



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 1 Fieldfare Crescent, Botley
SOUTHAMPTON, SO32 2TW

Contact: Tobias Whiting
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Report Issue Date: 15/02/2023

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0645 Plot 1			Issued on Date	15/02/2023
Assessment Reference	As Built	Prop Type Ref	D		
Property	1 Fieldfare Crescent, Botley, SOUTHAMPTON, SO32 2TW				
SAP Rating	90 B	DER	11.31	TER	15.74
Environmental	90 B	% DER<TER	28.12		
CO ₂ Emissions (t/year)	1.19	DFEE	43.94	TFEE	54.58
General Requirements Compliance	Pass	% DFEE<TFEE	19.49		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.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)	15.74	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	11.31	kgCO ₂ /m ²	Pass
	-4.43 (-28.1%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	54.58	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	43.94	kWh/m ² /yr	
	-10.7 (-19.6%)	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
Floor	0.11 (max. 0.25)	0.11 (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	3.82 (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 36CDi 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

Not applicable

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 North

9.82 m², Overhang twice as wide as window, ratio 0.57

Windows facing North East

0.78 m², No overhang

Windows facing East

2.08 m², No overhang

Windows facing South East

0.78 m², No overhang

Windows facing South

15.95 m², No overhang

Windows facing West

1.44 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

3.82 (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

Roof U-value	0.10	W/m ² K
Floor U-value	0.11	W/m ² K
Door U-value	1.10	W/m ² K
Thermal bridging γ -value	0.029	W/m ² K
Air permeability	3.8	m ³ /m ² h
Photovoltaic array	1.24	kW

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THERMAL BRIDGING

Calculation Type: New Build (As Built)

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General Requirements Compliance	Pass	% DFEE<TFEE	19.49		

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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	0.077	1.26	0.10	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.070	4.80	0.34	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.067	1.64	0.11	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.064	7.08	0.45	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.056	5.54	0.31	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Table K1 - Default	1.000	1.80	1.80	
External wall	E3 Sill	Independently assessed	0.021	14.94	0.31	Birtley Supatherm
External wall	E4 Jamb	Independently assessed	0.016	38.70	0.62	Birtley Supatherm
External wall	E5 Ground floor (normal)	Independently assessed	0.062	37.54	2.33	BE-E5-23902
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	35.38	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	35.92	2.16	
External wall	E24 Eaves (insulation at ceiling level - inverted)	Table K1 - Default	0.240	4.06	0.97	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.044	4.36	0.19	Knauf P21
External wall	E16 Corner (normal)	Independently assessed	0.039	34.79	1.36	Knauf P23
External wall	E17 Corner (inverted – internal area greater than external area)	Independently assessed	-0.091	15.52	-1.41	Knauf P24

Total: **9.63** W/mK:
Y-Value: **0.029** 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

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

DWELLING AS BUILT

Detached House, total floor area 146 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) 15.74 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 11.31 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)54.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)43.9 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	OK
Floor	0.11 (max. 0.25)	0.11 (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: 3.82 (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 36CDi 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

Not applicable

9 Summertime temperature

Overheating risk (Southern England): Slight OK

Based on:

Overshading: Average
Windows facing North: 9.82 m², Overhang twice as wide as window, ratio 0.57
Windows facing North East: 0.78 m², No overhang
Windows facing East: 2.08 m², No overhang
Windows facing South East: 0.78 m², No overhang
Windows facing South: 15.95 m², No overhang
Windows facing West: 1.44 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Roof U-value 0.10 W/m²K
Floor U-value 0.11 W/m²K
Door U-value 1.10 W/m²K
Thermal bridging y-value 0.029 W/m²K
Air permeability 3.8 m³/m²h
Photovoltaic array 1.24 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	74.2300 (1b)	x 2.3900 (2b)	= 177.4097 (1b) - (3b)
First floor	71.8000 (1c)	x 2.6700 (2c)	= 191.7060 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	146.0300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 369.1157 (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					4 * 10 = 40.0000 (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) =					40.0000 / (5) = 0.1084 (8)
Pressure test					Yes
Measured/design AP50					3.8200
Infiltration rate					0.2994 (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) =	0.2769 (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	0.3531	0.3461	0.3392	0.3046	0.2977	0.2631	0.2631	0.2561	0.2769	0.2977	0.3115	0.3254 (22b)
Effective ac	0.5623	0.5599	0.5575	0.5464	0.5443	0.5346	0.5346	0.5328	0.5383	0.5443	0.5485	0.5529 (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		(26a)
Windows (Uw = 1.20)			30.8500	1.1450	35.3244		(27)
Ground Floor			74.2300	0.1100	8.1653	140.0000	10392.2000 (28a)
Brick and Block	184.1900	32.9700	151.2200	0.2400	36.2928	42.2200	6384.5084 (29a)
Pitched Roof	74.2300		74.2300	0.1000	7.4230	9.0000	668.0700 (30)
Total net area of external elements Aum(A, m ²)			332.6500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	89.5375		(33)
Ground Floor Block			65.1500			75.0000	4886.2500 (32c)
Ground Floor Stud			43.6400			9.0000	392.7600 (32c)
First Floor Block			48.7800			75.0000	3658.5000 (32c)
First Floor Timber			104.6400			9.0000	941.7600 (32c)
Internal Floor 1			71.8000			18.0000	1292.4000 (32d)
Internal Ceiling 1			71.8000			18.0000	1292.4000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	29908.8484 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							204.8130 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.6326 (36)
Total fabric heat loss						(33) + (36) =	99.1701 (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	68.4961	68.2013	67.9124	66.5551	66.3011	65.1190	65.1190	64.9001	65.5743	66.3011	66.8148	67.3519 (38)
Heat transfer coeff	167.6663	167.3715	167.0825	165.7252	165.4713	164.2891	164.2891	164.0702	164.7445	165.4713	165.9850	166.5221 (39)
Average = Sum(39)m / 12 =												165.7240 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1482	1.1461	1.1442	1.1349	1.1331	1.1250	1.1250	1.1235	1.1282	1.1331	1.1366	1.1403 (40)
HLP (average)												1.1349 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.9278 (42)
Average daily hot water use (litres/day)												103.7351 (43)
Daily hot water use	114.1086	109.9592	105.8098	101.6604	97.5110	93.3616	93.3616	97.5110	101.6604	105.8098	109.9592	114.1086 (44)
Energy conte	169.2198	148.0007	152.7235	133.1480	127.7587	110.2460	102.1592	117.2291	118.6292	138.2509	150.9117	163.8803 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy content (annual)												Total = Sum(45)m = 1632.1570 (45)
Distribution loss (46)m = 0.15 x (45)m												
	25.3830	22.2001	22.9085	19.9722	19.1638	16.5369	15.3239	17.5844	17.7944	20.7376	22.6368	24.5820 (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	27.5671	24.8979	27.5540	26.6466	27.5147	26.5972	27.4651	27.4973	26.6221	27.5302	26.6640	27.5587 (61)
Total heat required for water heating calculated for each month	196.7868	172.8986	180.2775	159.7946	155.2734	136.8432	129.6242	144.7264	145.2513	165.7811	177.5757	191.4391 (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	196.7868	172.8986	180.2775	159.7946	155.2734	136.8432	129.6242	144.7264	145.2513	165.7811	177.5757	191.4391 (64)
	Total per year (kWh/year) = Sum(64)m = 1956.2720 (64)											
Heat gains from water heating, kWh/month	63.1573	55.4347	57.6691	50.9334	49.3584	43.3061	40.8342	45.8530	46.0997	52.8510	56.8441	61.3799 (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	146.3897	146.3897	146.3897	146.3897	146.3897	146.3897	146.3897	146.3897	146.3897	146.3897	146.3897	146.3897	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.2526	25.0937	20.4076	15.4499	11.5490	9.7501	10.5353	13.6942	18.3804	23.3381	27.2390	29.0379	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	316.1700	319.4508	311.1832	293.5824	271.3644	250.4827	236.5325	233.2516	241.5193	259.1201	281.3380	302.2197	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6390	37.6390	37.6390	37.6390	37.6390	37.6390	37.6390	37.6390	37.6390	37.6390	37.6390	37.6390	(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)	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	(71)
Water heating gains (Table 5)	84.8889	82.4921	77.5122	70.7408	66.3420	60.1474	54.8847	61.6304	64.0274	71.0363	78.9502	82.4999	(72)
Total internal gains	499.2284	496.9536	479.0199	449.6899	419.1723	390.2971	371.8694	378.4932	393.8440	423.4114	457.4442	483.6744	(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	
North				9.8200	10.6334	0.6300	0.7000		0.7700		31.9121 (74)	
Northeast				0.7800	11.2829	0.6300	0.7000		0.7700		2.6896 (75)	
East				2.0800	19.6403	0.6300	0.7000		0.7700		12.4848 (76)	
Southeast				0.7800	36.7938	0.6300	0.7000		0.7700		8.7708 (77)	
South				15.9500	46.7521	0.6300	0.7000		0.7700		227.8942 (78)	
West				1.4400	19.6403	0.6300	0.7000		0.7700		8.6433 (80)	
Solar gains	292.3949	495.9636	677.4328	844.5945	955.9778	954.8337	918.0585	833.1620	734.5577	547.4066	349.7340	250.6023 (83)
Total gains	791.6234	992.9172	1156.4526	1294.2844	1375.1501	1345.1308	1289.9279	1211.6551	1128.4017	970.8180	807.1782	734.2767 (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	49.5509	49.6382	49.7240	50.1313	50.2082	50.5695	50.5695	50.6369	50.4297	50.2082	50.0528	49.8914
alpha	4.3034	4.3092	4.3149	4.3421	4.3472	4.3713	4.3713	4.3758	4.3620	4.3472	4.3369	4.3261
util living area	0.9969	0.9914	0.9781	0.9414	0.8557	0.7024	0.5399	0.5908	0.8165	0.9620	0.9931	0.9977 (86)
MIT	19.4906	19.7156	20.0297	20.4077	20.7272	20.9196	20.9800	20.9706	20.8376	20.4074	19.8671	19.4474 (87)
Th 2	19.9617	19.9633	19.9649	19.9725	19.9739	19.9804	19.9804	19.9817	19.9779	19.9739	19.9710	19.9680 (88)
util rest of house	0.9960	0.9890	0.9717	0.9234	0.8112	0.6170	0.4243	0.4742	0.7466	0.9469	0.9908	0.9971 (89)
MIT 2	18.5824	18.8075	19.1189	19.4908	19.7829	19.9397	19.9744	19.9718	19.8830	19.4980	18.9652	18.5443 (90)
Living area fraction	fLA = Living area / (4) =											0.1359 (91)
MIT	18.7058	18.9308	19.2427	19.6154	19.9112	20.0728	20.1110	20.1075	20.0127	19.6216	19.0878	18.6670 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7058	18.9308	19.2427	19.6154	19.9112	20.0728	20.1110	20.1075	20.0127	19.6216	19.0878	18.6670 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9945	0.9857	0.9659	0.9158	0.8081	0.6254	0.4397	0.4895	0.7493	0.9401	0.9880	0.9959	(94)
Useful gains	787.2342	978.7350	1116.9676	1185.2881	1111.2145	841.2257	567.2367	593.0681	845.5014	912.7030	797.5133	731.2808	(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	2415.3647	2348.3636	2129.0768	1775.8093	1358.7185	899.1243	576.8208	608.2951	974.0798	1492.8145	1989.7881	2409.0692	(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	1211.3291	920.3904	753.0092	425.1752	184.1430	0.0000	0.0000	0.0000	0.0000	431.6030	858.4379	1248.2746	(98)
Space heating												6032.3624 (98)	
Space heating per m2												(98) / (4) = 41.3091 (99)	

