



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 6, Nuthatch Way
Botley, SO32 2UH

Contact: Tobias Whiting
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Report Issue Date: 03/01/2024

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0645 Plot 49	Issued on Date	03/01/2024
Assessment Reference	As Built	Prop Type Ref	Block L
Property	6, Nuthatch Way, Botley, SO32 2UH		
SAP Rating	88 B	DER	12.21
Environmental	91 B	TER	16.61
CO ₂ Emissions (t/year)	0.73	% DER<TER	26.48
General Requirements Compliance	Pass	DfEE	33.93
		TfEE	43.26
		% DfEE<TfEE	21.55
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)	16.61	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	12.21	kgCO ₂ /m ²	Pass
	-4.40 (-26.5%)	kgCO ₂ /m ²	

1b TfEE and DfEE

Target Fabric Energy Efficiency (TfEE)	43.26	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DfEE)	33.93	kWh/m ² /yr	
	-9.4 (-21.7%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	Pass
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	Pass
Openings	1.18 (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	4.41 (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)

Not significant

Pass

Based on:

Overshading

Average

Windows facing North East

3.67 m², No overhang

Windows facing South West

8.18 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

4.41 (measured in this dwelling)

m³/(h.m²) @ 50 Pa

Maximum

10.0

m³/(h.m²) @ 50 Pa

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Roof U-value

0.10

W/m²K

Floor U-value

0.10

W/m²K

Door U-value

1.10

W/m²K

Photovoltaic array

0.65

kW

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THERMAL BRIDGING

Calculation Type: New Build (As Built)

Property Reference	SAP 0645 Plot 49	Issued on Date	03/01/2024
Assessment Reference	As Built	Prop Type Ref	Block L
Property	6, Nuthatch Way, Botley, SO32 2UH		

SAP Rating	88 B	DER	12.21	TER	16.61
Environmental	91 B	% DER<TER	26.48		
CO ₂ Emissions (t/year)	0.73	DFEE	33.93	TFEE	43.26
General Requirements Compliance	Pass	% DFEE<TFEE	21.55		

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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	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.093	0.49	0.05	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.071	3.76	0.27	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.067	3.91	0.26	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.064	1.77	0.11	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.021	7.40	0.16	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	24.60	0.39	Knauf P6
External wall	E5 Ground floor (normal)	Independently assessed	0.062	10.02	0.62	Be-E5-23902
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	10.02	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	10.02	0.60	
External wall	E18 Party wall between dwellings	Independently assessed	0.036	5.05	0.18	Knauf P25 Halved
External wall	E25 Staggered party wall between dwellings	Independently assessed	0.055	5.05	0.28	Knauf P27 Halved
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.160	16.94	2.71	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	16.94	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	0.035	16.94	0.59	Knauf P29 Halved

Total: **6.22** W/mK:
Y-Value: **0.046** W/m²K:

FULL SAP CALCULATION PRINTOUT

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

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

DWELLING AS BUILT

Mid-Terrace House, total floor area 84 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 16.61 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 12.21 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)43.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)33.9 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.18 (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: 4.41 (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): Not significant OK
Based on:
Overshading: Average
Windows facing North East: 3.67 m², No overhang
Windows facing South West: 8.18 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Floor U-value 0.10 W/m²K
Door U-value 1.10 W/m²K
Photovoltaic array 0.65 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.0100 (1b)	x 2.3900 (2b)	= 100.4039 (1b) - (3b)
First floor	42.0100 (1c)	x 2.6700 (2c)	= 112.1667 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.5706 (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) = 0.1882 (8)
Pressure test					Yes
Measured/design AP50					4.4100
Infiltration rate					0.4087 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)]	=	0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20)	=	0.3474 (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	0.4429	0.4342	0.4255	0.3821	0.3734	0.3300	0.3300	0.3213	0.3474	0.3734	0.3908	0.4082 (22b)
Effective ac	0.5981	0.5943	0.5905	0.5730	0.5697	0.5545	0.5545	0.5516	0.5603	0.5697	0.5764	0.5833 (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)			11.8500	1.1450	13.5687		(27)
Ground Floor			42.0100	0.1000	4.2010	140.0000	5881.4000 (28a)
Brick and Block	37.1300	11.7700	25.3600	0.2400	6.0864	42.2200	1070.6992 (29a)
External Cladding	14.4800	2.2000	12.2800	0.2400	2.9472	42.2200	518.4616 (29a)
Pitched Roof	42.0100		42.0100	0.1000	4.2010	9.0000	378.0900 (30)
Total net area of external elements Aum(A, m ²)			135.6300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.3363		(33)
Party Wall 1			85.5400	0.0000	0.0000	110.0000	9409.4000 (32)
Ground Floor Block			46.9800			75.0000	3523.5000 (32c)
Ground Floor Stud			23.1800			9.0000	208.6200 (32c)
First Floor Stud			91.6300			9.0000	824.6700 (32c)
Internal Floor 1			42.0100			18.0000	756.1800 (32d)
Internal Ceiling 1			42.0100			18.0000	756.1800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	23327.2008 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							277.6387 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.2221 (36)
Total fabric heat loss						(33) + (36) =	39.5584 (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	41.9543	41.6871	41.4252	40.1952	39.9651	38.8938	38.8938	38.6954	39.3064	39.9651	40.4307	40.9174 (38)
Heat transfer coeff	81.5127	81.2455	80.9836	79.7536	79.5235	78.4522	78.4522	78.2538	78.8648	79.5235	79.9890	80.4757 (39)
Average = Sum(39)m / 12 =												79.7525 (39)
HLP	0.9702	0.9670	0.9639	0.9492	0.9465	0.9337	0.9337	0.9314	0.9386	0.9465	0.9520	0.9578 (40)
HLP (average)												0.9492 (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												2.5347 (42)
Average daily hot water use (litres/day)												94.3998 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	103.8397	100.0637	96.2877	92.5118	88.7358	84.9598	84.9598	88.7358	92.5118	96.2877	100.0637	103.8397 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy conte	153.9913	134.6818	138.9795	121.1657	116.2614	100.3248	92.9656	106.6794	107.9535	125.8094	137.3308	149.1324 (45)
Energy content (annual)										Total =	Sum (45)m =	1485.2757 (45)
Distribution loss (46)m = 0.15 x (45)m	23.0987	20.2023	20.8469	18.1749	17.4392	15.0487	13.9448	16.0019	16.1930	18.8714	20.5996	22.3699 (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	27.5591	24.8897	27.5304	26.6128	27.4783	26.5671	27.4372	27.4639	26.5920	27.5089	26.6557	27.5510 (61)
Total heat required for water heating calculated for each month	181.5504	159.5715	166.5100	147.7785	143.7397	126.8919	120.4028	134.1433	134.5455	153.3183	163.9865	176.6834 (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	181.5504	159.5715	166.5100	147.7785	143.7397	126.8919	120.4028	134.1433	134.5455	153.3183	163.9865	176.6834 (64)
Heat gains from water heating, kWh/month	58.0919	51.0041	53.0933	46.9408	45.5265	39.9998	37.7704	42.3369	42.5425	48.7088	52.3264	56.4743 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	126.7363	126.7363	126.7363	126.7363	126.7363	126.7363	126.7363	126.7363	126.7363	126.7363	126.7363	126.7363 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.7368	19.3064	15.7011	11.8867	8.8855	7.5015	8.1056	10.5360	14.1414	17.9557	20.9570	22.3409 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	227.6369	229.9990	224.0465	211.3742	195.3776	180.3432	170.2992	167.9371	173.8897	186.5620	202.5585	217.5929 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6736	35.6736	35.6736	35.6736	35.6736	35.6736	35.6736	35.6736	35.6736	35.6736	35.6736	35.6736 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891 (71)
Water heating gains (Table 5)	78.0805	75.8990	71.3620	65.1955	61.1915	55.5552	50.7666	56.9044	59.0869	65.4689	72.6756	75.9063 (72)
Total internal gains	391.4751	389.2253	375.1304	352.4773	329.4755	307.4208	293.1924	299.3984	311.1388	334.0074	360.2119	379.8610 (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
Northeast				3.6700	11.2829	0.6300	0.7000			0.7700			12.6549 (75)
Southwest				8.1800	36.7938	0.6300	0.7000			0.7700			91.9814 (79)
Solar gains	104.6364	182.4379	260.7847	341.8393	399.9702	404.5915	386.9426	342.4256	288.6738	204.6432	126.0957	89.0516	(83)
Total gains	496.1114	571.6632	635.9150	694.3166	729.4458	712.0123	680.1350	641.8240	599.8126	538.6506	486.3076	468.9126	(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	79.4941	79.7555	80.0134	81.2475	81.4826	82.5953	82.5953	82.8047	82.1631	81.4826	81.0083	80.5184
alpha	6.2996	6.3170	6.3342	6.4165	6.4322	6.5064	6.5064	6.5203	6.4775	6.4322	6.4006	6.3679
util living area	0.9989	0.9970	0.9905	0.9628	0.8713	0.6821	0.5045	0.5551	0.8206	0.9769	0.9972	0.9992 (86)
MIT	20.0825	20.2173	20.4224	20.6846	20.8893	20.9825	20.9978	20.9961	20.9446	20.6799	20.3335	20.0617 (87)
Th 2	20.1083	20.1109	20.1136	20.1259	20.1282	20.1389	20.1389	20.1409	20.1348	20.1282	20.1235	20.1186 (88)
util rest of house	0.9985	0.9959	0.9868	0.9482	0.8262	0.6005	0.4075	0.4546	0.7490	0.9650	0.9959	0.9989 (89)
MIT 2	19.2676	19.4041	19.6096	19.8738	20.0562	20.1315	20.1384	20.1399	20.1063	19.8750	19.5309	19.2555 (90)
Living area fraction	19.4330	19.5692	19.7746	20.0385	20.2254	20.3043	20.3129	20.3137	20.2765	20.0384	19.6938	19.4192 (92)
MIT	19.4330	19.5692	19.7746	20.0385	20.2254	20.3043	20.3129	20.3137	20.2765	20.0384	19.6938	19.4192 (93)
Temperature adjustment												0.0000
adjusted MIT	19.4330	19.5692	19.7746	20.0385	20.2254	20.3043	20.3129	20.3137	20.2765	20.0384	19.6938	19.4192 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	495.1548	568.7800	626.3749	657.1393	606.7441	439.1551	290.6151	304.9736	456.9861	518.9785	483.9185	468.2719 (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	1233.5342	1191.8089	1075.0289	888.3316	677.9695	447.5117	291.2852	306.2649	487.1118	750.5760	1007.3680	1224.7754 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	549.3543	418.6755	333.7986	166.4585	52.9917	0.0000	0.0000	0.0000	0.0000	172.3085	376.8837	562.8386 (98)
Space heating												2633.3093 (98)
Space heating per m ²												31.3415 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2903.3178 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	549.3543	418.6755	333.7986	166.4585	52.9917	0.0000	0.0000	0.0000	0.0000	172.3085	376.8837	562.8386	(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)	605.6828	461.6047	368.0249	183.5264	58.4252	0.0000	0.0000	0.0000	0.0000	189.9763	415.5278	620.5497	(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	181.5504	159.5715	166.5100	147.7785	143.7397	126.8919	120.4028	134.1433	134.5455	153.3183	163.9865	176.6834	(64)
Efficiency of water heater (217)m	89.9880	89.9097	89.7485	89.3613	88.6371	87.9000	87.9000	87.9000	87.9000	89.3598	89.8324	90.0149	(216)
Fuel for water heating, kWh/month	201.7496	177.4798	185.5295	165.3718	162.1666	144.3593	136.9771	152.6090	153.0665	171.5742	182.5471	196.2823	(219)
Water heating fuel used												2029.7129	(219)
Annual totals kWh/year													
Space heating fuel - main system												2903.3178	(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)													383.8789 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.65 * 1029 * 1.00) =										-535.1771		-535.1771	(233)
Total delivered energy for all uses												4856.7326	(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	2903.3178	0.2160	627.1167	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2029.7129	0.2160	438.4180	(264)
Space and water heating			1065.5346	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	383.8789	0.5190	199.2332	(268)
Energy saving/generation technologies				
PV Unit	-535.1771	0.5190	-277.7569	(269)
Total CO2, kg/year			1025.9359	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			12.2100	(273)

