000	757.9800 (32d)
Internal Ceiling 1			42.1100			18.0000	757.9800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13238.6402 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							157.1912 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.8546 (36)
Total fabric heat loss						(33) + (36) =	54.8934 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576 (38)
Average = Sum(39)m / 12 =	90.0510	90.0510	90.0510	90.0510	90.0510	90.0510	90.0510	90.0510	90.0510	90.0510	90.0510	90.0510 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5381 (42)
Average daily hot water use (litres/day)												94.4792 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Energy conte	103.9272	100.1480	96.3688	92.5897	88.8105	85.0313	85.0313	88.8105	92.5897	96.3688	100.1480	103.9272 (44)
Energy content (annual)	154.1210	134.7952	139.0966	121.2678	116.3593	100.4092	93.0439	106.7692	108.0444	125.9153	137.4464	149.2579 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1486.5263 (45)
	23.1181	20.2193	20.8645	18.1902	17.4539	15.0614	13.9566	16.0154	16.2067	18.8873	20.6170	22.3887 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	31.2429	28.2110	31.2048	30.1650	31.1464	30.1139	31.1004	31.1303	30.1418	31.1806	30.2128	31.2337 (61)
Total heat required for water heating calculated for each month	185.3639	163.0062	170.3013	151.4328	147.5057	130.5231	124.1443	137.8995	138.1862	157.0960	167.6593	180.4916 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
								Solar input (sum of months) =	Sum (63)m =			0.0000 (63)
Output from w/h	185.3639	163.0062	170.3013	151.4328	147.5057	130.5231	124.1443	137.8995	138.1862	157.0960	167.6593	180.4916 (64)
Heat gains from water heating, kWh/month	59.0560	51.8722	54.0508	47.8628	46.4761	40.9145	38.7122	43.2833	43.4602	49.6620	53.2542	57.4367 (65)
										Total per year (kWh/year) =	Sum (64)m =	1853.6100 (64)

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
	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	52.6557	46.7683	38.0345	28.7946	21.5243	18.1717	19.6352	25.5225	34.2563	43.4963	50.7665	54.1191 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.3491	343.8809	334.9810	316.0341	292.1171	269.6384	254.6213	251.0896	259.9895	278.9364	302.8534	325.3320 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229 (71)
Water heating gains (Table 5)	79.3763	77.1907	72.6489	66.4761	62.4678	56.8258	52.0325	58.1765	60.3614	66.7500	73.9641	77.1998 (72)
Total internal gains	578.9091	574.3679	552.1924	517.8328	482.6372	451.1639	432.8170	441.3166	461.1352	495.7106	534.1120	563.1790 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
East				4.6500	19.6403	0.6300	0.7000	0.7700	27.9108 (76)			
South				1.9200	46.7521	0.6300	0.7000	0.7700	27.4330 (78)			
West				7.4000	19.6403	0.6300	0.7000	0.7700	44.4172 (80)			
Solar gains	99.7610	186.4171	290.2426	404.5170	483.8831	491.2076	469.2727	410.2064	330.7867	216.3477	122.7020	83.1837 (83)
Total gains	678.6700	760.7849	842.4350	922.3498	966.5202	942.3715	902.0897	851.5231	791.9218	712.0584	656.8140	646.3626 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	40.8368	40.8368	40.8368	40.8368	40.8368	40.8368	40.8368	40.8368	40.8368	40.8368	40.8368	40.8368
util living area	3.7225	3.7225	3.7225	3.7225	3.7225	3.7225	3.7225	3.7225	3.7225	3.7225	3.7225	3.7225
	0.9709	0.9548	0.9205	0.8485	0.7285	0.5693	0.4275	0.4688	0.6842	0.8809	0.9548	0.9754 (86)
MIT	19.6381	19.8339	20.1453	20.5051	20.7850	20.9359	20.9829	20.9757	20.8718	20.5015	19.9932	19.5777 (87)
Th 2	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260 (88)
util rest of house	0.9652	0.9461	0.9052	0.8196	0.6790	0.4958	0.3378	0.3767	0.6140	0.8514	0.9445	0.9705 (89)
MIT 2	18.7993	18.9906	19.2919	19.6295	19.8753	19.9916	20.0200	20.0168	19.9497	19.6350	19.1497	18.7400 (90)
Living area fraction	18.9798	19.1721	19.4756	19.8180	20.0711	20.1949	20.2273	20.2232	20.1482	19.8216	19.3313	18.9203 (91)
MIT												0.0000
Temperature adjustment	18.9798	19.1721	19.4756	19.8180	20.0711	20.1949	20.2273	20.2232	20.1482	19.8216	19.3313	18.9203 (93)
adjusted MIT												

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9575	0.9367	0.8951	0.8127	0.6814	0.5091	0.3568	0.3959	0.6235	0.8442	0.9355	0.9634 (94)
Ext temp.	649.8268	712.6511	754.0263	749.5546	658.6196	479.7825	321.8505	337.1389	493.7388	601.1442	614.4241	622.7144 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Month fracti	1321.9356	1285.2202	1168.4678	983.1793	753.8278	503.8235	326.6384	344.2846	544.6425	830.4115	1101.4426	1325.5791 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating	500.0490	384.7664	308.3445	168.2098	70.8349	0.0000	0.0000	0.0000	0.0000	170.5749	350.6533	522.9314 (98)
Space heating per m2												2476.3641 (98)
										(98) / (4) =		29.4035 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2730.2801 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	500.0490	384.7664	308.3445	168.2098	70.8349	0.0000	0.0000	0.0000	0.0000	170.5749	350.6533	522.9314	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	551.3219	424.2188	339.9608	185.4573	78.0980	0.0000	0.0000	0.0000	0.0000	188.0649	386.6078	576.5506	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement													
Efficiency of water heater (217)m	185.3639	163.0062	170.3013	151.4328	147.5057	130.5231	124.1443	137.8995	138.1862	157.0960	167.6593	180.4916	(64)
Fuel for water heating, kWh/month	89.6687	89.5665	89.3480	88.9086	88.1668	87.0000	87.0000	87.0000	87.0000	88.8876	89.4692	89.7209	(216)
Water heating fuel used	206.7209	181.9947	190.6045	170.3240	167.3030	150.0266	142.6946	158.5052	158.8347	176.7355	187.3933	201.1700	(219)
Annual totals kWh/year												2092.3070	(219)
Space heating fuel - main system												2730.2801	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.4200)													
mechanical ventilation fans (SFP = 0.4200)												109.1804	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												184.1804	(231)
Electricity for lighting (calculated in Appendix L)												371.9662	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.64 * 908 * 1.00) =										-464.8214		-464.8214	(233)
Total delivered energy for all uses												4913.9124	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2730.2801	3.4800	95.0137 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2092.3070	3.4800	72.8123 (247)
Mechanical ventilation fans	109.1804	13.1900	14.4009 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	371.9662	13.1900	49.0623 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-464.8214	13.1900	-61.3099 (252)
Total energy cost			299.8718 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.4200	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9747 (257)
SAP value	86.4034	
SAP rating (Section 12)	86	(258)
SAP band	B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2730.2801	0.2160	589.7405 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2092.3070	0.2160	451.9383 (264)
Space and water heating			1041.6788 (265)
Pumps and fans	184.1804	0.5190	95.5897 (267)
Energy for lighting	371.9662	0.5190	193.0504 (268)
Energy saving/generation technologies			
PV Unit	-464.8214	0.5190	-241.2423 (269)
Total kg/year			1089.0766 (272)
CO2 emissions per m2			12.9300 (273)
EI value			88.7064
EI rating			89
EI band			B