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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	74.2300 (1b)	x 2.3900 (2b)	= 177.4097 (1b) - (3b)
First floor	71.8000 (1c)	x 2.6700 (2c)	= 191.7060 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	146.0300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 369.1157 (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					4 * 10 = 40.0000 (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) =				40.0000 / (5) = 0.1084 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3584 (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) =				0.3315 (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	0.4226	0.4144	0.4061	0.3646	0.3564	0.3149	0.3149	0.3066	0.3315	0.3564	0.3729	0.3895 (22b)
Effective ac	0.5893	0.5858	0.5824	0.5665	0.5635	0.5496	0.5496	0.5470	0.5549	0.5635	0.5695	0.5759 (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 Semi-glazed door			2.1200	1.2000	2.5440		(26a)
TER Opening Type (Uw = 1.40)			30.8500	1.3258	40.8996		(27)
Ground Floor			74.2300	0.1300	9.6499		(28a)
Brick and Block	184.1900	32.9700	151.2200	0.1800	27.2196		(29a)
Pitched Roof	74.2300		74.2300	0.1300	9.6499		(30)
Total net area of external elements Aum(A, m ²)			332.6500				(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =				89.9630		(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)							14.9199 (36)
Total fabric heat loss	(33) + (36) =						104.8829 (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	71.7835	71.3611	70.9470	69.0020	68.6381	66.9440	66.9440	66.6303	67.5966	68.6381	69.3742	70.1439 (38)
Heat transfer coeff	176.6665	176.2440	175.8299	173.8849	173.5210	171.8270	171.8270	171.5133	172.4795	173.5210	174.2572	175.0268 (39)
Average = Sum(39)m / 12 =												173.8832 (39)
HLP	Jan 1.2098	Feb 1.2069	Mar 1.2041	Apr 1.1907	May 1.1883	Jun 1.1767	Jul 1.1767	Aug 1.1745	Sep 1.1811	Oct 1.1883	Nov 1.1933	Dec 1.1986 (40)
HLP (average)												1.1907 (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												2.9278 (42)
Average daily hot water use (litres/day)												103.7351 (43)
Daily hot water use	Jan 114.1086	Feb 109.9592	Mar 105.8098	Apr 101.6604	May 97.5110	Jun 93.3616	Jul 93.3616	Aug 97.5110	Sep 101.6604	Oct 105.8098	Nov 109.9592	Dec 114.1086 (44)
Energy conte	169.2198	148.0007	152.7235	133.1480	127.7587	110.2460	102.1592	117.2291	118.6292	138.2509	150.9117	163.8803 (45)
Energy content (annual)												Total = Sum(45)m = 1632.1570 (45)
Distribution loss (46)m = 0.15 x (45)m	25.3830	22.2001	22.9085	19.9722	19.1638	16.5369	15.3239	17.5844	17.7944	20.7376	22.6368	24.5820 (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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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	50.9589	49.3151	49.6905	46.0413	47.5760	49.6905	49.3151	50.9589	49.3151	50.9589 (61)
Solar input	220.1787	194.0281	203.6824	182.4631	177.4492	156.2874	149.7352	166.9197	167.9443	189.2098	200.2267	214.8392 (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	220.1787	194.0281	203.6824	182.4631	177.4492	156.2874	149.7352	166.9197	167.9443	189.2098	200.2267	214.8392 (64)
Heat gains from water heating, kWh/month	69.0053	60.7171	63.5203	56.6005	54.9024	48.1671	45.8619	51.4013	51.7730	58.7082	62.5069	67.2299 (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	146.3897	146.3897	146.3897	146.3897	146.3897	146.3897	146.3897	146.3897	146.3897	146.3897	146.3897	146.3897	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.2526	25.0937	20.4076	15.4499	11.5490	9.7501	10.5353	13.6942	18.3804	23.3381	27.2390	29.0379	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	316.1700	319.4508	311.1832	293.5824	271.3644	250.4827	236.5325	233.2516	241.5193	259.1201	281.3380	302.2197	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6390	37.6390	37.6390	37.6390	37.6390	37.6390	37.6390	37.6390	37.6390	37.6390	37.6390	37.6390	(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)	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	(71)
Water heating gains (Table 5)	92.7491	90.3528	85.3767	78.6118	73.7935	66.8988	61.6424	69.0878	71.9069	78.9088	86.8151	90.3628	(72)
Total internal gains	507.0886	504.8143	486.8844	457.5609	426.6239	397.0486	378.6271	385.9506	401.7235	431.2840	465.3091	491.5373	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
North	9.8200	10.6334	0.6300	0.7000	0.7700	31.9121 (74)
Northeast	0.7800	11.2829	0.6300	0.7000	0.7700	2.6896 (75)
East	2.0800	19.6403	0.6300	0.7000	0.7700	12.4848 (76)
Southeast	0.7800	36.7938	0.6300	0.7000	0.7700	8.7708 (77)
South	15.9500	46.7521	0.6300	0.7000	0.7700	227.8942 (78)
West	1.4400	19.6403	0.6300	0.7000	0.7700	8.6433 (80)

Solar gains	292.3949	495.9636	677.4328	844.5945	955.9778	954.8337	918.0585	833.1620	734.5577	547.4066	349.7340	250.6023	(83)
Total gains	799.4835	1000.7779	1164.3172	1302.1554	1382.6017	1351.8823	1296.6857	1219.1125	1136.2812	978.6905	815.0431	742.1396	(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	57.4018	57.5394	57.6749	58.3200	58.4423	59.0185	59.0185	59.1265	58.7952	58.4423	58.1954	57.9395	
alpha	4.8268	4.8360	4.8450	4.8880	4.8962	4.9346	4.9346	4.9418	4.9197	4.8962	4.8797	4.8626	
util living area	0.9987	0.9958	0.9877	0.9612	0.8876	0.7359	0.5654	0.6184	0.8497	0.9765	0.9967	0.9991	(86)
MIT	19.6310	19.8282	20.1087	20.4558	20.7532	20.9329	20.9853	20.9776	20.8564	20.4578	19.9728	19.5982	(87)
Th 2	19.9122	19.9145	19.9167	19.9274	19.9294	19.9387	19.9387	19.9404	19.9351	19.9294	19.9254	19.9211	(88)
util rest of house	0.9982	0.9943	0.9832	0.9461	0.8435	0.6428	0.4380	0.4900	0.7770	0.9645	0.9954	0.9988	(89)
MIT 2	18.0857	18.3752	18.7841	19.2864	19.6846	19.8934	19.9333	19.9312	19.8194	19.2981	18.5948	18.0440	(90)
Living area fraction	18.2957	18.5726	18.9640	19.4453	19.8298	20.0346	20.0762	20.0733	19.9603	19.4557	18.7821	18.2552	(91)
Temperature adjustment	18.2957	18.5726	18.9640	19.4453	19.8298	20.0346	20.0762	20.0733	19.9603	19.4557	18.7821	18.2552	(92)
adjusted MIT	18.2957	18.5726	18.9640	19.4453	19.8298	20.0346	20.0762	20.0733	19.9603	19.4557	18.7821	18.2552	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9971	0.9916	0.9776	0.9372	0.8386	0.6520	0.4552	0.5070	0.7790	0.9571	0.9931	0.9979	(94)
Ext temp.	797.1553	992.3772	1138.1911	1220.4352	1159.5000	881.4634	590.2115	618.1291	885.1997	936.7271	809.4037	740.6116	(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	2472.5654	2409.7102	2191.5481	1833.6653	1410.6840	933.8150	597.3126	630.0264	1010.7806	1536.6433	2035.6819	2460.0338	(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 per m2	1246.5051	952.4477	783.6976	441.5257	186.8809	0.0000	0.0000	0.0000	0.0000	446.3376	882.9203	1279.2501	(98)
												6219.5652	(98)
												42.5910	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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													6659.0634 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1246.5051	952.4477	783.6976	441.5257	186.8809	0.0000	0.0000	0.0000	0.0000	446.3376	882.9203	1279.2501	(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)	1334.5879	1019.7513	839.0767	472.7256	200.0867	0.0000	0.0000	0.0000	0.0000	477.8775	945.3109	1369.6468	(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	220.1787	194.0281	203.6824	182.4631	177.4492	156.2874	149.7352	166.9197	167.9443	189.2098	200.2267	214.8392	(64)
Efficiency of water heater (217)m	88.7247	88.5158	88.1138	87.1931	85.1817	80.3000	80.3000	80.3000	80.3000	87.1371	88.3459	88.7941	(216)
Fuel for water heating, kWh/month	248.1594	219.2016	231.1584	209.2632	208.3185	194.6293	186.4697	207.8701	209.1461	217.1404	226.6396	241.9522	(219)
Water heating fuel used												2599.9485	(219)
Annual totals kWh/year													
Space heating fuel - main system												6659.0634	(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)												498.9505	(232)
Total delivered energy for all uses												9832.9623	(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	6659.0634	0.2160	1438.3577 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2599.9485	0.2160	561.5889 (264)
Space and water heating			1999.9466 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	498.9505	0.5190	258.9553 (268)
Total CO2, kg/m2/year			2297.8269 (272)
Emissions per m2 for space and water heating			13.6955 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			1.7733 (272b)
Emissions per m2 for pumps and fans			0.2666 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.6955 * 1.00) + 1.7733 + 0.2666, rounded to 2 d.p.			15.7400 (273)