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

DER			12.2100	ZC1
Total Floor Area		TFA	84.0200	
Assumed number of occupants		N	2.5347	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			16.0548	ZC2
CO2 emissions from cooking, equation (L16)			2.1404	ZC3
Total CO2 emissions			30.4052	ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000	ZC7
Net CO2 emissions			30.4052	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.0100 (1b)	x 2.3900 (2b)	= 100.4039 (1b) - (3b)
First floor	42.0100 (1c)	x 2.6700 (2c)	= 112.1667 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.5706 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					30.0000 / (5) = 0.1411 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3911 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3325 (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	0.4239	0.4156	0.4073	0.3657	0.3574	0.3158	0.3158	0.3075	0.3325	0.3574	0.3740	0.3906 (22b)
Effective ac	0.5898	0.5864	0.5829	0.5669	0.5639	0.5499	0.5499	0.5473	0.5553	0.5639	0.5699	0.5763 (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)			11.8500	1.3258	15.7102		(27)
Ground Floor			42.0100	0.1300	5.4613		(28a)
Brick and Block	37.1300	11.7700	25.3600	0.1800	4.5648		(29a)
External Cladding	14.4800	2.2000	12.2800	0.1800	2.2104		(29a)
Pitched Roof	42.0100		42.0100	0.1300	5.4613		(30)
Total net area of external elements Aum(A, m ²)			135.6300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		35.9520		(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)							8.2949 (36)
Total fabric heat loss						(33) + (36) =	44.2469 (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	41.3763	41.1316	40.8917	39.7650	39.5542	38.5729	38.5729	38.3912	38.9509	39.5542	39.9806	40.4265 (38)
Heat transfer coeff	85.6232	85.3785	85.1386	84.0119	83.8011	82.8198	82.8198	82.6381	83.1978	83.8011	84.2276	84.6734 (39)
Average = Sum(39)m / 12 =												84.0109 (39)
HLP	1.0191	1.0162	1.0133	0.9999	0.9974	0.9857	0.9857	0.9836	0.9902	0.9974	1.0025	1.0078 (40)
HLP (average)												0.9999 (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												2.5347 (42)
Average daily hot water use (litres/day)												94.3998 (43)
Daily hot water use	103.8397	100.0637	96.2877	92.5118	88.7358	84.9598	84.9598	88.7358	92.5118	96.2877	100.0637	103.8397 (44)
Energy conte	153.9913	134.6818	138.9795	121.1657	116.2614	100.3248	92.9656	106.6794	107.9535	125.8094	137.3308	149.1324 (45)
Energy content (annual)										Total = Sum(45)m =		1485.2757 (45)
Distribution loss (46)m = 0.15 x (45)m	23.0987	20.2023	20.8469	18.1749	17.4392	15.0487	13.9448	16.0019	16.1930	18.8714	20.5996	22.3699 (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)

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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	50.9589	46.0274	49.0672	45.6222	45.2188	41.8980	43.2946	45.2188	45.6222	49.0672	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	204.9502	180.7092	188.0467	166.7880	161.4802	142.2227	136.2602	151.8982	153.5757	174.8766	186.6459	200.0913 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	204.9502	180.7092	188.0467	166.7880	161.4802	142.2227	136.2602	151.8982	153.5757	174.8766	186.6459	200.0913 (64)
Heat gains from water heating, kWh/month	63.9418	56.2885	58.4775	51.6932	49.9616	43.8325	41.7347	46.7756	47.3001	54.0984	57.9913	62.3262 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	126.7363	126.7363	126.7363	126.7363	126.7363	126.7363	126.7363	126.7363	126.7363	126.7363	126.7363	126.7363 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.7368	19.3064	15.7011	11.8867	8.8855	7.5015	8.1056	10.5360	14.1414	17.9557	20.9570	22.3409 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	227.6369	229.9990	224.0465	211.3742	195.3776	180.3432	170.2992	167.9371	173.8897	186.5620	202.5585	217.5929 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6736	35.6736	35.6736	35.6736	35.6736	35.6736	35.6736	35.6736	35.6736	35.6736	35.6736	35.6736 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891 (71)
Water heating gains (Table 5)	85.9433	83.7627	78.5988	71.7961	67.1527	60.8784	56.0950	62.8704	65.6946	72.7129	80.5434	83.7718 (72)
Total internal gains	399.3379	397.0891	382.3672	359.0778	335.4367	312.7440	298.5208	305.3644	317.7465	341.2515	368.0797	387.7266 (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			
Northeast				3.6700	11.2829	0.6300	0.7000	0.7700	12.6549 (75)			
Southwest				8.1800	36.7938	0.6300	0.7000	0.7700	91.9814 (79)			

Solar gains	104.6364	182.4379	260.7847	341.8393	399.9702	404.5915	386.9426	342.4256	288.6738	204.6432	126.0957	89.0516 (83)
Total gains	503.9743	579.5270	643.1518	700.9171	735.4069	717.3355	685.4634	647.7900	606.4203	545.8947	494.1755	476.7782 (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	68.1442	68.3395	68.5320	69.4511	69.6258	70.4508	70.4508	70.6057	70.1307	69.6258	69.2733	68.9086
alpha	5.5429	5.5560	5.5688	5.6301	5.6417	5.6967	5.6967	5.7070	5.6754	5.6417	5.6182	5.5939
util living area	0.9980	0.9952	0.9871	0.9582	0.8729	0.6993	0.5247	0.5749	0.8259	0.9721	0.9954	0.9985 (86)
MIT	19.9386	20.0859	20.3126	20.6036	20.8420	20.9672	20.9945	20.9911	20.9157	20.6081	20.2203	19.9140 (87)
Th 2	20.0675	20.0699	20.0723	20.0834	20.0855	20.0953	20.0953	20.0971	20.0915	20.0855	20.0813	20.0769 (88)
util rest of house	0.9973	0.9936	0.9827	0.9430	0.8295	0.6162	0.4205	0.4682	0.7561	0.9590	0.9936	0.9980 (89)
MIT 2	18.6462	18.8628	19.1933	19.6146	19.9294	20.0732	20.0932	20.0933	20.0241	19.6285	19.0679	18.6172 (90)
Living area fraction	18.9086	19.1111	19.4206	19.8154	20.1147	20.2547	20.2762	20.2756	20.2051	19.8274	19.3019	18.8805 (92)
Temperature adjustment	18.9086	19.1111	19.4206	19.8154	20.1147	20.2547	20.2762	20.2756	20.2051	19.8274	19.3019	18.8805 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	502.0187	574.4972	629.2960	657.1750	611.1489	453.1216	302.7920	317.3389	464.4373	520.9117	489.9486	475.3947 (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	1250.8360	1213.3246	1100.0385	917.0227	705.1600	468.3227	304.4614	320.2720	507.9340	773.2685	1027.7353	1243.0461 (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	557.1200	429.2920	350.2324	187.0904	69.9442	0.0000	0.0000	0.0000	0.0000	187.7534	387.2064	571.1326 (98)
Space heating												2739.7716 (98)
Space heating per m2										(98) / (4) =		32.6086 (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												2933.3743 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	557.1200	429.2920	350.2324	187.0904	69.9442	0.0000	0.0000	0.0000	0.0000	187.7534	387.2064	571.1326 (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)	596.4883	459.6274	374.9812	200.3109	74.8868	0.0000	0.0000	0.0000	0.0000	201.0208	414.5679	611.4910 (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	204.9502	180.7092	188.0467	166.7880	161.4802	142.2227	136.2602	151.8982	153.5757	174.8766	186.6459	200.0913 (64)
Efficiency of water heater (217)m	87.4421	87.1526	86.5950	85.3409	83.1063	80.3000	80.3000	80.3000	80.3000	85.2303	86.8471	80.3000 (216)
Fuel for water heating, kWh/month	234.3839	207.3480	217.1566	195.4373	194.3056	177.1142	169.6889	189.1634	191.2525	205.1813	214.9131	87.5432 (217)
Water heating fuel used												228.5628 (219)
Annual totals kWh/year												2424.5077 (219)
Space heating fuel - main system												2933.3743 (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)												383.8789 (232)
Total delivered energy for all uses												5816.7609 (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	2933.3743	0.2160	633.6088 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2424.5077	0.2160	523.6937 (264)
Space and water heating			1157.3025 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	383.8789	0.5190	199.2332 (268)
Total CO2, kg/m2/year			1395.4607 (272)
Emissions per m2 for space and water heating			13.7741 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3713 (272b)
Emissions per m2 for pumps and fans			0.4633 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.7741 * 1.00) + 2.3713 + 0.4633, rounded to 2 d.p.			16.6100 (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	42.0100 (1b)	x 2.3900 (2b)	= 100.4039 (1b) - (3b)
First floor	42.0100 (1c)	x 2.6700 (2c)	= 112.1667 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.5706 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					30.0000 / (5) = 0.1411 (8)
Pressure test					Yes
Measured/design AP50					4.4100
Infiltration rate					0.3616 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3074 (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	0.3919	0.3842	0.3765	0.3381	0.3304	0.2920	0.2920	0.2843	0.3074	0.3304	0.3458	0.3612 (22b)
Effective ac	0.5768	0.5738	0.5709	0.5572	0.5546	0.5426	0.5426	0.5404	0.5472	0.5546	0.5598	0.5652 (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)			11.8500	1.1450	13.5687		(27)
Ground Floor			42.0100	0.1000	4.2010	140.0000	5881.4000 (28a)
Brick and Block	37.1300	11.7700	25.3600	0.2400	6.0864	42.2200	1070.6992 (29a)
External Cladding	14.4800	2.2000	12.2800	0.2400	2.9472	42.2200	518.4616 (29a)
Pitched Roof	42.0100		42.0100	0.1000	4.2010	9.0000	378.0900 (30)
Total net area of external elements Aum(A, m ²)			135.6300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.3363		(33)
Party Wall 1			85.5400	0.0000	0.0000	110.0000	9409.4000 (32)
Ground Floor Block			46.9800			75.0000	3523.5000 (32c)
Ground Floor Stud			23.1800			9.0000	208.6200 (32c)
First Floor Stud			91.6300			9.0000	824.6700 (32c)
Internal Floor 1			42.0100			18.0000	756.1800 (32d)
Internal Ceiling 1			42.0100			9.0000	378.0900 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	22949.1108 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							273.1387 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.2221 (36)
Total fabric heat loss						(33) + (36) =	39.5584 (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	40.4615	40.2523	40.0472	39.0841	38.9039	38.0650	38.0650	37.9097	38.3882	38.9039	39.2684	39.6495 (38)
Heat transfer coeff	80.0198	79.8107	79.6056	78.6425	78.4623	77.6234	77.6234	77.4681	77.9465	78.4623	78.8268	79.2079 (39)
Average = Sum(39)m / 12 =												78.6416 (39)
HLP	0.9524	0.9499	0.9475	0.9360	0.9339	0.9239	0.9239	0.9220	0.9277	0.9339	0.9382	0.9427 (40)
HLP (average)												0.9360 (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												2.5347 (42)
Average daily hot water use (litres/day)												94.3998 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	103.8397	100.0637	96.2877	92.5118	88.7358	84.9598	84.9598	88.7358	92.5118	96.2877	100.0637	103.8397 (44)