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9070 = 3.837$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9070 = 0.2381$, stars = 4
Water heating energy efficiency	$3.48 / 0.8848 = 3.933$, stars = 4
Water heating environmental impact	$0.216 / 0.8848 = 0.2441$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.1100 (1b)	x 2.3900 (2b)	= 100.6429 (1b) - (3b)
First floor	42.1100 (1c)	x 2.6700 (2c)	= 112.4337 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	213.0766 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.9900
Infiltration rate					0.1995 (18)
Number of sides sheltered					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.1845 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate	0.2168	0.2030	0.2030	0.1845	0.1892	0.1799	0.1799	0.1753	0.1753	0.1892	0.1845	0.1892 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			13.9700	1.1450	15.9962		(27)
Ground Floor			42.1100	0.1200	5.0532	84.0000	3537.2400 (28a)
Brick and Block	92.9500	16.0900	76.8600	0.2400	18.4464	42.2200	3245.0292 (29a)
Pitched Roof	42.1100		42.1100	0.1000	4.2110	9.1000	383.2010 (30)
Total net area of external elements Aum(A, m ²)			177.1700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.0388		(33)
Party Wall 1			44.3400	0.0000	0.0000	70.0000	3103.8000 (32)
GF Stud			74.8900			9.0000	674.0100 (32c)
First Floor			86.6000			9.0000	779.4000 (32c)
Internal Floor 1			42.1100			18.0000	757.9800 (32d)
Internal Ceiling 1			42.1100			18.0000	757.9800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13238.6402 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							157.1912 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.8546 (36)
Total fabric heat loss						(33) + (36) =	54.8934 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576 (38)
Average = Sum(39)m / 12 =	90.0510	90.0510	90.0510	90.0510	90.0510	90.0510	90.0510	90.0510	90.0510	90.0510	90.0510	90.0510 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5381 (42)
Average daily hot water use (litres/day)												94.4792 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

Energy conte	103.9272	100.1480	96.3688	92.5897	88.8105	85.0313	85.0313	88.8105	92.5897	96.3688	100.1480	103.9272 (44)
Energy content (annual)	154.1210	134.7952	139.0966	121.2678	116.3593	100.4092	93.0439	106.7692	108.0444	125.9153	137.4464	149.2579 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1181	20.2193	20.8645	18.1902	17.4539	15.0614	13.9566	16.0154	16.2067	18.8873	20.6170	22.3887 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	31.2429	28.2110	31.2048	30.1650	31.1464	30.1139	31.1004	31.1303	30.1418	31.1806	30.2128	31.2337 (61)
Total heat required for water heating calculated for each month	185.3639	163.0062	170.3013	151.4328	147.5057	130.5231	124.1443	137.8995	138.1862	157.0960	167.6593	180.4916 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	185.3639	163.0062	170.3013	151.4328	147.5057	130.5231	124.1443	137.8995	138.1862	157.0960	167.6593	180.4916 (64)
Heat gains from water heating, kWh/month	59.0560	51.8722	54.0508	47.8628	46.4761	40.9145	38.7122	43.2833	43.4602	49.6620	53.2542	57.4367 (65)