FULL SAP CALCULATION PRINTOUT

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	74.2300 (1b)	x 2.3900 (2b)	= 177.4097 (1b) - (3b)
First floor	71.8000 (1c)	x 2.6700 (2c)	= 191.7060 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	146.0300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 369.1157 (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					4 * 10 = 40.0000 (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)					40.0000 / (5) = 0.1084 (8)
Pressure test					Yes
Measured/design AP50					3.8200
Infiltration rate					0.2994 (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) =	0.2769 (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	0.3531	0.3461	0.3392	0.3046	0.2977	0.2631	0.2631	0.2561	0.2769	0.2977	0.3115	0.3254 (22b)
Effective ac	0.5623	0.5599	0.5575	0.5464	0.5443	0.5346	0.5346	0.5328	0.5383	0.5443	0.5485	0.5529 (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		(26a)
Windows (Uw = 1.20)			30.8500	1.1450	35.3244		(27)
Ground Floor			74.2300	0.1100	8.1653	140.0000	10392.2000 (28a)
Brick and Block	184.1900	32.9700	151.2200	0.2400	36.2928	42.2200	6384.5084 (29a)
Pitched Roof	74.2300		74.2300	0.1000	7.4230	9.0000	668.0700 (30)
Total net area of external elements Aum(A, m ²)			332.6500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	89.5375		(33)
Ground Floor Block			65.1500			75.0000	4886.2500 (32c)
Ground Floor Stud			43.6400			9.0000	392.7600 (32c)
First Floor Block			48.7800			75.0000	3658.5000 (32c)
First Floor Timber			104.6400			9.0000	941.7600 (32c)
Internal Floor 1			71.8000			18.0000	1292.4000 (32d)
Internal Ceiling 1			71.8000			9.0000	646.2000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 29262.6484 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 200.3879 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.6326 (36)
Total fabric heat loss (33) + (36) = 99.1701 (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	68.4961	68.2013	67.9124	66.5551	66.3011	65.1190	65.1190	64.9001	65.5743	66.3011	66.8148	67.3519 (38)
Heat transfer coeff	167.6663	167.3715	167.0825	165.7252	165.4713	164.2891	164.2891	164.0702	164.7445	165.4713	165.9850	166.5221 (39)
Average = Sum(39)m / 12 =												165.7240 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1482	1.1461	1.1442	1.1349	1.1331	1.1250	1.1250	1.1235	1.1282	1.1331	1.1366	1.1403 (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 2.9278 (42)
Average daily hot water use (litres/day) 103.7351 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	114.1086	109.9592	105.8098	101.6604	97.5110	93.3616	93.3616	97.5110	101.6604	105.8098	109.9592	114.1086 (44)
Energy conte	169.2198	148.0007	152.7235	133.1480	127.7587	110.2460	102.1592	117.2291	118.6292	138.2509	150.9117	163.8803 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Energy content (annual)	Total = Sum(45)m = 1632.1570 (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	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	35.9592	31.4501	32.4537	28.2940	27.1487	23.4273	21.7088	24.9112	25.2087	29.3783	32.0687	34.8246 (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)
(66)m	146.3897	146.3897	146.3897	146.3897	146.3897	146.3897	146.3897	146.3897	146.3897	146.3897	146.3897	146.3897	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.2526	25.0937	20.4076	15.4499	11.5490	9.7501	10.5353	13.6942	18.3804	23.3381	27.2390	29.0379	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	316.1700	319.4508	311.1832	293.5824	271.3644	250.4827	236.5325	233.2516	241.5193	259.1201	281.3380	302.2197	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6390	37.6390	37.6390	37.6390	37.6390	37.6390	37.6390	37.6390	37.6390	37.6390	37.6390	37.6390	(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)	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	(71)
Water heating gains (Table 5)	48.3323	46.8008	43.6206	39.2972	36.4902	32.5379	29.1785	33.4828	35.0121	39.4870	44.5399	46.8072	(72)
Total internal gains	459.6718	458.2623	442.1283	415.2463	386.3205	359.6877	343.1633	347.3456	361.8287	388.8621	420.0339	444.9817	(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	
North				9.8200	10.6334	0.6300	0.7000		0.7700		31.9121 (74)	
Northeast				0.7800	11.2829	0.6300	0.7000		0.7700		2.6896 (75)	
East				2.0800	19.6403	0.6300	0.7000		0.7700		12.4848 (76)	
Southeast				0.7800	36.7938	0.6300	0.7000		0.7700		8.7708 (77)	
South				15.9500	46.7521	0.6300	0.7000		0.7700		227.8942 (78)	
West				1.4400	19.6403	0.6300	0.7000		0.7700		8.6433 (80)	
Solar gains	292.3949	495.9636	677.4328	844.5945	955.9778	954.8337	918.0585	833.1620	734.5577	547.4066	349.7340	250.6023 (83)
Total gains	752.0667	954.2259	1119.5611	1259.8407	1342.2983	1314.5213	1261.2218	1180.5075	1096.3864	936.2687	769.7679	695.5840 (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	48.4803	48.5657	48.6497	49.0481	49.1234	49.4769	49.4769	49.5429	49.3401	49.1234	48.9714	48.8134
alpha	4.2320	4.2377	4.2433	4.2699	4.2749	4.2985	4.2985	4.3029	4.2893	4.2749	4.2648	4.2542
util living area	0.9972	0.9920	0.9793	0.9441	0.8614	0.7115	0.5496	0.6022	0.8253	0.9648	0.9938	0.9980 (86)
MIT	19.4356	19.6655	19.9870	20.3756	20.7070	20.9109	20.9772	20.9664	20.8223	20.3741	19.8202	19.3922 (87)
Th 2	19.9617	19.9633	19.9649	19.9725	19.9739	19.9804	19.9804	19.9817	19.9779	19.9739	19.9710	19.9680 (88)
util rest of house	0.9964	0.9898	0.9733	0.9270	0.8183	0.6269	0.4330	0.4850	0.7575	0.9508	0.9917	0.9974 (89)
MIT 2	18.5297	18.7596	19.0789	19.4619	19.7667	19.9345	19.9733	19.9701	19.8722	19.4679	18.9207	18.4913 (90)
Living area fraction	18.6528	18.8827	19.2023	19.5861	19.8944	20.0672	20.1097	20.1055	20.0013	19.5910	19.0429	18.6137 (92)
MIT	18.6528	18.8827	19.2023	19.5861	19.8944	20.0672	20.1097	20.1055	20.0013	19.5910	19.0429	18.6137 (93)
Temperature adjustment												0.0000
adjusted MIT	18.6528	18.8827	19.2023	19.5861	19.8944	20.0672	20.1097	20.1055	20.0013	19.5910	19.0429	18.6137 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9950	0.9867	0.9676	0.9191	0.8145	0.6347	0.4485	0.5002	0.7593	0.9439	0.9891	0.9963 (94)
Useful gains	748.2927	941.4899	1083.2327	1157.9613	1093.2999	834.3625	565.6087	590.4748	832.4536	883.7782	761.3763	693.0370 (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	2406.4735	2340.3077	2122.3308	1770.9510	1355.9437	898.1936	576.6080	607.9579	972.2089	1487.7490	1982.3400	2400.1943 (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	1233.6865	940.0056	773.0890	441.3526	195.4070	0.0000	0.0000	0.0000	0.0000	449.3543	879.0938	1270.1251 (98)
Space heating												6182.1139 (98)
Space heating per m2	(98) / (4) =											42.3345 (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
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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	1544.3176	1215.7394	1246.9335	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8395	0.9031	0.8788	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1296.5237	1097.9056	1095.8216	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1660.8578	1595.6563	1503.7313	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	262.3206	370.3265	303.4848	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling													
Cooled fraction									FC = cooled area / (4) =			936.1319	(104)
Intermittency factor (Table 10b)												1.0000	(105)
Intermittency factor	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	65.5801	92.5816	75.8712	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling													
Space cooling per m2												234.0330	(107)
Energy for space heating												1.6026	(108)
Energy for space cooling												42.3345	(99)
Total												1.6026	(108)
Dwelling Fabric Energy Efficiency (DFEE)												43.9372	(109)
												43.9	(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	74.2300 (1b)	x 2.3900 (2b)	= 177.4097 (1b) - (3b)
First floor	71.8000 (1c)	x 2.6700 (2c)	= 191.7060 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	146.0300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 369.1157 (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																4 * 10 =	40.0000 (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) =					40.0000 / (5) =	0.1084 (8)	
Pressure test															Yes		
Measured/design AP50															5.0000		
Infiltration rate															0.3584 (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) =					0.3315 (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	0.4226	0.4144	0.4061	0.3646	0.3564	0.3149	0.3149	0.3066	0.3315	0.3564	0.3729	0.3895 (22b)					
Effective ac	0.5893	0.5858	0.5824	0.5665	0.5635	0.5496	0.5496	0.5470	0.5549	0.5635	0.5695	0.5759 (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 Semi-glazed door			2.1200	1.2000	2.5440			(26a)					
TER Opening Type (Uw = 1.40)			30.8500	1.3258	40.8996			(27)					
Ground Floor			74.2300	0.1300	9.6499			(28a)					
Brick and Block	184.1900	32.9700	151.2200	0.1800	27.2196			(29a)					
Pitched Roof	74.2300		74.2300	0.1300	9.6499			(30)					
Total net area of external elements Aum(A, m2)			332.6500					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	89.9630			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								14.9199 (36)					
Total fabric heat loss						(33) + (36) =		104.8829 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 71.7835	Feb 71.3611	Mar 70.9470	Apr 69.0020	May 68.6381	Jun 66.9440	Jul 66.9440	Aug 66.6303	Sep 67.5966	Oct 68.6381	Nov 69.3742	Dec 70.1439	(38)
Heat transfer coeff	176.6665	176.2440	175.8299	173.8849	173.5210	171.8270	171.8270	171.5133	172.4795	173.5210	174.2572	175.0268	(39)
Average = Sum(39)m / 12 =												173.8832	(39)
HLP	Jan 1.2098	Feb 1.2069	Mar 1.2041	Apr 1.1907	May 1.1883	Jun 1.1767	Jul 1.1767	Aug 1.1745	Sep 1.1811	Oct 1.1883	Nov 1.1933	Dec 1.1986	(40)
HLP (average)												1.1907	(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												2.9278 (42)
Average daily hot water use (litres/day)												103.7351 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	114.1086	109.9592	105.8098	101.6604	97.5110	93.3616	93.3616	97.5110	101.6604	105.8098	109.9592	114.1086 (44)
Energy conte	169.2198	148.0007	152.7235	133.1480	127.7587	110.2460	102.1592	117.2291	118.6292	138.2509	150.9117	163.8803 (45)
Energy content (annual)											Total = Sum(45)m =	1632.1570 (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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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)
	35.9592	31.4501	32.4537	28.2940	27.1487	23.4273	21.7088	24.9112	25.2087	29.3783	32.0687	34.8246 (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	146.3897	146.3897	146.3897	146.3897	146.3897	146.3897	146.3897	146.3897	146.3897	146.3897	146.3897	146.3897	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.2526	25.0937	20.4076	15.4499	11.5490	9.7501	10.5353	13.6942	18.3804	23.3381	27.2390	29.0379	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	316.1700	319.4508	311.1832	293.5824	271.3644	250.4827	236.5325	233.2516	241.5193	259.1201	281.3380	302.2197	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6390	37.6390	37.6390	37.6390	37.6390	37.6390	37.6390	37.6390	37.6390	37.6390	37.6390	37.6390	(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)	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	(71)
Water heating gains (Table 5)	48.3323	46.8008	43.6206	39.2972	36.4902	32.5379	29.1785	33.4828	35.0121	39.4870	44.5399	46.8072	(72)
Total internal gains	459.6718	458.2623	442.1283	415.2463	386.3205	359.6877	343.1633	347.3456	361.8287	388.8621	420.0339	444.9817	(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
North	9.8200	10.6334	0.6300	0.7000	0.7700	31.9121 (74)
Northeast	0.7800	11.2829	0.6300	0.7000	0.7700	2.6896 (75)
East	2.0800	19.6403	0.6300	0.7000	0.7700	12.4848 (76)
Southeast	0.7800	36.7938	0.6300	0.7000	0.7700	8.7708 (77)
South	15.9500	46.7521	0.6300	0.7000	0.7700	227.8942 (78)
West	1.4400	19.6403	0.6300	0.7000	0.7700	8.6433 (80)