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Energy conte	153.9913	134.6818	138.9795	121.1657	116.2614	100.3248	92.9656	106.6794	107.9535	125.8094	137.3308	149.1324 (45)
Energy content (annual)	Total = Sum (45)m = 1485.2757 (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	32.7232	28.6199	29.5332	25.7477	24.7055	21.3190	19.7552	22.6694	22.9401	26.7345	29.1828	31.6906 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	126.7363	126.7363	126.7363	126.7363	126.7363	126.7363	126.7363	126.7363	126.7363	126.7363	126.7363	126.7363	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.7368	19.3064	15.7011	11.8867	8.8855	7.5015	8.1056	10.5360	14.1414	17.9557	20.9570	22.3409	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	227.6369	229.9990	224.0465	211.3742	195.3776	180.3432	170.2992	167.9371	173.8897	186.5620	202.5585	217.5929	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6736	35.6736	35.6736	35.6736	35.6736	35.6736	35.6736	35.6736	35.6736	35.6736	35.6736	35.6736	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	(71)
Water heating gains (Table 5)	43.9827	42.5891	39.6951	35.7607	33.2064	29.6097	26.5527	30.4696	31.8613	35.9335	40.5317	42.5949	(72)
Total internal gains	354.3773	352.9155	340.4635	320.0425	298.4904	278.4753	265.9784	269.9636	280.9132	301.4720	325.0680	343.5497	(73)

6. Solar gains

[Jan]												Area m2		Solar flux Table 6a W/m2		Specific data or Table 6b		g		FF or Table 6c		Access factor Table 6d		Gains W	
Northeast												3.6700	11.2829		0.6300		0.7000		0.7700		12.6549		(75)		
Southwest												8.1800	36.7938		0.6300		0.7000		0.7700		91.9814		(79)		
Solar gains	104.6364	182.4379	260.7847	341.8393	399.9702	404.5915	386.9426	342.4256	288.6738	204.6432	126.0957	89.0516	(83)												
Total gains	459.0137	535.3534	601.2482	661.8818	698.4606	683.0668	652.9210	612.3891	569.5870	506.1152	451.1637	432.6013	(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	79.6646	79.8735	80.0792	81.0599	81.2461	82.1241	82.1241	82.2888	81.7837	81.2461	80.8704	80.4813	
alpha	6.3110	6.3249	6.3386	6.4040	6.4164	6.4749	6.4749	6.4859	6.4522	6.4164	6.3914	6.3654	
util living area	0.9992	0.9977	0.9923	0.9681	0.8833	0.6995	0.5193	0.5745	0.8397	0.9818	0.9980	0.9995	(86)
MIT	20.0541	20.1905	20.3985	20.6640	20.8781	20.9794	20.9973	20.9951	20.9356	20.6549	20.3027	20.0302	(87)
Th 2	20.1232	20.1253	20.1273	20.1370	20.1388	20.1473	20.1473	20.1488	20.1440	20.1388	20.1352	20.1313	(88)
util rest of house	0.9989	0.9969	0.9893	0.9553	0.8410	0.6183	0.4208	0.4723	0.7716	0.9722	0.9971	0.9993	(89)
MIT 2	19.2528	19.3905	19.5988	19.8653	20.0580	20.1383	20.1466	20.1475	20.1098	19.8616	19.5110	19.2357	(90)
Living area fraction	19.4155	19.5530	19.7612	20.0275	20.2245	20.3091	20.3193	20.3196	20.2775	20.0227	19.6718	19.3971	(92)
MIT	19.4155	19.5530	19.7612	20.0275	20.2245	20.3091	20.3193	20.3196	20.2775	20.0227	19.6718	19.3971	(93)
Temperature adjustment													0.0000
adjusted MIT	19.4155	19.5530	19.7612	20.0275	20.2245	20.3091	20.3193	20.3196	20.2775	20.0227	19.6718	19.3971	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	458.3837	533.2741	593.8281	631.0045	590.6988	433.3196	287.8896	302.0182	446.2356	491.1851	449.5506	432.1903	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1209.5397	1169.4624	1055.6628	875.0918	668.8540	443.1580	288.7085	303.6446	481.5113	739.3242	990.9925	1203.7273	(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	558.8600	427.5186	343.6050	175.7429	58.1475	0.0000	0.0000	0.0000	0.0000	184.6154	389.8382	574.0236	(98)
Space heating													2712.3511 (98)
Space heating per m2													(98) / (4) = 32.2822 (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	729.6600	574.4132	588.7573	0.0000	0.0000	0.0000	0.0000	(100)

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Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9368	0.9739	0.9623	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	683.5307	559.4352	566.5381	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	893.8692	856.7028	811.1372	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												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	151.4437	221.1671	181.9818	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												554.5926 (104)
Cooled fraction									FC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)												
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												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	37.8609	55.2918	45.4954	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												138.6482 (107)
Space cooling per m2												1.6502 (108)
Energy for space heating												32.2822 (99)
Energy for space cooling												1.6502 (108)
Total												33.9324 (109)
Dwelling Fabric Energy Efficiency (DFEE)												33.9 (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	42.0100 (1b)	x 2.3900 (2b)	= 100.4039 (1b) - (3b)
First floor	42.0100 (1c)	x 2.6700 (2c)	= 112.1667 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.5706 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1411 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3911 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3325 (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	0.4239	0.4156	0.4073	0.3657	0.3574	0.3158	0.3158	0.3075	0.3325	0.3574	0.3740	0.3906 (22b)
Effective ac	0.5898	0.5864	0.5829	0.5669	0.5639	0.5499	0.5499	0.5473	0.5553	0.5639	0.5699	0.5763 (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)			11.8500	1.3258	15.7102		(27)
Ground Floor			42.0100	0.1300	5.4613		(28a)
Brick and Block	37.1300	11.7700	25.3600	0.1800	4.5648		(29a)
External Cladding	14.4800	2.2000	12.2800	0.1800	2.2104		(29a)
Pitched Roof	42.0100		42.0100	0.1300	5.4613		(30)
Total net area of external elements Aum(A, m ²)			135.6300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		35.9520		(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)							8.2949 (36)
Total fabric heat loss						(33) + (36) =	44.2469 (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	41.3763	41.1316	40.8917	39.7650	39.5542	38.5729	38.5729	38.3912	38.9509	39.5542	39.9806	40.4265 (38)
Heat transfer coeff	85.6232	85.3785	85.1386	84.0119	83.8011	82.8198	82.8198	82.6381	83.1978	83.8011	84.2276	84.6734 (39)
Average = Sum(39)m / 12 =												84.0109 (39)
HLP	1.0191	1.0162	1.0133	0.9999	0.9974	0.9857	0.9857	0.9836	0.9902	0.9974	1.0025	1.0078 (40)
HLP (average)												0.9999 (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												2.5347 (42)
Average daily hot water use (litres/day)												94.3998 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	103.8397	100.0637	96.2877	92.5118	88.7358	84.9598	84.9598	88.7358	92.5118	96.2877	100.0637	103.8397 (44)
Energy content (annual)	153.9913	134.6818	138.9795	121.1657	116.2614	100.3248	92.9656	106.6794	107.9535	125.8094	137.3308	149.1324 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water 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 (46)
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)