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
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	52.6557	46.7683	38.0345	28.7946	21.5243	18.1717	19.6352	25.5225	34.2563	43.4963	50.7665	54.1191 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	340.3491	343.8809	334.9810	316.0341	292.1171	269.6384	254.6213	251.0896	259.9895	278.9364	302.8534	325.3320 (68)
Pumps, fans	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665 (69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Water heating gains (Table 5)	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229 (71)
Total internal gains	79.3763	77.1907	72.6489	66.4761	62.4678	56.8258	52.0325	58.1765	60.3614	66.7500	73.9641	77.1998 (72)
	578.9091	574.3679	552.1924	517.8328	482.6372	451.1639	432.8170	441.3166	461.1352	495.7106	534.1120	563.1790 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d			Gains W	
East				4.6500	25.1733	0.6300	0.7000	0.7700			35.7737 (76)	
South				1.9200	56.5862	0.6300	0.7000	0.7700			33.2035 (78)	
West				7.4000	25.1733	0.6300	0.7000	0.7700			56.9302 (80)	
Solar gains	125.9074	200.3825	317.4661	443.4279	498.4772	559.6738	513.8067	469.0755	378.5200	250.9403	154.3978	99.3503 (83)
Total gains	704.8165	774.7504	869.6585	961.2606	981.1144	1010.8377	946.6237	910.3921	839.6552	746.6509	688.5099	662.5293 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	40.8368	40.8368	40.8368	40.8368	40.8368	40.8368	40.8368	40.8368	40.8368	40.8368	40.8368	40.8368
util living area	3.7225	3.7225	3.7225	3.7225	3.7225	3.7225	3.7225	3.7225	3.7225	3.7225	3.7225	3.7225
	0.9587	0.9419	0.8952	0.7964	0.6479	0.4409	0.3110	0.3135	0.5611	0.8152	0.9294	0.9649 (86)
MIT	19.8538	19.9990	20.3098	20.6518	20.8780	20.9780	20.9956	20.9956	20.9465	20.6893	20.2316	19.8096 (87)
Th 2	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260 (88)
util rest of house	0.9503	0.9304	0.8747	0.7587	0.5871	0.3619	0.2206	0.2196	0.4770	0.7701	0.9128	0.9575 (89)
MIT 2	19.0116	19.1520	19.4485	19.7608	19.9492	20.0168	20.0251	20.0251	20.0002	19.8024	19.3805	18.9691 (90)
Living area fraction	19.1929	19.3344	19.6339	19.9526	20.1491	20.2237	20.2340	20.2340	fLA = Living area / (4) =	19.9933	19.5637	0.2153 (91)
MIT	19.1929	19.3344	19.6339	19.9526	20.1491	20.2237	20.2340	20.2340	20.2039	19.9933	19.5637	19.1500 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1929	19.3344	19.6339	19.9526	20.1491	20.2237	20.2340	20.2340	20.2039	19.9933	19.5637	19.1500 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9413	0.9205	0.8653	0.7556	0.5952	0.3783	0.2401	0.2398	0.4931	0.7684	0.9033	0.9491 (94)
Ext temp.	663.4588	713.1788	752.4770	726.3116	583.9699	382.4144	227.3201	218.3571	414.0238	573.7536	621.9024	628.8089 (95)
Heat loss rate W	5.6000	6.0000	7.6000	10.1000	13.1000	15.9000	17.7000	17.8000	15.4000	12.1000	8.6000	5.7000 (96)
Month fracti	1224.0586	1200.7722	1083.6690	887.2381	634.7797	389.3580	228.1891	219.1883	432.5969	710.8031	987.2939	1211.1875 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating	417.0863	327.6628	246.4069	115.8671	37.8026	0.0000	0.0000	0.0000	0.0000	101.9648	263.0819	433.2897 (98)
Space heating per m2												1943.1619 (98)
										(98) / (4) =		23.0725 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2142.4056 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	417.0863	327.6628	246.4069	115.8671	37.8026	0.0000	0.0000	0.0000	0.0000	101.9648	263.0819	433.2897	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	459.8525	361.2599	271.6724	127.7476	41.6787	0.0000	0.0000	0.0000	0.0000	112.4199	290.0572	477.7174	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	185.3639	163.0062	170.3013	151.4328	147.5057	130.5231	124.1443	137.8995	138.1862	157.0960	167.6593	180.4916	(64)
Efficiency of water heater (217)m	89.5285	89.4364	89.1505	88.5661	87.7301	87.0000	87.0000	87.0000	87.0000	88.4197	89.2230	89.5797	(216)
Fuel for water heating, kWh/month	207.0446	182.2594	191.0268	170.9828	168.1359	150.0266	142.6946	158.5052	158.8347	177.6708	187.9103	201.4872	(219)
Water heating fuel used												2096.5788	(219)
Annual totals kWh/year													
Space heating fuel - main system												2142.4056	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.4200)													
mechanical ventilation fans (SFP = 0.4200)													109.1804 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													184.1804 (231)
Electricity for lighting (calculated in Appendix L)													371.9662 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.64 * 1030 * 1.00) =										-527.3904			-527.3904 (233)
Total delivered energy for all uses													4267.7406 (238)

10a. Fuel costs - using BEDF prices (491)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2142.4056	3.6300	77.7693 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2096.5788	3.6300	76.1058 (247)
Mechanical ventilation fans	109.1804	19.4400	21.2247 (249)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	371.9662	19.4400	72.3102 (250)
Additional standing charges			95.0000 (251)
Energy saving/generation technologies			
PV Unit	-527.3904	19.4400	-102.5247 (252)
Total energy cost			254.4653 (255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2142.4056	0.2160	462.7596 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2096.5788	0.2160	452.8610 (264)
Space and water heating			915.6206 (265)
Pumps and fans	184.1804	0.5190	95.5897 (267)
Energy for lighting	371.9662	0.5190	193.0504 (268)
Energy saving/generation technologies			
PV Unit	-527.3904	0.5190	-273.7156 (269)
Total kg/year			930.5451 (272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2142.4056	1.2200	2613.7348 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2096.5788	1.2200	2557.8262 (264)
Space and water heating			5171.5610 (265)
Pumps and fans	184.1804	3.0700	565.4340 (267)
Energy for lighting	371.9662	3.0700	1141.9362 (268)

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Energy saving/generation technologies			
PV Unit	-527.3904	3.0700	-1619.0885 (269)
Primary energy kWh/year			5259.8426 (272)
Primary energy kWh/m2/year			62.4536 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	B 86
Current environmental impact rating:	B 89

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered
D	Not considered
E Low energy lighting	Already installed
F	Not considered
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N Solar water heating	Recommended
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Already installed
A2	Not considered
A3	Not considered
T2	Not considered
W	Not considered
X	Not considered
Y	Not considered
J2	Not considered
Q2	Not considered
Z1	Not considered
Z2	Not considered
Z3	Not considered
Z4	Not considered
Z5	Not considered
V2 Wind turbine	Not applicable
L2	Not considered
Q3	Not considered
O3	Not considered

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.2	-£ 27	-192 kg (20.6%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£27 2.28 kg/m²	B 88	B 91
Total Savings	£27 2.28 kg/m²		

Potential energy efficiency rating:	B 88
Potential environmental impact rating:	B 91

Fuel prices for cost data on this page from database revision number 491 TEST (28 Feb 2022)
Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, Southern England):

	Current	Potential	Saving
Electricity	£108	£118	-£10
Mains gas	£249	£212	£37
Space heating	£209	£209	£0
Water heating	£76	£49	£27
Lighting	£72	£72	£0
Generated (PV)	-£103	-£103	£0
Total cost of fuels	£254	£227	£27
Total cost of uses	£254	£227	£27
Delivered energy	51 kWh/m²	39 kWh/m²	11 kWh/m²
Carbon dioxide emissions	0.9 tonnes	0.7 tonnes	0.2 tonnes
CO2 emissions per m²	11 kg/m²	9 kg/m²	2 kg/m²
Primary energy	62 kWh/m²	50 kWh/m²	13 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.1100 (1b)	x 2.3900 (2b)	= 100.6429 (1b) - (3b)
First floor	42.1100 (1c)	x 2.6700 (2c)	= 112.4337 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.0766 (5)