Solar gains	292.3949	495.9636	677.4328	844.5945	955.9778	954.8337	918.0585	833.1620	734.5577	547.4066	349.7340	250.6023	(83)
Total gains	752.0667	954.2259	1119.5611	1259.8407	1342.2983	1314.5213	1261.2218	1180.5075	1096.3864	936.2687	769.7679	695.5840	(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	57.4018	57.5394	57.6749	58.3200	58.4423	59.0185	59.0185	59.1265	58.7952	58.4423	58.1954	57.9395	
alpha	4.8268	4.8360	4.8450	4.8880	4.8962	4.9346	4.9346	4.9418	4.9197	4.8962	4.8797	4.8626	
util living area	0.9990	0.9966	0.9895	0.9656	0.8969	0.7498	0.5793	0.6350	0.8632	0.9802	0.9975	0.9993	(86)
MIT	19.6010	19.7991	20.0818	20.4334	20.7383	20.9270	20.9837	20.9748	20.8442	20.4336	19.9444	19.5686	(87)
Th 2	19.9122	19.9145	19.9167	19.9274	19.9294	19.9387	19.9387	19.9404	19.9351	19.9294	19.9254	19.9211	(88)
util rest of house	0.9986	0.9954	0.9856	0.9519	0.8550	0.6573	0.4497	0.5048	0.7936	0.9699	0.9964	0.9991	(89)
MIT 2	18.6352	18.8347	19.1171	19.4689	19.7504	19.9046	19.9346	19.9332	19.8480	19.4755	18.9887	18.6100	(90)
Living area fraction									fLA = Living area / (4) =			0.1359	(91)
MIT	18.7665	18.9657	19.2482	19.5999	19.8846	20.0435	20.0771	20.0748	19.9833	19.6056	19.1185	18.7403	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7665	18.9657	19.2482	19.5999	19.8846	20.0435	20.0771	20.0748	19.9833	19.6056	19.1185	18.7403	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9981	0.9939	0.9824	0.9466	0.8529	0.6674	0.4674	0.5224	0.7974	0.9657	0.9952	0.9987	(94)
Ext temp.	750.6180	948.4032	1099.8222	1192.5803	1144.8939	877.3263	589.4908	616.7259	874.2367	904.1412	766.0741	694.6622	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	16.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	2555.7372	2478.9966	2241.5106	1860.5597	1420.2019	935.3456	597.4623	630.2693	1014.7497	1562.6687	2094.3142	2544.9364	(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	1343.0086	1028.5588	849.4162	480.9451	204.8292	0.0000	0.0000	0.0000	0.0000	489.9445	956.3329	1376.6040	(98)
Space heating per m2													(98) / (4) = 46.0840 (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	1615.1734	1271.5195	1303.5007	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8429	0.9105	0.8851	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1361.3910	1157.7111	1153.7884	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1660.8578	1595.6563	1503.7313	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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	215.6161	325.8313	260.3575	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												801.8048 (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	53.9040	81.4578	65.0894	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												200.4512 (107)
Space cooling per m2												1.3727 (108)
Energy for space heating												46.0840 (99)
Energy for space cooling												1.3727 (108)
Total												47.4566 (109)
Target Fabric Energy Efficiency (TFEE)												54.6 (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	74.2300 (1b)	x 2.3900 (2b)	= 177.4097 (1b) - (3b)
First floor	71.8000 (1c)	x 2.6700 (2c)	= 191.7060 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	146.0300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 369.1157 (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					4 * 10 = 40.0000 (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)					40.0000 / (5) = 0.1084 (8)
Pressure test					Yes
Measured/design AP50					3.8200
Infiltration rate					0.2994 (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)	=	0.2769 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	3.9000	4.0000	3.8000	3.8000	3.7000	3.6000	3.5000	3.4000	3.7000	3.5000	3.7000 (22)
Wind factor	1.0500	0.9750	1.0000	0.9500	0.9500	0.9250	0.9000	0.8750	0.8500	0.9250	0.8750	0.9250 (22a)
Adj infilt rate												
Effective ac	0.2908	0.2700	0.2769	0.2631	0.2631	0.2561	0.2492	0.2423	0.2354	0.2561	0.2423	0.2561 (22b)
	0.5423	0.5364	0.5383	0.5346	0.5346	0.5328	0.5311	0.5294	0.5277	0.5328	0.5294	0.5328 (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		(26a)
Windows (Uw = 1.20)			30.8500	1.1450	35.3244		(27)
Ground Floor			74.2300	0.1100	8.1653	140.0000	10392.2000 (28a)
Brick and Block	184.1900	32.9700	151.2200	0.2400	36.2928	42.2200	6384.5084 (29a)
Pitched Roof	74.2300		74.2300	0.1000	7.4230	9.0000	668.0700 (30)
Total net area of external elements Aum(A, m ²)			332.6500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	89.5375		(33)
Ground Floor Block			65.1500			75.0000	4886.2500 (32c)
Ground Floor Stud			43.6400			9.0000	392.7600 (32c)
First Floor Block			48.7800			75.0000	3658.5000 (32c)
First Floor Timber			104.6400			9.0000	941.7600 (32c)
Internal Floor 1			71.8000			18.0000	1292.4000 (32d)
Internal Ceiling 1			71.8000			18.0000	1292.4000 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 29908.8484 (34)
204.8130 (35)
9.6326 (36)
(33) + (36) = 99.1701 (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	66.0530	65.3437	65.5743	65.1190	65.1190	64.9001	64.6870	64.4797	64.2783	64.9001	64.4797	64.9001 (38)
Heat transfer coeff	165.2232	164.5139	164.7445	164.2891	164.2891	164.0702	163.8571	163.6499	163.4485	164.0702	163.6499	164.0702 (39)
Average = Sum(39)m / 12 =												164.1563 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1314	1.1266	1.1282	1.1250	1.1250	1.1235	1.1221	1.1207	1.1193	1.1235	1.1207	1.1235 (40)
HLP (average)												1.1241 (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
Average daily hot water use (litres/day)
2.9278 (42)
103.7351 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	114.1086	109.9592	105.8098	101.6604	97.5110	93.3616	93.3616	97.5110	101.6604	105.8098	109.9592	114.1086 (44)
Energy conte	169.2198	148.0007	152.7235	133.1480	127.7587	110.2460	102.1592	117.2291	118.6292	138.2509	150.9117	163.8803 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Energy content (annual)												Total = Sum(45)m = 1632.1570 (45)
Distribution loss (46)m = 0.15 x (45)m												
25.3830	22.2001	22.9085	19.9722	19.1638	16.5369	15.3239	17.5844	17.7944	20.7376	22.6368	24.5820	(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	27.5671	24.8979	27.5540	26.6466	27.5147	26.5972	27.4651	27.4973	26.6221	27.5302	26.6640	27.5587 (61)
Total heat required for water heating calculated for each month												
196.7868	172.8986	180.2775	159.7946	155.2734	136.8432	129.6242	144.7264	145.2513	165.7811	177.5757	191.4391	(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	(63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
196.7868	172.8986	180.2775	159.7946	155.2734	136.8432	129.6242	144.7264	145.2513	165.7811	177.5757	191.4391	(64)
RHI water heating demand												
Heat gains from water heating, kWh/month												
63.1573	55.4347	57.6691	50.9334	49.3584	43.3061	40.8342	45.8530	46.0997	52.8510	56.8441	61.3799	(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	175.6676	175.6676	175.6676	175.6676	175.6676	175.6676	175.6676	175.6676	175.6676	175.6676	175.6676	175.6676 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	70.6316	62.7344	51.0190	38.6247	28.8724	24.3753	26.3384	34.2356	45.9510	58.3453	68.0976	72.5947 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	471.8955	476.7923	464.4525	438.1826	405.0216	373.8548	353.0336	348.1368	360.4765	386.7465	419.9075	451.0742 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.4946	55.4946	55.4946	55.4946	55.4946	55.4946	55.4946	55.4946	55.4946	55.4946	55.4946	55.4946 (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)	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117 (71)
Water heating gains (Table 5)	84.8889	82.4921	77.5122	70.7408	66.3420	60.1474	54.8847	61.6304	64.0274	71.0363	78.9502	82.4999 (72)
Total internal gains	744.4664	739.0692	710.0341	664.5985	617.2864	575.4279	551.3070	561.0532	587.5053	633.1784	684.0057	723.2192 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
North	9.8200	13.4839	0.6300	0.7000	0.7700	40.4668 (74)
Northeast	0.7800	14.6176	0.6300	0.7000	0.7700	3.4845 (75)
East	2.0800	25.1925	0.6300	0.7000	0.7700	16.0143 (76)
Southeast	0.7800	45.1778	0.6300	0.7000	0.7700	10.7694 (77)
South	15.9500	56.7559	0.6300	0.7000	0.7700	276.6580 (78)
West	1.4400	25.1925	0.6300	0.7000	0.7700	11.0868 (80)