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Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	(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	(59)
Heat gains from water heating, kWh/month	32.7232	28.6199	29.5332	25.7477	24.7055	21.3190	19.7552	22.6694	22.9401	26.7345	29.1828	31.6906 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	126.7363	126.7363	126.7363	126.7363	126.7363	126.7363	126.7363	126.7363	126.7363	126.7363	126.7363	126.7363	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.7368	19.3064	15.7011	11.8867	8.8855	7.5015	8.1056	10.5360	14.1414	17.9557	20.9570	22.3409	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	227.6369	229.9990	224.0465	211.3742	195.3776	180.3432	170.2992	167.9371	173.8897	186.5620	202.5585	217.5929	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6736	35.6736	35.6736	35.6736	35.6736	35.6736	35.6736	35.6736	35.6736	35.6736	35.6736	35.6736	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	(71)
Water heating gains (Table 5)	43.9827	42.5891	39.6951	35.7607	33.2064	29.6097	26.5527	30.4696	31.8613	35.9335	40.5317	42.5949	(72)
Total internal gains	354.3773	352.9155	340.4635	320.0425	298.4904	278.4753	265.9784	269.9636	280.9132	301.4720	325.0680	343.5497	(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
Northeast					3.6700	11.2829	0.6300	0.7000			0.7700			12.6549 (75)
Southwest					8.1800	36.7938	0.6300	0.7000			0.7700			91.9814 (79)
Solar gains	104.6364	182.4379	260.7847	341.8393	399.9702	404.5915	386.9426	342.4256	288.6738	204.6432	126.0957			89.0516 (83)
Total gains	459.0137	535.3534	601.2482	661.8818	698.4606	683.0668	652.9210	612.3891	569.5870	506.1152	451.1637	432.6013	(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	68.1442	68.3395	68.5320	69.4511	69.6258	70.4508	70.4508	70.6057	70.1307	69.6258	69.2733	68.9086	
alpha	5.5429	5.5560	5.5688	5.6301	5.6417	5.6967	5.6967	5.7070	5.6754	5.6417	5.6182	5.5939	
util living area	0.9988	0.9968	0.9906	0.9669	0.8918	0.7258	0.5490	0.6046	0.8535	0.9799	0.9971	0.9991	(86)
MIT	19.8876	20.0365	20.2676	20.5673	20.8201	20.9605	20.9932	20.9886	20.8988	20.5682	20.1719	19.8636	(87)
Th 2	20.0675	20.0699	20.0723	20.0834	20.0855	20.0953	20.0953	20.0971	20.0915	20.0855	20.0813	20.0769	(88)
util rest of house	0.9983	0.9957	0.9872	0.9544	0.8520	0.6427	0.4409	0.4941	0.7882	0.9701	0.9959	0.9988	(89)
MIT 2	19.0463	19.1967	19.4281	19.7297	19.9618	20.0767	20.0934	20.0937	20.0345	19.7361	19.3415	19.0300	(90)
Living area fraction									fLA = Living area / (4) =			0.2030	(91)
MIT	19.2171	19.3672	19.5985	19.8997	20.1361	20.2562	20.2761	20.2754	20.2100	19.9050	19.5101	19.1993	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2171	19.3672	19.5985	19.8997	20.1361	20.2562	20.2761	20.2754	20.2100	19.9050	19.5101	19.1993	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9978	0.9945	0.9850	0.9513	0.8545	0.6585	0.4631	0.5167	0.7979	0.9675	0.9949	0.9984	(94)
Useful gains	458.0012	532.4266	592.2094	629.6700	596.8485	449.7825	302.3383	316.4277	454.4699	489.6804	448.8698	431.9108	(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	1277.2487	1235.1871	1115.1901	924.1081	706.9507	468.4428	304.4563	320.2559	508.3356	779.7709	1045.2727	1270.0407	(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	(98a)
Space heating kWh	609.5202	472.2550	389.0976	211.9955	81.9161	0.0000	0.0000	0.0000	0.0000	215.8274	429.4101	623.5686	(98)
Space heating												3033.5905	(98)
Space heating per m2												36.1056	(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	778.5064	612.8668	628.0496	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9027	0.9528	0.9361	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	702.7492	583.9137	587.9079	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	893.8692	856.7028	811.1372	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	137.6064	202.9551	166.0826	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												506.6442	(104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Cooled fraction											FC = cooled area / (4) =	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	34.4016	50.7388	41.5206	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												126.6610 (107)
Space cooling per m2												1.5075 (108)
Energy for space heating												36.1056 (99)
Energy for space cooling												1.5075 (108)
Total												37.6131 (109)
Target Fabric Energy Efficiency (TFEE)												43.3 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.0100 (1b)	x 2.3900 (2b)	= 100.4039 (1b) - (3b)
First floor	42.0100 (1c)	x 2.6700 (2c)	= 112.1667 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.5706 (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) = 0.1882 (8)
Pressure test					Yes
Measured/design AP50					4.4100
Infiltration rate					0.4087 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)]	=	0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20)	=	0.3474 (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	0.3647	0.3387	0.3474	0.3300	0.3300	0.3213	0.3126	0.3040	0.2953	0.3213	0.3040	0.3213 (22b)
Effective ac	0.5665	0.5574	0.5603	0.5545	0.5545	0.5516	0.5489	0.5462	0.5436	0.5516	0.5462	0.5516 (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)			11.8500	1.1450	13.5687		(27)
Ground Floor			42.0100	0.1000	4.2010	140.0000	5881.4000 (28a)
Brick and Block	37.1300	11.7700	25.3600	0.2400	6.0864	42.2200	1070.6992 (29a)
External Cladding	14.4800	2.2000	12.2800	0.2400	2.9472	42.2200	518.4616 (29a)
Pitched Roof	42.0100		42.0100	0.1000	4.2010	9.0000	378.0900 (30)
Total net area of external elements Aum(A, m ²)			135.6300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.3363		(33)
Party Wall 1			85.5400	0.0000	0.0000	110.0000	9409.4000 (32)
Ground Floor Block			46.9800			75.0000	3523.5000 (32c)
Ground Floor Stud			23.1800			9.0000	208.6200 (32c)
First Floor Stud			91.6300			9.0000	824.6700 (32c)
Internal Floor 1			42.0100			18.0000	756.1800 (32d)
Internal Ceiling 1			42.0100			18.0000	756.1800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	23327.2008 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							277.6387 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.2221 (36)
Total fabric heat loss						(33) + (36) =	39.5584 (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	39.7403	39.0975	39.3064	38.8938	38.8938	38.6954	38.5023	38.3145	38.1320	38.6954	38.3145	38.6954 (38)
Heat transfer coeff	79.2986	78.6559	78.8648	78.4522	78.4522	78.2538	78.0607	77.8729	77.6904	78.2538	77.8729	78.2538 (39)
Average = Sum(39)m / 12 =												78.3318 (39)
HLP	0.9438	0.9362	0.9386	0.9337	0.9337	0.9314	0.9291	0.9268	0.9247	0.9314	0.9268	0.9314 (40)
HLP (average)												0.9323 (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												2.5347 (42)
Average daily hot water use (litres/day)												94.3998 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	103.8397	100.0637	96.2877	92.5118	88.7358	84.9598	84.9598	88.7358	92.5118	96.2877	100.0637	103.8397 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Energy content (annual)	153.9913	134.6818	138.9795	121.1657	116.2614	100.3248	92.9656	106.6794	107.9535	125.8094	137.3308	149.1324 (45)
Distribution loss (46)m = 0.15 x (45)m	23.0987	20.2023	20.8469	18.1749	17.4392	15.0487	13.9448	16.0019	16.1930	18.8714	20.5996	22.3699 (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	27.5591	24.8897	27.5304	26.6128	27.4783	26.5671	27.4372	27.4639	26.5920	27.5089	26.6557	27.5510 (61)
Total heat required for water heating calculated for each month	181.5504	159.5715	166.5100	147.7785	143.7397	126.8919	120.4028	134.1433	134.5455	153.3183	163.9865	176.6834 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	181.5504	159.5715	166.5100	147.7785	143.7397	126.8919	120.4028	134.1433	134.5455	153.3183	163.9865	176.6834 (64)
RHI water heating demand	58.0919	51.0041	53.0933	46.9408	45.5265	39.9998	37.7704	42.3369	42.5425	48.7088	52.3264	56.4743 (65)
Heat gains from water heating, kWh/month												
	58.0919	51.0041	53.0933	46.9408	45.5265	39.9998	37.7704	42.3369	42.5425	48.7088	52.3264	56.4743 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	152.0836	152.0836	152.0836	152.0836	152.0836	152.0836	152.0836	152.0836	152.0836	152.0836	152.0836	152.0836 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	54.3420	48.2661	39.2526	29.7168	22.2136	18.7537	20.2640	26.3399	35.3534	44.8893	52.3924	55.8524 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	339.7565	343.2821	334.3977	315.4838	291.6084	269.1689	254.1780	250.6524	259.5368	278.4507	302.3261	324.7655 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7431	52.7431	52.7431	52.7431	52.7431	52.7431	52.7431	52.7431	52.7431	52.7431	52.7431	52.7431 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891 (71)
Water heating gains (Table 5)	78.0805	75.8990	71.3620	65.1955	61.1915	55.5552	50.7666	56.9044	59.0869	65.4689	72.6756	75.9063 (72)
Total internal gains	578.6166	573.8848	551.4499	516.8337	481.4512	449.9155	431.6462	440.3343	460.4147	495.2464	533.8317	562.9618 (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
Northeast					3.6700	14.6176	0.6300	0.7000			0.7700	16.3952 (75)
Southwest					8.1800	45.1778	0.6300	0.7000			0.7700	112.9407 (79)

Solar gains	129.3358	192.2716	278.3610	369.6902	413.2815	455.0376	431.4135	389.6326	326.3137	233.0283	155.4164	108.1697 (83)
Total gains	707.9525	766.1564	829.8109	886.5239	894.7327	904.9531	863.0598	829.9669	786.7284	728.2747	689.2481	671.1315 (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	81.7136	82.3814	82.1631	82.5953	82.5953	82.8047	83.0095	83.2097	83.4052	82.8047	83.2097	82.8047
alpha	6.4476	6.4921	6.4775	6.5064	6.5064	6.5203	6.5340	6.5473	6.5603	6.5203	6.5473	6.5203
util living area	0.9899	0.9824	0.9557	0.8743	0.7138	0.4904	0.3525	0.3656	0.6114	0.8801	0.9737	0.9920 (86)
MIT	20.3868	20.4859	20.6685	20.8644	20.9699	20.9976	20.9998	20.9997	20.9910	20.8823	20.6273	20.3744 (87)
Th 2	20.1304	20.1369	20.1348	20.1389	20.1389	20.1409	20.1429	20.1447	20.1466	20.1409	20.1447	20.1409 (88)
util rest of house	0.9865	0.9766	0.9416	0.8393	0.6526	0.4178	0.2752	0.2856	0.5336	0.8383	0.9638	0.9892 (89)
MIT 2	19.5881	19.6904	19.8635	20.0423	20.1226	20.1401	20.1428	20.1447	20.1430	20.0625	19.8359	19.5851 (90)
Living area fraction	19.7503	19.8520	20.0270	20.2092	20.2946	20.3142	20.3168	20.3183	20.3152	20.2290	19.9966	19.7453 (92)
MIT	19.7503	19.8520	20.0270	20.2092	20.2946	20.3142	20.3168	20.3183	20.3152	20.2290	19.9966	19.7453 (93)
Temperature adjustment												0.0000
adjusted MIT	19.7503	19.8520	20.0270	20.2092	20.2946	20.3142	20.3168	20.3183	20.3152	20.2290	19.9966	19.7453 (93)