2. Ventilation rate

					main heating	secondary heating	other		total	m3 per hour		
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000 (8)
Pressure test											Yes	
Measured/design AP50											3.9900	
Infiltration rate											0.1995 (18)	
Number of sides sheltered											1 (19)	
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1845 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
	0.2353	0.2307	0.2261	0.2030	0.1984	0.1753	0.1753	0.1707	0.1845	0.1984	0.2076	0.2168 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			13.9700	1.1450	15.9962		(27)
Ground Floor			42.1100	0.1200	5.0532	84.0000	3537.2400 (28a)
Brick and Block	92.9500	16.0900	76.8600	0.2400	18.4464	42.2200	3245.0292 (29a)
Pitched Roof	42.1100		42.1100	0.1000	4.2110	9.1000	383.2010 (30)
Total net area of external elements Aum(A, m ²)			177.1700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.0388		(33)
Party Wall 1			44.3400	0.0000	0.0000	70.0000	3103.8000 (32)
GF Stud			74.8900			9.0000	674.0100 (32c)
First Floor			86.6000			9.0000	779.4000 (32c)
Internal Floor 1			42.1100			18.0000	757.9800 (32d)
Internal Ceiling 1			42.1100			18.0000	757.9800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13238.6402 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							157.1912 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.8546 (36)
Total fabric heat loss						(33) + (36) =	54.8934 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 35.1576	Feb 35.1576	Mar 35.1576	Apr 35.1576	May 35.1576	Jun 35.1576	Jul 35.1576	Aug 35.1576	Sep 35.1576	Oct 35.1576	Nov 35.1576	Dec 35.1576 (38)
Heat transfer coeff	90.0510	90.0510	90.0510	90.0510	90.0510	90.0510	90.0510	90.0510	90.0510	90.0510	90.0510	90.0510 (39)
Average = Sum(39)m / 12 =												90.0510 (39)
HLP	Jan 1.0692	Feb 1.0692	Mar 1.0692	Apr 1.0692	May 1.0692	Jun 1.0692	Jul 1.0692	Aug 1.0692	Sep 1.0692	Oct 1.0692	Nov 1.0692	Dec 1.0692 (40)
HLP (average)												1.0692 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5381 (42)
Average daily hot water use (litres/day)												94.4792 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Energy conte	103.9272	100.1480	96.3688	92.5897	88.8105	85.0313	85.0313	88.8105	92.5897	96.3688	100.1480	103.9272 (44)
Energy content (annual)	154.1210	134.7952	139.0966	121.2678	116.3593	100.4092	93.0439	106.7692	108.0444	125.9153	137.4464	149.2579 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1486.5263 (45)
	23.1181	20.2193	20.8645	18.1902	17.4539	15.0614	13.9566	16.0154	16.2067	18.8873	20.6170	22.3887 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	31.2429	28.2110	31.2048	30.1650	31.1464	30.1139	31.1004	31.1303	30.1418	31.1806	30.2128	31.2337 (61)
Total heat required for water heating calculated for each month	185.3639	163.0062	170.3013	151.4328	147.5057	130.5231	124.1443	137.8995	138.1862	157.0960	167.6593	180.4916 (62)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.7000 (H2)
Collector heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0050 (H3a)
Collector effective heat loss coefficient												1.8063 (H3b)
Collector performance ratio												2.5804 (H4)
Annual solar radiation per m2												1079.5246 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												1813.6014 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.2200 (H8)
Utilisation factor												0.5594 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.4792 (H14)
Volume ratio Veff/V												0.7938 (H15)
Solar storage volume factor												0.9538 (H16)
Solar input												-850.8985 (H17)
Solar input	-24.6744	-41.1744	-70.1247	-93.9810	-116.1056	-114.1503	-112.6417	-98.4157	-77.0792	-52.6360	-29.2673	-20.6482 (63)
												-850.8985 (63)
Solar input (sum of months) = Sum (63)m =												
Output from w/h	160.6895	121.8318	100.1766	57.4518	31.4002	16.3729	11.5026	39.4838	61.1070	104.4600	138.3919	159.8434 (64)
Total per year (kWh/year) = Sum (64)m =												1002.7115 (64)
Heat gains from water heating, kWh/month	59.0560	51.8722	54.0508	47.8628	46.4761	40.9145	38.7122	43.2833	43.4602	49.6620	53.2542	57.4367 (65)

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	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	52.6557	46.7683	38.0345	28.7946	21.5243	18.1717	19.6352	25.5225	34.2563	43.4963	50.7665	54.1191	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.3491	343.8809	334.9810	316.0341	292.1171	269.6384	254.6213	251.0896	259.9895	278.9364	302.8534	325.3320	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	(71)
Water heating gains (Table 5)	79.3763	77.1907	72.6489	66.4761	62.4678	56.8258	52.0325	58.1765	60.3614	66.7500	73.9641	77.1998	(72)
Total internal gains	578.9091	574.3679	552.1924	517.8328	482.6372	451.1639	432.8170	441.3166	461.1352	495.7106	534.1120	563.1790	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
East	4.6500	19.6403	0.6300		0.7000		0.7700	27.9108 (76)
South	1.9200	46.7521	0.6300		0.7000		0.7700	27.4330 (78)
West	7.4000	19.6403	0.6300		0.7000		0.7700	44.4172 (80)