Solar gains	358.4798	517.6392	715.1993	904.3331	980.2643	1067.1171	1016.5173	939.4415	821.3380	616.9016	427.3510	302.0772	(83)
Total gains	1102.9462	1256.7085	1425.2334	1568.9316	1597.5507	1642.5450	1567.8244	1500.4947	1408.8433	1250.0800	1111.3567	1025.2964	(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	50.2836	50.5004	50.4297	50.5695	50.5695	50.6369	50.7028	50.7670	50.8296	50.6369	50.7670	50.6369
alpha	4.3522	4.3667	4.3620	4.3713	4.3713	4.3758	4.3802	4.3845	4.3886	4.3758	4.3845	4.3758
util living area	0.9872	0.9774	0.9494	0.8808	0.7554	0.5474	0.4028	0.4195	0.6700	0.8945	0.9722	0.9900 (86)
MIT	19.8163	19.9786	20.2813	20.6172	20.8569	20.9728	20.9943	20.9934	20.9351	20.6552	20.1971	19.7850 (87)
Th 2	19.9752	19.9792	19.9779	19.9804	19.9804	19.9817	19.9828	19.9840	19.9851	19.9817	19.9840	19.9817 (88)
util rest of house	0.9837	0.9715	0.9359	0.8496	0.6946	0.4585	0.3002	0.3132	0.5833	0.8589	0.9633	0.9872 (89)
MIT 2	18.9162	19.0787	19.3717	19.6871	19.8905	19.9704	19.9815	19.9825	19.9533	19.7294	19.2992	18.8906 (90)
Living area fraction	19.0385	19.2010	19.4952	19.8135	20.0218	20.1066	20.1191	20.1198	20.0867	19.8552	19.4212	19.0121 (91)
MIT	19.0385	19.2010	19.4952	19.8135	20.0218	20.1066	20.1191	20.1198	20.0867	19.8552	19.4212	19.0121 (92)
Temperature adjustment	19.0385	19.2010	19.4952	19.8135	20.0218	20.1066	20.1191	20.1198	20.0867	19.8552	19.4212	19.0121 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9795	0.9656	0.9281	0.8437	0.6973	0.4699	0.3142	0.3277	0.5926	0.8537	0.9571	0.9836	(94)
Useful gains	1080.3271	1213.5226	1322.7652	1323.7282	1114.0202	771.7537	492.5387	491.6408	834.8744	1067.2246	1063.6355	1008.4873	(95)
Ext temp.	4.9000	5.3000	7.0000	9.5000	12.5000	15.3000	17.1000	17.1000	14.7000	11.4000	7.9000	5.0000	(96)
Heat loss rate W	2336.0119	2286.9047	2058.5229	1694.3884	1235.7489	788.6156	494.7080	494.1917	880.4533	1387.2488	1885.4444	2298.9723	(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	934.2295	721.3128	547.4037	266.8753	90.5662	0.0000	0.0000	0.0000	0.0000	238.0981	591.7024	960.1208	(98)
Space heating												4350.3088	(98)
RHI space heating demand												4350	(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	74.2300 (1b)	x 2.3900 (2b)	= 177.4097 (1b) - (3b)
First floor	71.8000 (1c)	x 2.6700 (2c)	= 191.7060 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	146.0300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 369.1157 (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					4 * 10 = 40.0000 (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)					40.0000 / (5) = 0.1084 (8)
Pressure test					Yes
Measured/design AP50					3.8200
Infiltration rate					0.2994 (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) =	0.2769 (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	0.3531	0.3461	0.3392	0.3046	0.2977	0.2631	0.2631	0.2561	0.2769	0.2977	0.3115	0.3254 (22b)
Effective ac	0.5623	0.5599	0.5575	0.5464	0.5443	0.5346	0.5346	0.5328	0.5383	0.5443	0.5485	0.5529 (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		(26a)
Windows (Uw = 1.20)			30.8500	1.1450	35.3244		(27)
Ground Floor			74.2300	0.1100	8.1653	140.0000	10392.2000 (28a)
Brick and Block	184.1900	32.9700	151.2200	0.2400	36.2928	42.2200	6384.5084 (29a)
Pitched Roof	74.2300		74.2300	0.1000	7.4230	9.0000	668.0700 (30)
Total net area of external elements Aum(A, m ²)			332.6500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	89.5375		(33)
Ground Floor Block			65.1500			75.0000	4886.2500 (32c)
Ground Floor Stud			43.6400			9.0000	392.7600 (32c)
First Floor Block			48.7800			75.0000	3658.5000 (32c)
First Floor Timber			104.6400			9.0000	941.7600 (32c)
Internal Floor 1			71.8000			18.0000	1292.4000 (32d)
Internal Ceiling 1			71.8000			18.0000	1292.4000 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 29908.8484 (34)
204.8130 (35)
9.6326 (36)
(33) + (36) = 99.1701 (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	68.4961	68.2013	67.9124	66.5551	66.3011	65.1190	65.1190	64.9001	65.5743	66.3011	66.8148	67.3519 (38)
Heat transfer coeff	167.6663	167.3715	167.0825	165.7252	165.4713	164.2891	164.2891	164.0702	164.7445	165.4713	165.9850	166.5221 (39)
Average = Sum(39)m / 12 =												165.7240 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1482	1.1461	1.1442	1.1349	1.1331	1.1250	1.1250	1.1235	1.1282	1.1331	1.1366	1.1403 (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												2.9278 (42)
Average daily hot water use (litres/day)												103.7351 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	114.1086	109.9592	105.8098	101.6604	97.5110	93.3616	93.3616	97.5110	101.6604	105.8098	109.9592	114.1086 (44)
	169.2198	148.0007	152.7235	133.1480	127.7587	110.2460	102.1592	117.2291	118.6292	138.2509	150.9117	163.8803 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Energy content (annual)	Total = Sum(45)m = 1632.1570 (45)										
Distribution loss (46)m = 0.15 x (45)m											
25.3830	22.2001	22.9085	19.9722	19.1638	16.5369	15.3239	17.5844	17.7944	20.7376	22.6368	24.5820 (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	27.5671	24.8979	27.5540	26.6466	27.5147	26.5972	27.4651	27.4973	26.6221	27.5302	26.6640 (61)
Total heat required for water heating calculated for each month											
196.7868	172.8986	180.2775	159.7946	155.2734	136.8432	129.6242	144.7264	145.2513	165.7811	177.5757	191.4391 (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 (63)
Solar input (sum of months) = Sum(63)m =	0.0000 (63)										
Output from w/h											
196.7868	172.8986	180.2775	159.7946	155.2734	136.8432	129.6242	144.7264	145.2513	165.7811	177.5757	191.4391 (64)
Heat gains from water heating, kWh/month											
63.1573	55.4347	57.6691	50.9334	49.3584	43.3061	40.8342	45.8530	46.0997	52.8510	56.8441	61.3799 (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	175.6676	175.6676	175.6676	175.6676	175.6676	175.6676	175.6676	175.6676	175.6676	175.6676	175.6676	175.6676 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	70.6316	62.7344	51.0190	38.6247	28.8724	24.3753	26.3384	34.2356	45.9510	58.3453	68.0976	72.5947 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	471.8955	476.7923	464.4525	438.1826	405.0216	373.8548	353.0336	348.1368	360.4765	386.7465	419.9075	451.0742 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.4946	55.4946	55.4946	55.4946	55.4946	55.4946	55.4946	55.4946	55.4946	55.4946	55.4946	55.4946 (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)	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117 (71)
Water heating gains (Table 5)	84.8889	82.4921	77.5122	70.7408	66.3420	60.1474	54.8847	61.6304	64.0274	71.0363	78.9502	82.4999 (72)
Total internal gains	744.4664	739.0692	710.0341	664.5985	617.2864	575.4279	551.3070	561.0532	587.5053	633.1784	684.0057	723.2192 (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	
North				9.8200	10.6334	0.6300	0.7000		0.7700		31.9121 (74)	
Northeast				0.7800	11.2829	0.6300	0.7000		0.7700		2.6896 (75)	
East				2.0800	19.6403	0.6300	0.7000		0.7700		12.4848 (76)	
Southeast				0.7800	36.7938	0.6300	0.7000		0.7700		8.7708 (77)	
South				15.9500	46.7521	0.6300	0.7000		0.7700		227.8942 (78)	
West				1.4400	19.6403	0.6300	0.7000		0.7700		8.6433 (80)	
Solar gains	292.3949	495.9636	677.4328	844.5945	955.9778	954.8337	918.0585	833.1620	734.5577	547.4066	349.7340	250.6023 (83)
Total gains	1036.8614	1235.0328	1387.4669	1509.1930	1573.2642	1530.2616	1469.3656	1394.2151	1322.0631	1180.5850	1033.7397	973.8215 (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	49.5509	49.6382	49.7240	50.1313	50.2082	50.5695	50.5695	50.6369	50.4297	50.2082	50.0528	49.8914
alpha	4.3034	4.3092	4.3149	4.3421	4.3472	4.3713	4.3713	4.3758	4.3620	4.3472	4.3369	4.3261
util living area	0.9912	0.9809	0.9593	0.9078	0.8039	0.6390	0.4805	0.5237	0.7475	0.9296	0.9828	0.9932 (86)
MIT	19.6697	19.8862	20.1799	20.5218	20.7936	20.9445	20.9872	20.9815	20.8880	20.5305	20.0284	19.6238 (87)
Th 2	19.9617	19.9633	19.9649	19.9725	19.9739	19.9804	19.9804	19.9817	19.9779	19.9739	19.9710	19.9680 (88)
util rest of house	0.9888	0.9759	0.9484	0.8827	0.7525	0.5543	0.3746	0.4159	0.6704	0.9050	0.9774	0.9913 (89)
MIT 2	18.7602	18.9751	19.2634	19.5940	19.8345	19.9534	19.9767	19.9757	19.9160	19.6104	19.1237	18.7196 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.8837	19.0989	19.3879	19.7201	19.9648	20.0881	20.1140	20.1124	20.0481	19.7354	19.2466	18.8425 (92)
Temperature adjustment												
adjusted MIT	18.8837	19.0989	19.3879	19.7201	19.9648	20.0881	20.1140	20.1124	20.0481	19.7354	19.2466	18.8425 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9855	0.9705	0.9409	0.8755	0.7520	0.5637	0.3889	0.4302	0.6762	0.8980	0.9723	0.9886 (94)
Useful gains	1021.8192	1198.5629	1305.4774	1321.3578	1183.1599	862.6822	571.3696	599.8324	893.9898	1060.2024	1005.1327	962.7055 (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	2445.2011	2376.4921	2153.3390	1793.1558	1367.5805	901.6337	577.3130	609.0931	979.9143	1511.6484	2016.1537	2438.2963 (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	1058.9961	791.5684	630.8090	339.6946	137.2089	0.0000	0.0000	0.0000	0.0000	335.8758	727.9351	1097.8395 (98)
Space heating												5119.9275 (98)
Space heating per m2											(98) / (4) =	35.0608 (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													5644.9035 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1058.9961	791.5684	630.8090	339.6946	137.2089	0.0000	0.0000	0.0000	0.0000	335.8758	727.9351	1097.8395	(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)	1167.5812	872.7325	695.4896	374.5254	151.2778	0.0000	0.0000	0.0000	0.0000	370.3151	802.5745	1210.4074	(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	196.7868	172.8986	180.2775	159.7946	155.2734	136.8432	129.6242	144.7264	145.2513	165.7811	177.5757	191.4391	(64)
Efficiency of water heater (217)m	90.2495	90.1850	90.0623	89.7850	89.1917	87.9000	87.9000	87.9000	87.9000	89.7552	90.1369	87.9000	(216)
Fuel for water heating, kWh/month	218.0476	191.7154	200.1696	177.9747	174.0896	155.6806	147.4678	164.6489	165.2461	184.7037	197.0066	212.0668	(219)
Water heating fuel used												2188.8174	(219)
Annual totals kWh/year													
Space heating fuel - main system												5644.9035	(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)												498.9505	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.24 * 1080 * 1.00) =										-1070.8884		-1070.8884	(233)
Total delivered energy for all uses												7336.7830	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	5644.9035	3.4800	196.4426 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2188.8174	3.4800	76.1708 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	498.9505	13.1900	65.8116 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-1070.8884	13.1900	-141.2502 (252)
Total energy cost			327.0674 (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] =	0.7191 (257)
SAP value		89.9687
SAP rating (Section 12)		90 (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	5644.9035	0.2160	1219.2992 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2188.8174	0.2160	472.7846 (264)
Space and water heating			1692.0837 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	498.9505	0.5190	258.9553 (268)
Energy saving/generation technologies			
PV Unit	-1070.8884	0.5190	-555.7911 (269)
Total kg/year			1434.1729 (272)
CO2 emissions per m2			9.8200 (273)
EI value			89.9398
EI rating			90 (274)
EI band			B