8. Space heating requirement

Utilisation	0.9847	0.9743	0.9395	0.8424	0.6642	0.4325	0.2909	0.3019	0.5493	0.8431	0.9617	0.9876 (94)
Useful gains	697.0928	746.4833	779.6399	746.8008	594.2430	391.4239	251.0513	250.5500	432.1366	614.0229	662.8304	662.7901 (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	1177.6089	1144.5961	1027.3707	840.1594	611.5045	392.3817	251.1071	250.6188	436.2439	690.9013	941.9947	1153.8773 (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	357.5039	267.5318	184.3118	67.2182	12.8425	0.0000	0.0000	0.0000	0.0000	57.1975	200.9983	365.3689 (98)
Space heating												1512.9728 (98)
RHI space heating demand												1513 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.0100 (1b)	x 2.3900 (2b)	= 100.4039 (1b) - (3b)
First floor	42.0100 (1c)	x 2.6700 (2c)	= 112.1667 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.5706 (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) = 0.1882 (8)
Pressure test					Yes
Measured/design AP50					4.4100
Infiltration rate					0.4087 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3474 (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	0.4429	0.4342	0.4255	0.3821	0.3734	0.3300	0.3300	0.3213	0.3474	0.3734	0.3908	0.4082 (22b)
Effective ac	0.5981	0.5943	0.5905	0.5730	0.5697	0.5545	0.5545	0.5516	0.5603	0.5697	0.5764	0.5833 (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)			11.8500	1.1450	13.5687		(27)
Ground Floor			42.0100	0.1000	4.2010	140.0000	5881.4000 (28a)
Brick and Block	37.1300	11.7700	25.3600	0.2400	6.0864	42.2200	1070.6992 (29a)
External Cladding	14.4800	2.2000	12.2800	0.2400	2.9472	42.2200	518.4616 (29a)
Pitched Roof	42.0100		42.0100	0.1000	4.2010	9.0000	378.0900 (30)
Total net area of external elements Aum(A, m ²)			135.6300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.3363		(33)
Party Wall 1			85.5400	0.0000	0.0000	110.0000	9409.4000 (32)
Ground Floor Block			46.9800			75.0000	3523.5000 (32c)
Ground Floor Stud			23.1800			9.0000	208.6200 (32c)
First Floor Stud			91.6300			9.0000	824.6700 (32c)
Internal Floor 1			42.0100			18.0000	756.1800 (32d)
Internal Ceiling 1			42.0100			18.0000	756.1800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	23327.2008 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							277.6387 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.2221 (36)
Total fabric heat loss						(33) + (36) =	39.5584 (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	41.9543	41.6871	41.4252	40.1952	39.9651	38.8938	38.8938	38.6954	39.3064	39.9651	40.4307	40.9174 (38)
Heat transfer coeff	81.5127	81.2455	80.9836	79.7536	79.5235	78.4522	78.4522	78.2538	78.8648	79.5235	79.9890	80.4757 (39)
Average = Sum(39)m / 12 =												79.7525 (39)
HLP	0.9702	0.9670	0.9639	0.9492	0.9465	0.9337	0.9337	0.9314	0.9386	0.9465	0.9520	0.9578 (40)
HLP (average)												0.9492 (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												2.5347 (42)
Average daily hot water use (litres/day)												94.3998 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	103.8397	100.0637	96.2877	92.5118	88.7358	84.9598	84.9598	88.7358	92.5118	96.2877	100.0637	103.8397 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Energy conte	153.9913	134.6818	138.9795	121.1657	116.2614	100.3248	92.9656	106.6794	107.9535	125.8094	137.3308	149.1324 (45)
Energy content (annual)										Total =	Sum (45)m =	1485.2757 (45)
Distribution loss (46)m = 0.15 x (45)m	23.0987	20.2023	20.8469	18.1749	17.4392	15.0487	13.9448	16.0019	16.1930	18.8714	20.5996	22.3699 (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	27.5591	24.8897	27.5304	26.6128	27.4783	26.5671	27.4372	27.4639	26.5920	27.5089	26.6557	27.5510 (61)
Total heat required for water heating calculated for each month	181.5504	159.5715	166.5100	147.7785	143.7397	126.8919	120.4028	134.1433	134.5455	153.3183	163.9865	176.6834 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	181.5504	159.5715	166.5100	147.7785	143.7397	126.8919	120.4028	134.1433	134.5455	153.3183	163.9865	176.6834 (64)
Heat gains from water heating, kWh/month	58.0919	51.0041	53.0933	46.9408	45.5265	39.9998	37.7704	42.3369	42.5425	48.7088	52.3264	56.4743 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	152.0836	152.0836	152.0836	152.0836	152.0836	152.0836	152.0836	152.0836	152.0836	152.0836	152.0836	152.0836 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	54.3420	48.2661	39.2526	29.7168	22.2136	18.7537	20.2640	26.3399	35.3534	44.8893	52.3924	55.8524 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	339.7565	343.2821	334.3977	315.4838	291.6084	269.1689	254.1780	250.6524	259.5368	278.4507	302.3261	324.7655 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7431	52.7431	52.7431	52.7431	52.7431	52.7431	52.7431	52.7431	52.7431	52.7431	52.7431	52.7431 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891 (71)
Water heating gains (Table 5)	78.0805	75.8990	71.3620	65.1955	61.1915	55.5552	50.7666	56.9044	59.0869	65.4689	72.6756	75.9063 (72)
Total internal gains	578.6166	573.8848	551.4499	516.8337	481.4512	449.9155	431.6462	440.3343	460.4147	495.2464	533.8317	562.9618 (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	
Northeast					3.6700	11.2829	0.6300	0.7000	0.7700		12.6549	
Southwest					8.1800	36.7938	0.6300	0.7000	0.7700		91.9814 (75)	
Solar gains	104.6364	182.4379	260.7847	341.8393	399.9702	404.5915	386.9426	342.4256	288.6738	204.6432	126.0957	89.0516 (83)
Total gains	683.2530	756.3227	812.2346	858.6731	881.4215	854.5070	818.5888	782.7599	749.0885	699.8896	659.9274	652.0134 (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	79.4941	79.7555	80.0134	81.2475	81.4826	82.5953	82.5953	82.8047	82.1631	81.4826	81.0083	80.5184
alpha	6.2996	6.3170	6.3342	6.4165	6.4322	6.5064	6.5064	6.5203	6.4775	6.4322	6.4006	6.3679
util living area	0.9935	0.9865	0.9680	0.9101	0.7791	0.5798	0.4208	0.4583	0.6988	0.9261	0.9853	0.9950 (86)
MIT	20.2767	20.4041	20.5883	20.8047	20.9438	20.9929	20.9992	20.9987	20.9780	20.8096	20.5092	20.2531 (87)
Th 2	20.1083	20.1109	20.1136	20.1259	20.1282	20.1389	20.1389	20.1409	20.1348	20.1282	20.1235	20.1186 (88)
util rest of house	0.9913	0.9821	0.9575	0.8825	0.7244	0.5054	0.3390	0.3736	0.6226	0.8972	0.9796	0.9933 (89)
MIT 2	19.4604	19.5881	19.7689	19.9796	20.0944	20.1361	20.1388	20.1406	20.1246	19.9901	19.7032	19.4459 (90)
Living area fraction	19.6261	19.7538	19.9353	20.1472	20.2669	20.3101	20.3135	20.3148	20.2979	20.1565	19.8669	19.6098 (92)
MIT	19.6261	19.7538	19.9353	20.1472	20.2669	20.3101	20.3135	20.3148	20.2979	20.1565	19.8669	19.6098 (93)
Temperature adjustment												0.0000
adjusted MIT	19.6261	19.7538	19.9353	20.1472	20.2669	20.3101	20.3135	20.3148	20.2979	20.1565	19.8669	19.6098 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	676.2527	741.0717	775.6290	758.4605	646.6552	444.7530	291.1035	305.9385	477.6459	628.7261	645.0657	646.8119 (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	1249.2747	1206.8010	1088.0405	897.0010	681.2673	447.9683	291.3296	306.3501	488.7967	759.9656	1021.2103	1240.1117 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	426.3283	312.9701	232.4341	99.7492	25.7514	0.0000	0.0000	0.0000	0.0000	97.6422	270.8241	441.4150 (98)
Space heating												1907.1144 (98)
Space heating per m ²												22.6983 (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													2102.6620	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	426.3283	312.9701	232.4341	99.7492	25.7514	0.0000	0.0000	0.0000	0.0000	97.6422	270.8241	441.4150	(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)	470.0422	345.0607	256.2670	109.9771	28.3918	0.0000	0.0000	0.0000	0.0000	107.6541	298.5933	486.6759	(211)	
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating														
Water heating requirement	181.5504	159.5715	166.5100	147.7785	143.7397	126.8919	120.4028	134.1433	134.5455	153.3183	163.9865	176.6834	(64)	
Efficiency of water heater (217)m	89.8452	89.7347	89.5099	89.0073	88.3142	87.9000	87.9000	87.9000	87.9000	88.9686	89.6233	89.8816	(216)	
Fuel for water heating, kWh/month	202.0702	177.8257	186.0240	166.0296	162.7594	144.3593	136.9771	152.6090	153.0665	172.3285	182.9730	196.5735	(219)	
Water heating fuel used												2033.5960	(219)	
Annual totals kWh/year														
Space heating fuel - main system												2102.6620	(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)													383.8789	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.65 * 1029 * 1.00) =										-535.1771			-535.1771	(233)
Total delivered energy for all uses													4059.9598	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2102.6620	3.4800	73.1726 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2033.5960	3.4800	70.7691 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	383.8789	13.1900	50.6336 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-535.1771	13.1900	-70.5899 (252)
Total energy cost			253.8780 (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] =	0.8265 (257)
SAP value		88.4710
SAP rating (Section 12)		88 (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	2102.6620	0.2160	454.1750 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2033.5960	0.2160	439.2567 (264)
Space and water heating			893.4317 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	383.8789	0.5190	199.2332 (268)
Energy saving/generation technologies			
PV Unit	-535.1771	0.5190	-277.7569 (269)
Total kg/year			853.8330 (272)
CO2 emissions per m2			10.1600 (273)
EI value			91.1321
EI rating			91 (274)
EI band			B

Calculation of stars for heating and DHW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