Solar gains	99.7610	186.4171	290.2426	404.5170	483.8831	491.2076	469.2727	410.2064	330.7867	216.3477	122.7020	83.1837 (83)
Total gains	678.6700	760.7849	842.4350	922.3498	966.5202	942.3715	902.0897	851.5231	791.9218	712.0584	656.8140	646.3626 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	40.8368	40.8368	40.8368	40.8368	40.8368	40.8368	40.8368	40.8368	40.8368	40.8368	40.8368	40.8368
alpha	3.7225	3.7225	3.7225	3.7225	3.7225	3.7225	3.7225	3.7225	3.7225	3.7225	3.7225	3.7225
util living area	0.9709	0.9548	0.9205	0.8485	0.7285	0.5693	0.4275	0.4688	0.6842	0.8809	0.9548	0.9754 (86)
MIT	19.6381	19.8339	20.1453	20.5051	20.7850	20.9359	20.9829	20.9757	20.8718	20.5015	19.9932	19.5777 (87)
Th 2	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260 (88)
util rest of house	0.9652	0.9461	0.9052	0.8196	0.6790	0.4958	0.3378	0.3767	0.6140	0.8514	0.9445	0.9705 (89)
MIT 2	18.7993	18.9906	19.2919	19.6295	19.8753	19.9916	20.0200	20.0168	19.9497	19.6350	19.1497	18.7400 (90)
Living area fraction												0.2153 (91)
MIT	18.9798	19.1721	19.4756	19.8180	20.0711	20.1949	20.2273	20.2232	20.1482	19.8216	19.3313	18.9203 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9798	19.1721	19.4756	19.8180	20.0711	20.1949	20.2273	20.2232	20.1482	19.8216	19.3313	18.9203 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9575	0.9367	0.8951	0.8127	0.6814	0.5091	0.3568	0.3959	0.6235	0.8442	0.9355	0.9634	(94)
Useful gains	649.8268	712.6511	754.0263	749.5546	658.6196	479.7825	321.8505	337.1389	493.7388	601.1442	614.4241	622.7144	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1321.9356	1285.2202	1168.4678	983.1793	753.8278	503.8235	326.6384	344.2846	544.6425	830.4115	1101.4426	1325.5791	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	500.0490	384.7664	308.3445	168.2098	70.8349	0.0000	0.0000	0.0000	0.0000	170.5749	350.6533	522.9314	(98)
Space heating													
Space heating per m2													(98) / (4) = 29.4035 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2730.2801 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	500.0490	384.7664	308.3445	168.2098	70.8349	0.0000	0.0000	0.0000	0.0000	170.5749	350.6533	522.9314	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	551.3219	424.2188	339.9608	185.4573	78.0980	0.0000	0.0000	0.0000	0.0000	188.0649	386.6078	576.5506	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	160.6895	121.8318	100.1766	57.4518	31.4002	16.3729	11.5026	39.4838	61.1070	104.4600	138.3919	159.8434	(64)
Efficiency of water heater	89.7715	89.7817	89.7639	89.7285	89.5305	87.0000	87.0000	87.0000	87.0000	89.2582	89.6214	89.8059	(216)
(217)m	89.7715	89.7817	89.7639	89.7285	89.5305	87.0000	87.0000	87.0000	87.0000	89.2582	89.6214	89.8059	(217)
Fuel for water heating, kWh/month	178.9984	135.6978	111.6001	64.0285	35.0720	18.8194	13.2214	45.3837	70.2379	117.0312	154.4184	177.9877	(219)
Water heating fuel used													
Annual totals kWh/year													
Space heating fuel - main system													2730.2801 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.4200)													
mechanical ventilation fans (SFP = 0.4200)													109.1804 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
pump for solar water heating													50.0000 (230g)
Total electricity for the above, kWh/year													234.1804 (231)
Electricity for lighting (calculated in Appendix L)													371.9662 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.64 * 908 * 1.00) =										-464.8214			-464.8214 (233)
Total delivered energy for all uses													3994.1018 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2730.2801	3.4800	95.0137	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1122.4964	3.4800	39.0629	(247)
Mechanical ventilation fans	109.1804	13.1900	14.4009	(249)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Pump for solar water heating	50.0000	13.1900	6.5950	(249)
Energy for lighting	371.9662	13.1900	49.0623	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-464.8214	13.1900	-61.3099	(252)
Total energy cost			272.7174	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)		0.8864 (257)
SAP value	[(255) x (256)] / [(4) + 45.0] =	87.6346
SAP rating (Section 12)		88 (258)
SAP band		B

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2730.2801	0.2160	589.7405 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1122.4964	0.2160	242.4592 (264)
Space and water heating			832.1997 (265)
Pumps and fans	234.1804	0.5190	121.5397 (267)
Energy for lighting	371.9662	0.5190	193.0504 (268)
Energy saving/generation technologies			
PV Unit	-464.8214	0.5190	-241.2423 (269)
Total kg/year			905.5475 (272)
CO2 emissions per m2			10.7500 (273)
EI value			90.6096
EI rating			91 (274)
EI band			B

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.1100 (1b)	x 2.3900 (2b)	= 100.6429 (1b) - (3b)
First floor	42.1100 (1c)	x 2.6700 (2c)	= 112.4337 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.0766 (5)

2. Ventilation rate

					main heating	secondary heating	other		total	m3 per hour		
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000 (8)
Pressure test											Yes	
Measured/design AP50											3.9900	
Infiltration rate											0.1995 (18)	
Number of sides sheltered											1 (19)	
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1845 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate	0.2168	0.2030	0.2030	0.1845	0.1892	0.1799	0.1799	0.1753	0.1753	0.1892	0.1845	0.1892 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			13.9700	1.1450	15.9962		(27)
Ground Floor			42.1100	0.1200	5.0532	84.0000	3537.2400 (28a)
Brick and Block	92.9500	16.0900	76.8600	0.2400	18.4464	42.2200	3245.0292 (29a)
Pitched Roof	42.1100		42.1100	0.1000	4.2110	9.1000	383.2010 (30)
Total net area of external elements Aum(A, m ²)			177.1700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.0388		(33)
Party Wall 1			44.3400	0.0000	0.0000	70.0000	3103.8000 (32)
GF Stud			74.8900			9.0000	674.0100 (32c)
First Floor			86.6000			9.0000	779.4000 (32c)
Internal Floor 1			42.1100			18.0000	757.9800 (32d)
Internal Ceiling 1			42.1100			18.0000	757.9800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13238.6402 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							157.1912 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.8546 (36)
Total fabric heat loss						(33) + (36) =	54.8934 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 35.1576	Feb 35.1576	Mar 35.1576	Apr 35.1576	May 35.1576	Jun 35.1576	Jul 35.1576	Aug 35.1576	Sep 35.1576	Oct 35.1576	Nov 35.1576	Dec 35.1576 (38)
Heat transfer coeff	90.0510	90.0510	90.0510	90.0510	90.0510	90.0510	90.0510	90.0510	90.0510	90.0510	90.0510	90.0510 (39)
Average = Sum(39)m / 12 =												90.0510 (39)
HLP	Jan 1.0692	Feb 1.0692	Mar 1.0692	Apr 1.0692	May 1.0692	Jun 1.0692	Jul 1.0692	Aug 1.0692	Sep 1.0692	Oct 1.0692	Nov 1.0692	Dec 1.0692 (40)
HLP (average)												1.0692 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5381 (42)
Average daily hot water use (litres/day)												94.4792 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