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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	$3.48 / 0.8927 = 3.898$, stars = 4
Water heating environmental impact	$0.216 / 0.8927 = 0.2420$, 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	74.2300 (1b)	x 2.3900 (2b)	= 177.4097 (1b) - (3b)
First floor	71.8000 (1c)	x 2.6700 (2c)	= 191.7060 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	146.0300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 369.1157 (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					4 * 10 = 40.0000 (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) =				40.0000 / (5) =	0.1084 (8)
Pressure test					Yes
Measured/design AP50					3.8200
Infiltration rate					0.2994 (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) =		0.2769 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	3.9000	4.0000	3.8000	3.8000	3.7000	3.6000	3.5000	3.4000	3.7000	3.5000	3.7000 (22)
Wind factor	1.0500	0.9750	1.0000	0.9500	0.9500	0.9250	0.9000	0.8750	0.8500	0.9250	0.8750	0.9250 (22a)
Adj infilt rate												
Effective ac	0.2908	0.2700	0.2769	0.2631	0.2631	0.2561	0.2492	0.2423	0.2354	0.2561	0.2423	0.2561 (22b)
	0.5423	0.5364	0.5383	0.5346	0.5346	0.5328	0.5311	0.5294	0.5277	0.5328	0.5294	0.5328 (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		(26a)
Windows (Uw = 1.20)			30.8500	1.1450	35.3244		(27)
Ground Floor			74.2300	0.1100	8.1653	140.0000	10392.2000 (28a)
Brick and Block	184.1900	32.9700	151.2200	0.2400	36.2928	42.2200	6384.5084 (29a)
Pitched Roof	74.2300		74.2300	0.1000	7.4230	9.0000	668.0700 (30)
Total net area of external elements Aum(A, m ²)			332.6500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	89.5375		(33)
Ground Floor Block			65.1500			75.0000	4886.2500 (32c)
Ground Floor Stud			43.6400			9.0000	392.7600 (32c)
First Floor Block			48.7800			75.0000	3658.5000 (32c)
First Floor Timber			104.6400			9.0000	941.7600 (32c)
Internal Floor 1			71.8000			18.0000	1292.4000 (32d)
Internal Ceiling 1			71.8000			18.0000	1292.4000 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 29908.8484 (34)
204.8130 (35)
9.6326 (36)
(33) + (36) = 99.1701 (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	66.0530	65.3437	65.5743	65.1190	65.1190	64.9001	64.6870	64.4797	64.2783	64.9001	64.4797	64.9001 (38)
Heat transfer coeff	165.2232	164.5139	164.7445	164.2891	164.2891	164.0702	163.8571	163.6499	163.4485	164.0702	163.6499	164.0702 (39)
Average = Sum(39)m / 12 =												164.1563 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1314	1.1266	1.1282	1.1250	1.1250	1.1235	1.1221	1.1207	1.1193	1.1235	1.1207	1.1235 (40)
HLP (average)												1.1241 (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
Average daily hot water use (litres/day)
2.9278 (42)
103.7351 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	114.1086	109.9592	105.8098	101.6604	97.5110	93.3616	93.3616	97.5110	101.6604	105.8098	109.9592	114.1086 (44)
Energy conte	169.2198	148.0007	152.7235	133.1480	127.7587	110.2460	102.1592	117.2291	118.6292	138.2509	150.9117	163.8803 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Energy content (annual)	Total = Sum(45)m = 1632.1570 (45)										
Distribution loss (46)m = 0.15 x (45)m											
25.3830	22.2001	22.9085	19.9722	19.1638	16.5369	15.3239	17.5844	17.7944	20.7376	22.6368	24.5820 (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	27.5671	24.8979	27.5540	26.6466	27.5147	26.5972	27.4651	27.4973	26.6221	27.5302	26.6640 (61)
Total heat required for water heating calculated for each month											
196.7868	172.8986	180.2775	159.7946	155.2734	136.8432	129.6242	144.7264	145.2513	165.7811	177.5757	191.4391 (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 (63)
Solar input (sum of months) = Sum(63)m =	0.0000 (63)										
Output from w/h											
196.7868	172.8986	180.2775	159.7946	155.2734	136.8432	129.6242	144.7264	145.2513	165.7811	177.5757	191.4391 (64)
Heat gains from water heating, kWh/month											
63.1573	55.4347	57.6691	50.9334	49.3584	43.3061	40.8342	45.8530	46.0997	52.8510	56.8441	61.3799 (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	175.6676	175.6676	175.6676	175.6676	175.6676	175.6676	175.6676	175.6676	175.6676	175.6676	175.6676	175.6676 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	70.6316	62.7344	51.0190	38.6247	28.8724	24.3753	26.3384	34.2356	45.9510	58.3453	68.0976	72.5947 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	471.8955	476.7923	464.4525	438.1826	405.0216	373.8548	353.0336	348.1368	360.4765	386.7465	419.9075	451.0742 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.4946	55.4946	55.4946	55.4946	55.4946	55.4946	55.4946	55.4946	55.4946	55.4946	55.4946	55.4946 (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)	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117	-117.1117 (71)
Water heating gains (Table 5)	84.8889	82.4921	77.5122	70.7408	66.3420	60.1474	54.8847	61.6304	64.0274	71.0363	78.9502	82.4999 (72)
Total internal gains	744.4664	739.0692	710.0341	664.5985	617.2864	575.4279	551.3070	561.0532	587.5053	633.1784	684.0057	723.2192 (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	
North				9.8200	13.4839	0.6300	0.7000		0.7700		40.4668 (74)	
Northeast				0.7800	14.6176	0.6300	0.7000		0.7700		3.4845 (75)	
East				2.0800	25.1925	0.6300	0.7000		0.7700		16.0143 (76)	
Southeast				0.7800	45.1778	0.6300	0.7000		0.7700		10.7694 (77)	
South				15.9500	56.7559	0.6300	0.7000		0.7700		276.6580 (78)	
West				1.4400	25.1925	0.6300	0.7000		0.7700		11.0868 (80)	
Solar gains	358.4798	517.6392	715.1993	904.3331	980.2643	1067.1171	1016.5173	939.4415	821.3380	616.9016	427.3510	302.0772 (83)
Total gains	1102.9462	1256.7085	1425.2334	1568.9316	1597.5507	1642.5450	1567.8244	1500.4947	1408.8433	1250.0800	1111.3567	1025.2964 (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	50.2836	50.5004	50.4297	50.5695	50.5695	50.6369	50.7028	50.7670	50.8296	50.6369	50.7670	50.6369
alpha	4.3522	4.3667	4.3620	4.3713	4.3713	4.3758	4.3802	4.3845	4.3886	4.3758	4.3845	4.3758
util living area	0.9872	0.9774	0.9494	0.8808	0.7554	0.5474	0.4028	0.4195	0.6700	0.8945	0.9722	0.9900 (86)
MIT	19.8163	19.9786	20.2813	20.6172	20.8569	20.9728	20.9943	20.9934	20.9351	20.6552	20.1971	19.7850 (87)
Th 2	19.9752	19.9792	19.9779	19.9804	19.9804	19.9817	19.9828	19.9840	19.9851	19.9817	19.9840	19.9817 (88)
util rest of house	0.9837	0.9715	0.9359	0.8496	0.6946	0.4585	0.3002	0.3132	0.5833	0.8589	0.9633	0.9872 (89)
MIT 2	18.9162	19.0787	19.3717	19.6871	19.8905	19.9704	19.9815	19.9825	19.9533	19.7294	19.2992	18.8906 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.0385	19.2010	19.4952	19.8135	20.0218	20.1066	20.1191	20.1198	20.0867	19.8552	19.4212	19.0121 (92)
Temperature adjustment												
adjusted MIT	19.0385	19.2010	19.4952	19.8135	20.0218	20.1066	20.1191	20.1198	20.0867	19.8552	19.4212	19.0121 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9795	0.9656	0.9281	0.8437	0.6973	0.4699	0.3142	0.3277	0.5926	0.8537	0.9571	0.9836	(94)
Useful gains	1080.3271	1213.5226	1322.7652	1323.7282	1114.0202	771.7537	492.5387	491.6408	834.8744	1067.2246	1063.6355	1008.4873	(95)
Ext temp.	4.9000	5.3000	7.0000	9.5000	12.5000	15.3000	17.1000	17.1000	14.7000	11.4000	7.9000	5.0000	(96)
Heat loss rate W													
	2336.0119	2286.9047	2058.5229	1694.3884	1235.7489	788.6156	494.7080	494.1917	880.4533	1387.2488	1885.4444	2298.9723	(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													
	934.2295	721.3128	547.4037	266.8753	90.5662	0.0000	0.0000	0.0000	0.0000	238.0981	591.7024	960.1208	(98)
Space heating													
Space heating per m2													
	(98) / (4) =												29.7905 (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													4796.3713 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	934.2295	721.3128	547.4037	266.8753	90.5662	0.0000	0.0000	0.0000	0.0000	238.0981	591.7024	960.1208	(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)	1030.0215	795.2732	603.5322	294.2396	99.8524	0.0000	0.0000	0.0000	0.0000	262.5116	652.3731	1058.5676	(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	196.7868	172.8986	180.2775	159.7946	155.2734	136.8432	129.6242	144.7264	145.2513	165.7811	177.5757	191.4391	(64)
Efficiency of water heater (217)m	90.2001	90.1448	89.9898	89.6307	88.9112	87.9000	87.9000	87.9000	87.9000	89.5294	90.0379	87.9000	(216)
Fuel for water heating, kWh/month	218.1671	191.8010	200.3309	178.2811	174.6388	155.6806	147.4678	164.6489	165.2461	185.1695	197.2232	212.1861	(219)
Water heating fuel used												2190.8412	(219)
Annual totals kWh/year													
Space heating fuel - main system												4796.3713	(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)												498.9505	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.24 * 1208 * 1.00) =										-1198.4858		-1198.4858	(233)
Total delivered energy for all uses												6362.6771	(238)