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	$3.48 / 0.8887 = 3.916$, stars = 4
Water heating environmental impact	$0.216 / 0.8887 = 0.2430$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.0100 (1b)	x 2.3900 (2b)	= 100.4039 (1b) - (3b)
First floor	42.0100 (1c)	x 2.6700 (2c)	= 112.1667 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.5706 (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) = 0.1882 (8)
Pressure test					Yes
Measured/design AP50					4.4100
Infiltration rate					0.4087 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)]	=	0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20)	=	0.3474 (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	0.3647	0.3387	0.3474	0.3300	0.3300	0.3213	0.3126	0.3040	0.2953	0.3213	0.3040	0.3213 (22b)
Effective ac	0.5665	0.5574	0.5603	0.5545	0.5545	0.5516	0.5489	0.5462	0.5436	0.5516	0.5462	0.5516 (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)			11.8500	1.1450	13.5687		(27)
Ground Floor			42.0100	0.1000	4.2010	140.0000	5881.4000 (28a)
Brick and Block	37.1300	11.7700	25.3600	0.2400	6.0864	42.2200	1070.6992 (29a)
External Cladding	14.4800	2.2000	12.2800	0.2400	2.9472	42.2200	518.4616 (29a)
Pitched Roof	42.0100		42.0100	0.1000	4.2010	9.0000	378.0900 (30)
Total net area of external elements Aum(A, m ²)			135.6300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.3363		(33)
Party Wall 1			85.5400	0.0000	0.0000	110.0000	9409.4000 (32)
Ground Floor Block			46.9800			75.0000	3523.5000 (32c)
Ground Floor Stud			23.1800			9.0000	208.6200 (32c)
First Floor Stud			91.6300			9.0000	824.6700 (32c)
Internal Floor 1			42.0100			18.0000	756.1800 (32d)
Internal Ceiling 1			42.0100			18.0000	756.1800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	23327.2008 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							277.6387 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.2221 (36)
Total fabric heat loss						(33) + (36) =	39.5584 (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	39.7403	39.0975	39.3064	38.8938	38.8938	38.6954	38.5023	38.3145	38.1320	38.6954	38.3145	38.6954 (38)
Heat transfer coeff	79.2986	78.6559	78.8648	78.4522	78.4522	78.2538	78.0607	77.8729	77.6904	78.2538	77.8729	78.2538 (39)
Average = Sum(39)m / 12 =												78.3318 (39)
HLP	0.9438	0.9362	0.9386	0.9337	0.9337	0.9314	0.9291	0.9268	0.9247	0.9314	0.9268	0.9314 (40)
HLP (average)												0.9323 (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												2.5347 (42)
Average daily hot water use (litres/day)												94.3998 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	103.8397	100.0637	96.2877	92.5118	88.7358	84.9598	84.9598	88.7358	92.5118	96.2877	100.0637	103.8397 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Energy conte	153.9913	134.6818	138.9795	121.1657	116.2614	100.3248	92.9656	106.6794	107.9535	125.8094	137.3308	149.1324 (45)
Energy content (annual)										Total =	Sum (45)m =	1485.2757 (45)
Distribution loss (46)m = 0.15 x (45)m	23.0987	20.2023	20.8469	18.1749	17.4392	15.0487	13.9448	16.0019	16.1930	18.8714	20.5996	22.3699 (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	27.5591	24.8897	27.5304	26.6128	27.4783	26.5671	27.4372	27.4639	26.5920	27.5089	26.6557	27.5510 (61)
Total heat required for water heating calculated for each month	181.5504	159.5715	166.5100	147.7785	143.7397	126.8919	120.4028	134.1433	134.5455	153.3183	163.9865	176.6834 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	181.5504	159.5715	166.5100	147.7785	143.7397	126.8919	120.4028	134.1433	134.5455	153.3183	163.9865	176.6834 (64)
Heat gains from water heating, kWh/month	58.0919	51.0041	53.0933	46.9408	45.5265	39.9998	37.7704	42.3369	42.5425	48.7088	52.3264	56.4743 (65)
Total per year (kWh/year) = Sum (64)m = 1809.1217 (64)												

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	152.0836	152.0836	152.0836	152.0836	152.0836	152.0836	152.0836	152.0836	152.0836	152.0836	152.0836	152.0836 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	54.3420	48.2661	39.2526	29.7168	22.2136	18.7537	20.2640	26.3399	35.3534	44.8893	52.3924	55.8524 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	339.7565	343.2821	334.3977	315.4838	291.6084	269.1689	254.1780	250.6524	259.5368	278.4507	302.3261	324.7655 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7431	52.7431	52.7431	52.7431	52.7431	52.7431	52.7431	52.7431	52.7431	52.7431	52.7431	52.7431 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891 (71)
Water heating gains (Table 5)	78.0805	75.8990	71.3620	65.1955	61.1915	55.5552	50.7666	56.9044	59.0869	65.4689	72.6756	75.9063 (72)
Total internal gains	578.6166	573.8848	551.4499	516.8337	481.4512	449.9155	431.6462	440.3343	460.4147	495.2464	533.8317	562.9618 (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
Northeast					3.6700	14.6176	0.6300	0.7000			0.7700			16.3952 (75)
Southwest					8.1800	45.1778	0.6300	0.7000			0.7700			112.9407 (79)
Solar gains	129.3358	192.2716	278.3610	369.6902	413.2815	455.0376	431.4135	389.6326	326.3137	233.0283	155.4164			108.1697 (83)
Total gains	707.9525	766.1564	829.8109	886.5239	894.7327	904.9531	863.0598	829.9669	786.7284	728.2747	689.2481			671.1315 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (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	81.7136	82.3814	82.1631	82.5953	82.5953	82.8047	83.0095	83.2097	83.4052	82.8047	83.2097	82.8047
alpha	6.4476	6.4921	6.4775	6.5064	6.5064	6.5203	6.5340	6.5473	6.5603	6.5203	6.5473	6.5203
util living area	0.9899	0.9824	0.9557	0.8743	0.7138	0.4904	0.3525	0.3656	0.6114	0.8801	0.9737	0.9920 (86)
MIT	20.3868	20.4859	20.6685	20.8644	20.9699	20.9976	20.9998	20.9997	20.9910	20.8823	20.6273	20.3744 (87)
Th 2	20.1304	20.1369	20.1348	20.1389	20.1389	20.1409	20.1429	20.1447	20.1466	20.1409	20.1447	20.1409 (88)
util rest of house	0.9865	0.9766	0.9416	0.8393	0.6526	0.4178	0.2752	0.2856	0.5336	0.8383	0.9638	0.9892 (89)
MIT 2	19.5881	19.6904	19.8635	20.0423	20.1226	20.1401	20.1428	20.1447	20.1430	20.0625	19.8359	19.5851 (90)
Living area fraction	19.7503	19.8520	20.0270	20.2092	20.2946	20.3142	20.3168	20.3183	20.3152	20.2290	19.9966	19.7453 (92)
MIT	19.7503	19.8520	20.0270	20.2092	20.2946	20.3142	20.3168	20.3183	20.3152	20.2290	19.9966	19.7453 (93)
Temperature adjustment												0.0000
adjusted MIT	19.7503	19.8520	20.0270	20.2092	20.2946	20.3142	20.3168	20.3183	20.3152	20.2290	19.9966	19.7453 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	697.0928	746.4833	779.6399	746.8008	594.2430	391.4239	251.0513	250.5500	432.1366	614.0229	662.8304	662.7901 (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	1177.6089	1144.5961	1027.3707	840.1594	611.5045	392.3817	251.1071	250.6188	436.2439	690.9013	941.9947	1153.8773 (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	357.5039	267.5318	184.3118	67.2182	12.8425	0.0000	0.0000	0.0000	0.0000	57.1975	200.9983	365.3689 (98)
Space heating												1512.9728 (98)
Space heating per m ²												(98) / (4) = 18.0073 (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													1668.1068 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	357.5039	267.5318	184.3118	67.2182	12.8425	0.0000	0.0000	0.0000	0.0000	57.1975	200.9983	365.3689	(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)	394.1609	294.9634	203.2103	74.1105	14.1593	0.0000	0.0000	0.0000	0.0000	63.0623	221.6078	402.8323	(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	181.5504	159.5715	166.5100	147.7785	143.7397	126.8919	120.4028	134.1433	134.5455	153.3183	163.9865	176.6834	(64)
Efficiency of water heater (217)m	89.7373	89.6333	89.3491	88.7567	88.1231	87.9000	87.9000	87.9000	87.9000	88.6435	89.4202	89.7679	(216)
Fuel for water heating, kWh/month	202.3133	178.0271	186.3588	166.4985	163.1124	144.3593	136.9771	152.6090	153.0665	172.9605	183.3886	196.8224	(219)
Water heating fuel used												2036.4935	(219)
Annual totals kWh/year													
Space heating fuel - main system												1668.1068	(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)												383.8789	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.65 * 1156 * 1.00) =										-601.2400		-601.2400	(233)
Total delivered energy for all uses												3562.2392	(238)

10a. Fuel costs - using BEDF prices (533)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1668.1068	10.2300	170.6473 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2036.4935	10.2300	208.3333 (247)
Pumps and fans for heating	75.0000	36.7200	27.5400 (249)
Energy for lighting	383.8789	36.7200	140.9603 (250)
Additional standing charges			103.0000 (251)
Energy saving/generation technologies			
PV Unit	-601.2400	36.7200	-220.7753 (252)
Total energy cost			429.7056 (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	1668.1068	0.2160	360.3111 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2036.4935	0.2160	439.8826 (264)
Space and water heating			800.1937 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	383.8789	0.5190	199.2332 (268)
Energy saving/generation technologies			
PV Unit	-601.2400	0.5190	-312.0435 (269)
Total kg/year			726.3083 (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	1668.1068	1.2200	2035.0903 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2036.4935	1.2200	2484.5220 (264)
Space and water heating			4519.6123 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	383.8789	3.0700	1178.5083 (268)
Energy saving/generation technologies			
PV Unit	-601.2400	3.0700	-1845.8067 (269)
Primary energy kWh/year			4082.5639 (272)
Primary energy kWh/m2/year			48.5904 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

SAP 2012 EPC IMPROVEMENTS

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

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

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.2	-£ 84	-190 kg (26.2%)

		Typical annual savings	Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£84	2.27 kg/m²	B 90	A 93
Total Savings	£84	2.27 kg/m²		
Potential energy efficiency rating:			B 90	
Potential environmental impact rating:				A 93