Energy conte	103.9272	100.1480	96.3688	92.5897	88.8105	85.0313	85.0313	88.8105	92.5897	96.3688	100.1480	103.9272 (44)
Energy content (annual)	154.1210	134.7952	139.0966	121.2678	116.3593	100.4092	93.0439	106.7692	108.0444	125.9153	137.4464	149.2579 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1486.5263 (45)
	23.1181	20.2193	20.8645	18.1902	17.4539	15.0614	13.9566	16.0154	16.2067	18.8873	20.6170	22.3887 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	31.2429	28.2110	31.2048	30.1650	31.1464	30.1139	31.1004	31.1303	30.1418	31.1806	30.2128	31.2337 (61)
Total heat required for water heating calculated for each month	185.3639	163.0062	170.3013	151.4328	147.5057	130.5231	124.1443	137.8995	138.1862	157.0960	167.6593	180.4916 (62)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.7000 (H2)
Collector heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0050 (H3a)
Collector effective heat loss coefficient												1.8063 (H3b)
Collector performance ratio												2.5804 (H4)
Annual solar radiation per m2												1206.0102 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												2026.0972 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.3630 (H8)
Utilisation factor												0.5199 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.4792 (H14)
Volume ratio Veff/V												0.7938 (H15)
Solar storage volume factor												0.9538 (H16)
Solar input	-28.8261	-40.9940	-71.1352	-95.6888	-111.1968	-120.9499	-114.6790	-104.5761	-81.8515	-56.5728	-34.0948	-883.3900 (H17)
Solar input (sum of months) = Sum (63)m =												-22.8250 (63)
Output from w/h	156.5378	122.0122	99.1662	55.7440	36.3089	9.5732	9.4654	33.3234	56.3347	100.5232	133.5645	157.6666 (64)
Total per year (kWh/year) = Sum (64)m =												970.2200 (64)
Heat gains from water heating, kWh/month	59.0560	51.8722	54.0508	47.8628	46.4761	40.9145	38.7122	43.2833	43.4602	49.6620	53.2542	57.4367 (65)

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	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	52.6557	46.7683	38.0345	28.7946	21.5243	18.1717	19.6352	25.5225	34.2563	43.4963	50.7665	54.1191 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.3491	343.8809	334.9810	316.0341	292.1171	269.6384	254.6213	251.0896	259.9895	278.9364	302.8534	325.3320 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229 (71)
Water heating gains (Table 5)	79.3763	77.1907	72.6489	66.4761	62.4678	56.8258	52.0325	58.1765	60.3614	66.7500	73.9641	77.1998 (72)
Total internal gains	578.9091	574.3679	552.1924	517.8328	482.6372	451.1639	432.8170	441.3166	461.1352	495.7106	534.1120	563.1790 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

East	4.6500	25.1733	0.6300	0.7000	0.7700	35.7737 (76)
South	1.9200	56.5862	0.6300	0.7000	0.7700	33.2035 (78)
West	7.4000	25.1733	0.6300	0.7000	0.7700	56.9302 (80)

Solar gains	125.9074	200.3825	317.4661	443.4279	498.4772	559.6738	513.8067	469.0755	378.5200	250.9403	154.3978	99.3503 (83)
Total gains	704.8165	774.7504	869.6585	961.2606	981.1144	1010.8377	946.6237	910.3921	839.6552	746.6509	688.5099	662.5293 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	40.8368	40.8368	40.8368	40.8368	40.8368	40.8368	40.8368	40.8368	40.8368	40.8368	40.8368	
alpha	3.7225	3.7225	3.7225	3.7225	3.7225	3.7225	3.7225	3.7225	3.7225	3.7225	3.7225	
util living area	0.9587	0.9419	0.8952	0.7964	0.6479	0.4409	0.3110	0.3135	0.5611	0.8152	0.9294	0.9649 (86)
MIT	19.8538	19.9990	20.3098	20.6518	20.8780	20.9780	20.9956	20.9956	20.9465	20.6893	20.2316	19.8096 (87)
Th 2	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260 (88)
util rest of house	0.9503	0.9304	0.8747	0.7587	0.5871	0.3619	0.2206	0.2196	0.4770	0.7701	0.9128	0.9575 (89)
MIT 2	19.0116	19.1520	19.4485	19.7608	19.9492	20.0168	20.0251	20.0251	20.0002	19.8024	19.3805	18.9691 (90)
Living area fraction									fLA = Living area / (4) =			0.2153 (91)
MIT	19.1929	19.3344	19.6339	19.9526	20.1491	20.2237	20.2340	20.2340	20.2039	19.9933	19.5637	19.1500 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1929	19.3344	19.6339	19.9526	20.1491	20.2237	20.2340	20.2340	20.2039	19.9933	19.5637	19.1500 (93)

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Calculation Type: New Build (As Built)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9413	0.9205	0.8653	0.7556	0.5952	0.3783	0.2401	0.2398	0.4931	0.7684	0.9033	0.9491	(94)
Useful gains	663.4588	713.1788	752.4770	726.3116	583.9699	382.4144	227.3201	218.3571	414.0238	573.7536	621.9024	628.8089	(95)
Ext temp.	5.6000	6.0000	7.6000	10.1000	13.1000	15.9000	17.7000	17.8000	15.4000	12.1000	8.6000	5.7000	(96)
Heat loss rate W	1224.0586	1200.7722	1083.6690	887.2381	634.7797	389.3580	228.1891	219.1883	432.5969	710.8031	987.2939	1211.1875	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	417.0863	327.6628	246.4069	115.8671	37.8026	0.0000	0.0000	0.0000	0.0000	101.9648	263.0819	433.2897	(98)
Space heating												1943.1619	(98)
Space heating per m2											(98) / (4) =	23.0725	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													90.7000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													2142.4056	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	417.0863	327.6628	246.4069	115.8671	37.8026	0.0000	0.0000	0.0000	0.0000	101.9648	263.0819	433.2897	(98)	
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)	
Space heating fuel (main heating system)	459.8525	361.2599	271.6724	127.7476	41.6787	0.0000	0.0000	0.0000	0.0000	112.4199	290.0572	477.7174	(211)	
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating														
Water heating requirement	156.5378	122.0122	99.1662	55.7440	36.3089	9.5732	9.4654	33.3234	56.3347	100.5232	133.5645	157.6666	(64)	
Efficiency of water heater	89.6594	89.6653	89.6064	89.4641	88.8488	87.0000	87.0000	87.0000	87.0000	88.8246	89.4194	89.6824	(216)	
(217)m	174.5915	136.0752	110.6686	62.3088	40.8659	11.0037	10.8797	38.3028	64.7525	113.1704	149.3686	175.8055	(219)	
Fuel for water heating, kWh/month	1087.7931											1087.7931	(219)	
Water heating fuel used														
Annual totals kWh/year														
Space heating fuel - main system													2142.4056	(211)
Space heating fuel - secondary													0.0000	(215)
Electricity for pumps and fans:														
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.4200)														
mechanical ventilation fans (SFP = 0.4200)													109.1804	(230a)
central heating pump													30.0000	(230c)
main heating flue fan													45.0000	(230e)
pump for solar water heating													50.0000	(230g)
Total electricity for the above, kWh/year													234.1804	(231)
Electricity for lighting (calculated in Appendix L)													371.9662	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.64 * 1030 * 1.00) =										-527.3904			-527.3904	(233)
Total delivered energy for all uses													3308.9550	(238)