10a. Fuel costs - using BEDF prices (511)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4796.3713	4.2600	204.3254 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2190.8412	4.2600	93.3298 (247)
Pumps and fans for heating	75.0000	22.5500	16.9125 (249)
Energy for lighting	498.9505	22.5500	112.5133 (250)
Additional standing charges			96.0000 (251)
Energy saving/generation technologies			
PV Unit	-1198.4858	22.5500	-270.2586 (252)
Total energy cost			252.8225 (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	4796.3713	0.2160	1036.0162 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2190.8412	0.2160	473.2217 (264)
Space and water heating			1509.2379 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	498.9505	0.5190	258.9553 (268)
Energy saving/generation technologies			
PV Unit	-1198.4858	0.5190	-622.0141 (269)
Total kg/year			1185.1040 (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	4796.3713	1.2200	5851.5730 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2190.8412	1.2200	2672.8263 (264)
Space and water heating			8524.3992 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	498.9505	3.0700	1531.7779 (268)
Energy saving/generation technologies			
PV Unit	-1198.4858	3.0700	-3679.3515 (269)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Primary energy kWh/year
Primary energy kWh/m²/year

6607.0757 (272)
45.2446 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 90
Current environmental impact rating: B 90

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered
D	Not considered
E	Low energy lighting
F	Already installed
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N	Solar water heating
O	SAP increase too small
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U	Solar photovoltaic panels
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
L2	Not applicable
Q3	Not considered
O3	Not considered