Fuel prices for cost data on this page from database revision number 533 TEST (30 Nov 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	£169	£187	-£18
Mains gas	£482	£380	£102
Space heating	£301	£301	£0
Water heating	£208	£124	£84
Lighting	£141	£141	£0
Generated (PV)	-£221	-£221	£0
Total cost of fuels	£430	£346	£84
Total cost of uses	£429	£345	£84
Delivered energy	42 kWh/m²	31 kWh/m²	11 kWh/m²
Carbon dioxide emissions	0.7 tonnes	0.5 tonnes	0.2 tonnes
CO2 emissions per m²	9 kg/m²	6 kg/m²	2 kg/m²
Primary energy	49 kWh/m²	36 kWh/m²	13 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.0100 (1b)	x 2.3900 (2b)	= 100.4039 (1b) - (3b)
First floor	42.0100 (1c)	x 2.6700 (2c)	= 112.1667 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.5706 (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) = 0.1882 (8)
Pressure test					Yes
Measured/design AP50					4.4100
Infiltration rate					0.4087 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)]	=	0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20)	=	0.3474 (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	0.4429	0.4342	0.4255	0.3821	0.3734	0.3300	0.3300	0.3213	0.3474	0.3734	0.3908	0.4082 (22b)
Effective ac	0.5981	0.5943	0.5905	0.5730	0.5697	0.5545	0.5545	0.5516	0.5603	0.5697	0.5764	0.5833 (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)			11.8500	1.1450	13.5687		(27)
Ground Floor			42.0100	0.1000	4.2010	140.0000	5881.4000 (28a)
Brick and Block	37.1300	11.7700	25.3600	0.2400	6.0864	42.2200	1070.6992 (29a)
External Cladding	14.4800	2.2000	12.2800	0.2400	2.9472	42.2200	518.4616 (29a)
Pitched Roof	42.0100		42.0100	0.1000	4.2010	9.0000	378.0900 (30)
Total net area of external elements Aum(A, m ²)			135.6300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.3363		(33)
Party Wall 1			85.5400	0.0000	0.0000	110.0000	9409.4000 (32)
Ground Floor Block			46.9800			75.0000	3523.5000 (32c)
Ground Floor Stud			23.1800			9.0000	208.6200 (32c)
First Floor Stud			91.6300			9.0000	824.6700 (32c)
Internal Floor 1			42.0100			18.0000	756.1800 (32d)
Internal Ceiling 1			42.0100			18.0000	756.1800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	23327.2008 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							277.6387 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.2221 (36)
Total fabric heat loss						(33) + (36) =	39.5584 (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	41.9543	41.6871	41.4252	40.1952	39.9651	38.8938	38.8938	38.6954	39.3064	39.9651	40.4307	40.9174 (38)
Heat transfer coeff	81.5127	81.2455	80.9836	79.7536	79.5235	78.4522	78.4522	78.2538	78.8648	79.5235	79.9890	80.4757 (39)
Average = Sum(39)m / 12 =												79.7525 (39)
HLP	0.9702	0.9670	0.9639	0.9492	0.9465	0.9337	0.9337	0.9314	0.9386	0.9465	0.9520	0.9578 (40)
HLP (average)												0.9492 (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												2.5347 (42)
Average daily hot water use (litres/day)												94.3998 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	103.8397	100.0637	96.2877	92.5118	88.7358	84.9598	84.9598	88.7358	92.5118	96.2877	100.0637	103.8397 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Energy content (annual)	153.9913	134.6818	138.9795	121.1657	116.2614	100.3248	92.9656	106.6794	107.9535	125.8094	137.3308	149.1324 (45)
Distribution loss (46)m = 0.15 x (45)m	23.0987	20.2023	20.8469	18.1749	17.4392	15.0487	13.9448	16.0019	16.1930	18.8714	20.5996	22.3699 (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	27.5591	24.8897	27.5304	26.6128	27.4783	26.5671	27.4372	27.4639	26.5920	27.5089	26.6557	27.5510 (61)
Total heat required for water heating calculated for each month	181.5504	159.5715	166.5100	147.7785	143.7397	126.8919	120.4028	134.1433	134.5455	153.3183	163.9865	176.6834 (62)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.7000 (H2)
Collector heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0050 (H3a)
Collector effective heat loss coefficient												1.8063 (H3b)
Collector performance ratio												2.5804 (H4)
Annual solar radiation per m2												1079.5246 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												1813.6014 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.2211 (H8)
Utilisation factor												0.5591 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.3998 (H14)
Volume ratio Veff/V												0.7945 (H15)
Solar storage volume factor												0.9540 (H16)
Solar input												-850.5863 (H17)
Solar input	-24.6653	-41.1593	-70.0990	-93.9465	-116.0630	-114.1084	-112.6004	-98.3795	-77.0509	-52.6167	-29.2566	-20.6407 (63)
Solar input (sum of months) = Sum (63)m =												-850.5863 (63)
Output from w/h	156.8851	118.4122	96.4110	53.8320	27.6767	12.7835	7.8024	35.7637	57.4946	100.7016	134.7299	156.0428 (64)
Total per year (kWh/year) = Sum (64)m =												958.5354 (64)
Heat gains from water heating, kWh/month	58.0919	51.0041	53.0933	46.9408	45.5265	39.9998	37.7704	42.3369	42.5425	48.7088	52.3264	56.4743 (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	152.0836	152.0836	152.0836	152.0836	152.0836	152.0836	152.0836	152.0836	152.0836	152.0836	152.0836	152.0836	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	54.3420	48.2661	39.2526	29.7168	22.2136	18.7537	20.2640	26.3399	35.3534	44.8893	52.3924	55.8524	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	339.7565	343.2821	334.3977	315.4838	291.6084	269.1689	254.1780	250.6524	259.5368	278.4507	302.3261	324.7655	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7431	52.7431	52.7431	52.7431	52.7431	52.7431	52.7431	52.7431	52.7431	52.7431	52.7431	52.7431	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	(71)
Water heating gains (Table 5)	78.0805	75.8990	71.3620	65.1955	61.1915	55.5552	50.7666	56.9044	59.0869	65.4689	72.6756	75.9063	(72)
Total internal gains	578.6166	573.8848	551.4499	516.8337	481.4512	449.9155	431.6462	440.3343	460.4147	495.2464	533.8317	562.9618	(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		
Northeast					3.6700	11.2829	0.6300	0.7000	0.7700	12.6549 (75)		
Southwest					8.1800	36.7938	0.6300	0.7000	0.7700	91.9814 (79)		

Solar gains	104.6364	182.4379	260.7847	341.8393	399.9702	404.5915	386.9426	342.4256	288.6738	204.6432	126.0957	89.0516 (83)
Total gains	683.2530	756.3227	812.2346	858.6731	881.4215	854.5070	818.5888	782.7599	749.0885	699.8896	659.9274	652.0134 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
alpha	79.4941	79.7555	80.0134	81.2475	81.4826	82.5953	82.5953	82.8047	82.1631	81.4826	81.0083	80.5184	
util living area	6.2996	6.3170	6.3342	6.4165	6.4322	6.5064	6.5064	6.5203	6.4775	6.4322	6.4006	6.3679	
	0.9935	0.9865	0.9680	0.9101	0.7791	0.5798	0.4208	0.4583	0.6988	0.9261	0.9853	0.9950 (86)	
MIT	20.2767	20.4041	20.5883	20.8047	20.9438	20.9929	20.9992	20.9987	20.9780	20.8096	20.5092	20.2531 (87)	
Th 2	20.1083	20.1109	20.1136	20.1259	20.1282	20.1389	20.1389	20.1409	20.1348	20.1282	20.1235	20.1186 (88)	
util rest of house	0.9913	0.9821	0.9575	0.8825	0.7244	0.5054	0.3390	0.3736	0.6226	0.8972	0.9796	0.9933 (89)	
MIT 2	19.4604	19.5881	19.7689	19.9796	20.0944	20.1361	20.1388	20.1406	20.1246	19.9901	19.7032	19.4459 (90)	
Living area fraction									fLA = Living area / (4) =			0.2030 (91)	
MIT	19.6261	19.7538	19.9353	20.1472	20.2669	20.3101	20.3135	20.3148	20.2979	20.1565	19.8669	19.6098 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.6261	19.7538	19.9353	20.1472	20.2669	20.3101	20.3135	20.3148	20.2979	20.1565	19.8669	19.6098 (93)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9898	0.9798	0.9549	0.8833	0.7337	0.5205	0.3556	0.3908	0.6376	0.8983	0.9775	0.9920	(94)
Useful gains	676.2527	741.0717	775.6290	758.4605	646.6552	444.7530	291.1035	305.9385	477.6459	628.7261	645.0657	646.8119	(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	1249.2747	1206.8010	1088.0405	897.0010	681.2673	447.9683	291.3296	306.3501	488.7967	759.9656	1021.2103	1240.1117	(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	426.3283	312.9701	232.4341	99.7492	25.7514	0.0000	0.0000	0.0000	0.0000	97.6422	270.8241	441.4150	(98)
Space heating												1907.1144	(98)
Space heating per m2										(98) / (4) =		22.6983	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													90.7000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													2102.6620	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	426.3283	312.9701	232.4341	99.7492	25.7514	0.0000	0.0000	0.0000	0.0000	97.6422	270.8241	441.4150	(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)	470.0422	345.0607	256.2670	109.9771	28.3918	0.0000	0.0000	0.0000	0.0000	107.6541	298.5933	486.6759	(211)	
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating														
Water heating requirement	156.8851	118.4122	96.4110	53.8320	27.6767	12.7835	7.8024	35.7637	57.4946	100.7016	134.7299	156.0428	(64)	
Efficiency of water heater	89.9294	89.9138	89.8608	89.6985	89.2276	87.9000	87.9000	87.9000	87.9000	89.2565	89.7502	89.9516	(217)	
Fuel for water heating, kWh/month	174.4536	131.6952	107.2892	60.0144	31.0181	14.5432	8.8765	40.6869	65.4091	112.8227	150.1165	173.4741	(219)	
Water heating fuel used												1070.3994	(219)	
Annual totals kWh/year														
Space heating fuel - main system												2102.6620	(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)
pump for solar water heating													50.0000	(230g)
Total electricity for the above, kWh/year													125.0000	(231)
Electricity for lighting (calculated in Appendix L)													383.8789	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.65 * 1029 * 1.00) =										-535.1771		-535.1771	(233)	
Total delivered energy for all uses												3146.7632	(238)	

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2102.6620	3.4800	73.1726 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1070.3994	3.4800	37.2499 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Pump for solar water heating	50.0000	13.1900	6.5950 (249)
Energy for lighting	383.8789	13.1900	50.6336 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-535.1771	13.1900	-70.5899 (252)
Total energy cost			226.9538 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)		0.7388 (257)
SAP value	[(255) x (256)] / [(4) + 45.0] =	89.6937
SAP rating (Section 12)		90 (258)
SAP band		B