10a. Fuel costs - using BEDF prices (491)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2142.4056	3.6300	77.7693	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1087.7931	3.6300	39.4869	(247)
Mechanical ventilation fans	109.1804	19.4400	21.2247	(249)
Pumps and fans for heating	75.0000	19.4400	14.5800	(249)
Pump for solar water heating	50.0000	19.4400	9.7200	(249)
Energy for lighting	371.9662	19.4400	72.3102	(250)
Additional standing charges			95.0000	(251)
Energy saving/generation technologies				
PV Unit	-527.3904	19.4400	-102.5247	(252)
Total energy cost			227.5664	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2142.4056	0.2160	462.7596	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1087.7931	0.2160	234.9633	(264)
Space and water heating			697.7229	(265)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

Pumps and fans	234.1804	0.5190	121.5397 (267)
Energy for lighting	371.9662	0.5190	193.0504 (268)
Energy saving/generation technologies			
PV Unit	-527.3904	0.5190	-273.7156 (269)
Total kg/year			738.5974 (272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2142.4056	1.2200	2613.7348 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1087.7931	1.2200	1327.1076 (264)
Space and water heating			3940.8425 (265)
Pumps and fans	234.1804	3.0700	718.9340 (267)
Energy for lighting	371.9662	3.0700	1141.9362 (268)
Energy saving/generation technologies			
PV Unit	-527.3904	3.0700	-1619.0885 (269)
Primary energy kWh/year			4182.6241 (272)
Primary energy kWh/m2/year			49.6631 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 85	Issued on Date	30/03/2022
Assessment Reference	As Built	Prop Type Ref	H (H/A - A/R)
Project	2 Haines Crescent, West End, Southampton, SO30 3LG		
Calculation Type	New Build (As Built)		

SAP Rating	86 B	DER	14.65	TER	18.14
Environmental	89 B	% DER<TER	19.23		
CO ₂ Emissions (t/year)	0.93	DFEE	43.34	TFEE	52.07
General Requirements Compliance	Pass	% DFEE<TFEE	16.75		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com	Assessor ID	E477-0001
Client	Foreman Homes, FORE		

Building Elements

Roof 000002 - Mineral Wool between and above

Roof Type: Pitched Roof, insulated flat ceiling

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	Earthwool Loft Roll 40						
	Main construction	150	0.0400	3.7500	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 2	Earthwool Loft Roll 40						
	Main construction	200	0.0400	5.0000	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 3	Earthwool Loft Roll 40						
	Main construction	100	0.0400	2.5000	87.50		
	Main construction	100	0.1300	0.7692	12.50		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 4	Plasterboard, standard						
	Main construction	12.5	0.2100	0.0595	100.00	700	1000
Int surface				0.1000			

Total resistance:	Upper limit = 11.200 m ² K/W	Lower limit = 10.901 m ² K/W	Average = 11.050 m ² K/W
	Total correction = 0.0065 m ² K/W	U-value (unrounded) = 0.1 W/m ² K	

Unheated space: None

Total thickness: 463 mm

U-value: 0.10 W/m² K

Kappa: 9.10 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 85	Issued on Date	30/03/2022
Assessment Reference	As Built	Prop Type Ref	H (H/A - A/R)
Project	2 Haines Crescent, West End, Southampton, SO30 3LG		
Calculation Type	New Build (As Built)		

SAP Rating	86 B	DER	14.65	TER	18.14
Environmental	89 B	% DER<TER	19.23		
CO ₂ Emissions (t/year)	0.93	DFEE	43.34	TFEE	52.07
General Requirements Compliance	Pass	% DFEE<TFEE	16.75		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com	Assessor ID	E477-0001
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Client	Foreman Homes, FORE
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Building Elements

Wall 000001

Wall Type: Standard Wall

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	Brick, outer leaf						
	Main construction	102	0.7700	0.1325	82.81		
	Main construction	102	0.9407	0.1084	17.19		
Layer 2	Supafil 34						
	Main construction	100	0.0340	2.9412	100.00		
	Corrections - Air Gap: Level 0, Fasteners: None or plastic						
Layer 3	Supabloc						
	Main construction	100	0.1100	0.9091	94.04	460	1000
	Main construction	100	0.8803	0.1136	5.96	460	1000
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 4	airspace/plaster dabs						
	Main construction	15	0.0882	0.1700	80.00		
	Main construction	15	0.0882	0.1700	20.00		
	Corrections - Cavity Unventilated, Emissivity: Normal						
Layer 5	Plasterboard, standard						
	Main construction	12.5	0.2100	0.0595	100.00	700	1000
Int surface				0.1300			

Total resistance:	Upper limit = 4.321 m ² K/W	Lower limit = 4.110 m ² K/W	Average = 4.215 m ² K/W
	Total correction = 0.0002 m ² K/W	U-value (unrounded) = 0.24 W/m ² K	

Unheated space: None		
Total thickness: 330 mm	U-value: 0.24 W/m² K	Kappa: 42.22 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 85	Issued on Date	30/03/2022
Assessment Reference	As Built	Prop Type Ref	H (H/A - A/R)
Project	2 Haines Crescent, West End, Southampton, SO30 3LG		
Calculation Type	New Build (As Built)		