Recommended measures: SAP change Cost change CO2 change
(none)

Measures omitted - SAP change or cost saving too small:
N Solar water heating + 0.9 -£ 33 -199 kg (16.8%)

Recommended measures Typical annual savings Energy Environmental
(none) efficiency impact
Total Savings £0 0.00 kg/m²

Potential energy efficiency rating: B 90
Potential environmental impact rating: B 90

Fuel prices for cost data on this page from database revision number 511 TEST (31 Jan 2023)
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	£129	£129	£0
Mains gas	£394	£394	£0
Space heating	£317	£317	£0
Water heating	£93	£93	£0
Lighting	£113	£113	£0
Generated (PV)	-£270	-£270	£0
Total cost of fuels	£253	£253	£0
Total cost of uses	£253	£253	£0
Delivered energy	44 kWh/m ²	44 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	1.2 tonnes	1.2 tonnes	0.0 tonnes
CO2 emissions per m ²	8 kg/m ²	8 kg/m ²	0 kg/m ²
Primary energy	45 kWh/m ²	45 kWh/m ²	0 kWh/m ²

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

No improvements selected / applicable

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

No improvements selected / applicable

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0645 Plot 1	Issued on Date	15/02/2023
Assessment Reference	As Built	Prop Type Ref	D
Project	1 Fieldfare Crescent, Botley, SOUTHAMPTON, SO32 2TW		
Calculation Type	New Build (As Built)		

SAP Rating	90 B	DER	11.31	TER	15.74
Environmental	90 B	% DER<TER	28.12		
CO ₂ Emissions (t/year)	1.19	DFEE	43.94	TFEE	54.58
General Requirements Compliance	Pass	% DFEE<TFEE	19.49		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.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 (%)
Ext surface				0.0400	
Layer 1	Mineral wool batt				
	Main construction	350	0.0380	9.2105	100.00
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 2	Mineral wool batt				
	Main construction	100	0.0380	2.6316	87.50
	Main construction	100	0.1300	0.7692	12.50
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 3	Plasterboard, standard				
	Main construction	12.5	0.2100	0.0595	100.00
Int surface				0.1000	

Total resistance: Upper limit = 11.772 m² K/W Lower limit = 11.430 m² K/W Average = 11.601 m² K/W
Total correction = 0.0096 m² K/W U-value (unrounded) = 0.1 W/m² K

Unheated space: None

Total thickness: 463 mm

U-value: 0.10 W/m² K

Kappa: n/a

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0645 Plot 1	Issued on Date	15/02/2023
Assessment Reference	As Built	Prop Type Ref	D
Project	1 Fieldfare Crescent, Botley, SOUTHAMPTON, SO32 2TW		
Calculation Type	New Build (As Built)		

SAP Rating	90 B	DER	11.31	TER	15.74
Environmental	90 B	% DER<TER	28.12		
CO ₂ Emissions (t/year)	1.19	DFEE	43.94	TFEE	54.58
General Requirements Compliance	Pass	% DFEE<TFEE	19.49		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.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 0645 Plot 1	Issued on Date	15/02/2023
Assessment Reference	As Built	Prop Type Ref	D
Project	1 Fieldfare Crescent, Botley, SOUTHAMPTON, SO32 2TW		
Calculation Type	New Build (As Built)		

SAP Rating	90 B	DER	11.31	TER	15.74
Environmental	90 B	% DER<TER	28.12		
CO ₂ Emissions (t/year)	1.19	DFEE	43.94	TFEE	54.58
General Requirements Compliance	Pass	% DFEE<TFEE	19.49		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com	Assessor ID	E477-0001
Client	Foreman Homes, FORE		

Building Elements

Floor 000003 - Floor - suspended beam-and-block floor

Floor Type: Suspended Floor

Area = 74.63 m², Perimeter = 37.51 m, Wall thickness = 300.00 mm, Soil: Clay

Depth of underfloor space below ground: 0.200 m Floor wind shielding: Average (suburban)

Floor height above ground: h = 0.000 m

U-value of walls above ground: U_w = 1.500 m

Ventilation openings per perimeter length: e = 0.0015 %

Mean wind speed: v = 5.000 m/s

Resistance on solum: R_g = 0.000 m²K/W

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				0.1700			
Layer 1	Extruded polystyrene						
	Main construction	100	0.0270	3.7037	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 2	Extruded polystyrene						
	Main construction	200	0.0270	7.4074	91.67		
	Main construction	200	2.3000	0.0870	8.33		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 3	Concrete, reinforced (1% steel)						
	Main construction	75	2.3000	0.0326	100.00	2000	1000
Layer 4	Screed						
	Main construction	75	1.1500	0.0652	100.00	1200	1000
Int surface				0.1700			

Total resistance: Upper limit = 10.093 m² K/W Lower limit = 5.066 m² K/W Average = 7.579 m² K/W
Total correction = 0.0025 m² K/W U-value (unrounded) = 0.11 W/m² K

Unheated space: None

Total thickness: 450 mm

U-value: 0.11 W/m² K

Kappa: 140.00 kJ/m² K

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Property Reference	SAP 0645 Plot 1			Issued on Date	15/02/2023	
Assessment Reference	As Built	Prop Type Ref	D			
Property	1 Fieldfare Crescent, Botley, SOUTHAMPTON, SO32 2TW					
SAP Rating		90 B	DER	11.31	TER	15.74
Environmental		90 B	% DER<TER	28.12		
CO ₂ Emissions (t/year)		1.19	DFEE	43.94	TFEE	54.58
General Requirements Compliance		Pass	% DFEE<TFEE	19.49		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001	
Client	Foreman Homes, FORE					

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

Orientation	North
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	House, Detached
2.0 Number of Storeys	2
3.0 Date Built	2019
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:	37.54 m	74.23 m ²	2.39 m
	1st Storey:	35.38 m	71.80 m ²	2.67 m

7.0 Living Area	19.84	m ²
8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	204.81	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	184.19	151.22

9.2 Internal Walls		Construction	Kappa (kJ/m ² K)	Area (m ²)
Description				
Ground Floor Block		Dense block, plasterboard on dabs	75.00	65.15
Ground Floor Stud		Plasterboard on timber frame	9.00	43.64
First Floor Block		Dense block, plasterboard on dabs	75.00	48.78
First Floor Timber		Plasterboard on timber frame	9.00	104.64

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	Plasterboard, insulated at ceiling level	0.10	9.00	74.23	74.23

10.2 Internal Ceilings		Construction	Kappa (kJ/m ² K)	Area (m ²)
Description				
Internal Ceiling 1		Plasterboard ceiling, carpeted chipboard floor	9.00	71.80

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)
Ground Floor	Ground Floor - Solid	Other	0.11	140.00	74.23

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	71.80

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Half Glazed Door	Double Low-E Soft 0.1			0.63		0.70	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 (m²)	Curtain Closed
North Elevation	Half Glazed Door	[1] Brick and Block	North							2.12	
North Elevation	Window	[1] Brick and Block	North	None	0.57	Yes				0.66	
North Elevation	Window	[1] Brick and Block	North	None	0.00					9.16	
North East Bay	Window	[1] Brick and Block	North East	None	0.00					0.78	
South East Bay	Window	[1] Brick and Block	South East	None	0.00					0.78	
East Elevation	Window	[1] Brick and Block	East	None	0.00					2.08	
South Elevation	Window	[1] Brick and Block	South	None	0.00					15.95	
West Elevation	Window	[1] Brick and Block	West	None	0.00					1.44	

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)	1.26	0.077	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	4.80	0.070	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.64	0.067	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	7.08	0.064	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	5.54	0.056	No	Birtley Supatherm
Table K1 - Default	E2 Other lintels (including other steel lintels)	1.80	1.000	No	
Independently assessed	E3 Sill	14.94	0.021	No	Birtley Supatherm
Independently assessed	E4 Jamb	38.70	0.016	No	Birtley Supatherm
Independently assessed	E5 Ground floor (normal)	37.54	0.062	No	BE-E5-23902
Independently assessed	E6 Intermediate floor within a dwelling	35.38	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	35.92	0.060	No	
Table K1 - Default	E24 Eaves (insulation at ceiling level - inverted)	4.06	0.240	No	
Independently assessed	E12 Gable (insulation at ceiling level)	4.36	0.044	No	Knauf P21
Independently assessed	E16 Corner (normal)	34.79	0.039	No	Knauf P23
Independently assessed	E17 Corner (inverted – internal area greater than external area)	15.52	-0.091	No	Knauf P24

Y-value 0.029 W/m²K

18.0 Pressure Testing

Yes

Designed AP₅₀ 5.00 m³/(h.m²) @ 50 Pa

Property Tested ? Yes

As Built AP₅₀ 3.82 m³/(h.m²) @ 50 Pa

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

19.0 Mechanical Ventilation

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	No
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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				4
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	27	
Total number of L.E.L. fittings	27	
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

0 Main Heating 1		Database	
Description		Combi Boiler	
Percentage of Heat		100	%
Database Ref. No.		17515	
Fuel Type		Mains gas	
Main Heating		BGW	
SAP Code		104	
In Winter		90.7	
In Summer		87.9	
Controls		CBE Programmer, room thermostat and TRVs	
PCDF Controls		0	
Delayed Start Stat		No	
Sap Code		2106	
Flue Type		Balanced	
Fan Assisted Flue		Yes	
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

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

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			
32.0 Photovoltaic Unit	One Dwelling			
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
1.24	South	30°	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None