SAP Rating	86 B	DER	14.65	TER	18.14
Environmental	89 B	% DER<TER	19.23		
CO ₂ Emissions (t/year)	0.93	DFEE	43.34	TFEE	52.07
General Requirements Compliance	Pass	% DFEE<TFEE	16.75		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com	Assessor ID	E477-0001
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Client	Foreman Homes, FORE
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Building Elements

Floor 000003 - Worst Case Slab

Floor Type: Slab On Ground Floor

Area = 35.11 m², Perimeter = 16.79 m, Wall thickness = 275.00 mm, Soil: Unknown

Horizontal edge insulation: none

Vertical edge insulation: none

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	Concrete, medium density						
	Main construction	100	1.3500	0.0741	100.00		
Layer 2	Polythene,1000 gauge						
	Main construction	0.5	0.0000	0.0000	100.00		
Layer 3	Celotex XR4000						
	Main construction	150	0.0220	6.8182	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 4	Polythene, 500 gauge						
	Main construction	0.5	0.0000	0.0000	100.00		
Layer 5	Screed						
	Main construction	70	1.1500	0.0609	100.00	1200	1000
Int surface				0.1700			

Total resistance: Upper limit = 6.953 m² K/W Lower limit = 6.953 m² K/W Average = 6.953 m² K/W

Total correction = 0.0096 m² K/W

U-value (unrounded) = 0.12 W/m² K

Unheated space: None

Total thickness: 321 mm

U-value: 0.12 W/m² K

Kappa: 84.00 kJ/m² K

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Plot 85	Issued on Date	30/03/2022
Assessment Reference	As Built	Prop Type Ref	H (H/A - A/R)
Property	2 Haines Crescent, West End, Southampton, SO30 3LG		
SAP Rating	86 B	DER	14.65
Environmental	89 B	TER	18.14
CO ₂ Emissions (t/year)	0.93	% DER<TER	19.23
General Requirements Compliance	Pass	DfEE	43.34
		TFEE	52.07
		% DfEE<TFEE	16.75
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	East
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	House, Semi-Detached
2.0 Number of Storeys	2
3.0 Date Built	2020
4.0 Sheltered Sides	1
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground Floor:	18.37 m	42.11 m ²
	1st Storey:	18.37 m	2.39 m
			2.67 m

7.0 Living Area	18.13	m ²
8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	157.19	kJ/m ² K

9.0 External Walls			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction				
Brick and Block	Cavity Wall	Other	0.24	42.22	92.95	76.86

9.1 Party Walls			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Description	Type	Construction			
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs on both sides, dense blocks, cavity or cavity fill	0.00	70.00	44.34

9.2 Internal Walls			Kappa (kJ/m ² K)	Area (m ²)
Description	Construction			
GF Stud	Plasterboard on timber frame		9.00	74.89
First Floor	Plasterboard on timber frame		9.00	86.60

10.0 External Roofs			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction				
Pitched Roof	External Plane Roof	Other	0.10	9.10	42.11	42.11

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

10.2 Internal Ceilings

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor	9.00	42.11

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Ground Floor	Ground Floor - Solid	Other	0.12	84.00	42.11

11.2 Internal Floors

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	42.11

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m ² K)
Front Door	Manufacturer	Solid Door							1.10
Windows	Manufacturer	Window	Double Low-E Soft 0.1			0.63		0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m ²)	Curtain Closed
Front Door	Solid Door	[1] Brick and Block	East							2.12	
Front Elevation	Window	[1] Brick and Block	East	None	0.00					4.14	
Front Elevation	Window	[1] Brick and Block	East	None	0.51	Yes				0.51	
Side Elevation	Window	[1] Brick and Block	South	None	0.00					1.92	
Rear Elevation	Window	[1] Brick and Block	West	None	0.00					7.40	

14.0 Conservatory

None

15.0 Draught Proofing

100

%

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	12.04	0.053	No	CD0025
Independently assessed	E3 Sill	9.52	0.034	No	CD0027
Independently assessed	E4 Jamb	28.50	0.039	No	CD0028
Independently assessed	E5 Ground floor (normal)	18.37	0.060	No	CBA -302
Independently assessed	E6 Intermediate floor within a dwelling	18.37	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	9.70	0.060	No	
Independently assessed	E12 Gable (insulation at ceiling level)	8.78	0.054	No	CD0031
Independently assessed	E16 Corner (normal)	10.10	0.050	No	CD0035
Table K1 - Approved	E18 Party wall between dwellings	10.10	0.060	No	
Table K1 - Default	P1 Party wall - Ground floor	8.78	0.160	No	
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	8.78	0.000	No	
Table K1 - Default	P4 Party wall - Roof (insulation at ceiling level)	8.78	0.240	No	

Y-value	0.050	W/m ² K
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18.0 Pressure Testing

Designed AP ₅₀	5.00	m ³ /(h.m ²) @ 50 Pa
Property Tested ?	Yes	
As Built AP ₅₀	3.99	m ³ /(h.m ²) @ 50 Pa

19.0 Mechanical Ventilation

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Summer Overheating

Windows open in hot weather	Windows half open
Cross ventilation possible	Yes
Night Ventilation	Yes
Air change rate	4.00

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - centralised
MV Reference Number	500233
Configuration	2
Manufacturer SFP	0.30
Duct Type	Rigid
Wet Rooms	2

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				0
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

Total number of light fittings	13	
Total number of L.E.L. fittings	13	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	Yes
Light and motion sensor	Yes

23.0 Electricity Tariff

Standard

24.0 Main Heating 1

Description	Database	
Percentage of Heat	Gas Combi	%
Database Ref. No.	100	
Fuel Type	17503	
Main Heating	Mains gas	
SAP Code	BGW	
In Winter	104	
In Summer	90.7	
Controls	87.0	
PCDF Controls	CBE Programmer, room thermostat and TRVs	
Delayed Start Stat	0	
Sap Code	No	
Flue Type	2106	
Fan Assisted Flue	Balanced	
	Yes	

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Is MHS Pumped	Pump in heated space
Heat Emitter	Radiators
Flow Temperature	Normal (> 45°C)
Combi boiler type	Standard Combi
Combi keep hot type	Gas/Oil, time clock
25.0 Main Heating 2	None

Community Heating	None
28.0 Water Heating	HWP From main heating 1
Water Heating	Main Heating 1
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
SAP Code	901

29.0 Hot Water Cylinder	None
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32.0 Photovoltaic Unit		One Dwelling		
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
0.64	West	30°	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£27	B 88	