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2102.6620	0.2160	454.1750 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1070.3994	0.2160	231.2063 (264)
Space and water heating			685.3813 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	383.8789	0.5190	199.2332 (268)
Energy saving/generation technologies			
PV Unit	-535.1771	0.5190	-277.7569 (269)
Total kg/year			671.7325 (272)
CO2 emissions per m2			7.9900 (273)
EI value			93.0234
EI rating			93 (274)
EI band			A

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.0100 (1b)	x 2.3900 (2b)	= 100.4039 (1b) - (3b)
First floor	42.0100 (1c)	x 2.6700 (2c)	= 112.1667 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.5706 (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) = 0.1882 (8)
Pressure test					Yes
Measured/design AP50					4.4100
Infiltration rate					0.4087 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)]	=	0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20)	=	0.3474 (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	0.3647	0.3387	0.3474	0.3300	0.3300	0.3213	0.3126	0.3040	0.2953	0.3213	0.3040	0.3213 (22b)
Effective ac	0.5665	0.5574	0.5603	0.5545	0.5545	0.5516	0.5489	0.5462	0.5436	0.5516	0.5462	0.5516 (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)			11.8500	1.1450	13.5687		(27)
Ground Floor			42.0100	0.1000	4.2010	140.0000	5881.4000 (28a)
Brick and Block	37.1300	11.7700	25.3600	0.2400	6.0864	42.2200	1070.6992 (29a)
External Cladding	14.4800	2.2000	12.2800	0.2400	2.9472	42.2200	518.4616 (29a)
Pitched Roof	42.0100		42.0100	0.1000	4.2010	9.0000	378.0900 (30)
Total net area of external elements Aum(A, m ²)			135.6300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.3363		(33)
Party Wall 1			85.5400	0.0000	0.0000	110.0000	9409.4000 (32)
Ground Floor Block			46.9800			75.0000	3523.5000 (32c)
Ground Floor Stud			23.1800			9.0000	208.6200 (32c)
First Floor Stud			91.6300			9.0000	824.6700 (32c)
Internal Floor 1			42.0100			18.0000	756.1800 (32d)
Internal Ceiling 1			42.0100			18.0000	756.1800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	23327.2008 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							277.6387 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.2221 (36)
Total fabric heat loss						(33) + (36) =	39.5584 (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	39.7403	39.0975	39.3064	38.8938	38.8938	38.6954	38.5023	38.3145	38.1320	38.6954	38.3145	38.6954 (38)
Heat transfer coeff	79.2986	78.6559	78.8648	78.4522	78.4522	78.2538	78.0607	77.8729	77.6904	78.2538	77.8729	78.2538 (39)
Average = Sum(39)m / 12 =												78.3318 (39)
HLP	0.9438	0.9362	0.9386	0.9337	0.9337	0.9314	0.9291	0.9268	0.9247	0.9314	0.9268	0.9314 (40)
HLP (average)												0.9323 (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												2.5347 (42)
Average daily hot water use (litres/day)												94.3998 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	103.8397	100.0637	96.2877	92.5118	88.7358	84.9598	84.9598	88.7358	92.5118	96.2877	100.0637	103.8397 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Energy content (annual)	153.9913	134.6818	138.9795	121.1657	116.2614	100.3248	92.9656	106.6794	107.9535	125.8094	137.3308	149.1324 (45)
Distribution loss (46)m = 0.15 x (45)m	23.0987	20.2023	20.8469	18.1749	17.4392	15.0487	13.9448	16.0019	16.1930	18.8714	20.5996	22.3699 (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	27.5591	24.8897	27.5304	26.6128	27.4783	26.5671	27.4372	27.4639	26.5920	27.5089	26.6557	27.5510 (61)
Total heat required for water heating calculated for each month	181.5504	159.5715	166.5100	147.7785	143.7397	126.8919	120.4028	134.1433	134.5455	153.3183	163.9865	176.6834 (62)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.7000 (H2)
Collector heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0050 (H3a)
Collector effective heat loss coefficient												1.8063 (H3b)
Collector performance ratio												2.5804 (H4)
Annual solar radiation per m2												1208.1510 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												2029.6937 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.3665 (H8)
Utilisation factor												0.5189 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.3998 (H14)
Volume ratio Veff/V												0.7945 (H15)
Solar storage volume factor												0.9540 (H16)
Solar input												-883.5463 (H17)
Solar input	-28.8234	-40.9851	-70.4435	-95.0446	-111.6356	-119.2444	-116.7367	-104.4829	-81.8029	-56.5557	-34.0905	-23.7012 (63)
Solar input (sum of months) = Sum (63)m =												-883.5463 (63)
Output from w/h	152.7270	118.5864	96.0665	52.7339	32.1042	7.6475	3.6662	29.6604	52.7426	96.7626	129.8960	152.9822 (64)
Total per year (kWh/year) = Sum (64)m =												925.5754 (64)
Heat gains from water heating, kWh/month	58.0919	51.0041	53.0933	46.9408	45.5265	39.9998	37.7704	42.3369	42.5425	48.7088	52.3264	56.4743 (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	152.0836	152.0836	152.0836	152.0836	152.0836	152.0836	152.0836	152.0836	152.0836	152.0836	152.0836	152.0836	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	54.3420	48.2661	39.2526	29.7168	22.2136	18.7537	20.2640	26.3399	35.3534	44.8893	52.3924	55.8524	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	339.7565	343.2821	334.3977	315.4838	291.6084	269.1689	254.1780	250.6524	259.5368	278.4507	302.3261	324.7655	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7431	52.7431	52.7431	52.7431	52.7431	52.7431	52.7431	52.7431	52.7431	52.7431	52.7431	52.7431	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	-101.3891	(71)
Water heating gains (Table 5)	78.0805	75.8990	71.3620	65.1955	61.1915	55.5552	50.7666	56.9044	59.0869	65.4689	72.6756	75.9063	(72)
Total internal gains	578.6166	573.8848	551.4499	516.8337	481.4512	449.9155	431.6462	440.3343	460.4147	495.2464	533.8317	562.9618	(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

Northeast					3.6700	14.6176	0.6300	0.7000			0.7700			16.3952 (75)
Southwest					8.1800	45.1778	0.6300	0.7000			0.7700			112.9407 (79)

Solar gains	129.3358	192.2716	278.3610	369.6902	413.2815	455.0376	431.4135	389.6326	326.3137	233.0283	155.4164	108.1697 (83)		
Total gains	707.9525	766.1564	829.8109	886.5239	894.7327	904.9531	863.0598	829.9669	786.7284	728.2747	689.2481	671.1315 (84)		

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
alpha	81.7136	82.3814	82.1631	82.5953	82.5953	82.8047	83.0095	83.2097	83.4052	82.8047	83.2097	82.8047	
util living area	6.4476	6.4921	6.4775	6.5064	6.5064	6.5203	6.5340	6.5473	6.5603	6.5203	6.5473	6.5203	
	0.9899	0.9824	0.9557	0.8743	0.7138	0.4904	0.3525	0.3656	0.6114	0.8801	0.9737	0.9920	(86)
MIT	20.3868	20.4859	20.6685	20.8644	20.9699	20.9976	20.9998	20.9997	20.9910	20.8823	20.6273	20.3744	(87)
Th 2	20.1304	20.1369	20.1348	20.1389	20.1389	20.1409	20.1429	20.1447	20.1466	20.1409	20.1447	20.1409	(88)
util rest of house	0.9865	0.9766	0.9416	0.8393	0.6526	0.4178	0.2752	0.2856	0.5336	0.8383	0.9638	0.9892	(89)
MIT 2	19.5881	19.6904	19.8635	20.0423	20.1226	20.1401	20.1428	20.1447	20.1430	20.0625	19.8359	19.5851	(90)
Living area fraction									fLA = Living area / (4) =			0.2030	(91)
MIT	19.7503	19.8520	20.0270	20.2092	20.2946	20.3142	20.3168	20.3183	20.3152	20.2290	19.9966	19.7453	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7503	19.8520	20.0270	20.2092	20.2946	20.3142	20.3168	20.3183	20.3152	20.2290	19.9966	19.7453	(93)

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

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9847	0.9743	0.9395	0.8424	0.6642	0.4325	0.2909	0.3019	0.5493	0.8431	0.9617	0.9876	(94)
Useful gains	697.0928	746.4833	779.6399	746.8008	594.2430	391.4239	251.0513	250.5500	432.1366	614.0229	662.8304	662.7901	(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	1177.6089	1144.5961	1027.3707	840.1594	611.5045	392.3817	251.1071	250.6188	436.2439	690.9013	941.9947	1153.8773	(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	357.5039	267.5318	184.3118	67.2182	12.8425	0.0000	0.0000	0.0000	0.0000	57.1975	200.9983	365.3689	(98)
Space heating												1512.9728	(98)
Space heating per m2												(98) / (4) =	18.0073 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1668.1068 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	357.5039	267.5318	184.3118	67.2182	12.8425	0.0000	0.0000	0.0000	0.0000	57.1975	200.9983	365.3689	(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)	394.1609	294.9634	203.2103	74.1105	14.1593	0.0000	0.0000	0.0000	0.0000	63.0623	221.6078	402.8323	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	152.7270	118.5864	96.0665	52.7339	32.1042	7.6475	3.6662	29.6604	52.7426	96.7626	129.8960	152.9822	(64)
Efficiency of water heater	89.8433	89.8213	89.7208	89.4474	88.6822	87.9000	87.9000	87.9000	87.9000	88.9198	89.5798	89.8552	(217)
Fuel for water heating, kWh/month	169.9926	132.0249	107.0728	58.9552	36.2014	8.7002	4.1709	33.7434	60.0030	108.8201	145.0058	170.2540	(219)
Water heating fuel used												1034.9441	(219)
Annual totals kWh/year													
Space heating fuel - main system												1668.1068	(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)
pump for solar water heating													50.0000 (230g)
Total electricity for the above, kWh/year													125.0000 (231)
Electricity for lighting (calculated in Appendix L)													383.8789 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.65 * 1156 * 1.00) =										-601.2400		-601.2400	(233)
Total delivered energy for all uses												2610.6898	(238)

10a. Fuel costs - using BEDF prices (533)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1668.1068	10.2300	170.6473 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1034.9441	10.2300	105.8748 (247)
Pumps and fans for heating	75.0000	36.7200	27.5400 (249)
Pump for solar water heating	50.0000	36.7200	18.3600 (249)
Energy for lighting	383.8789	36.7200	140.9603 (250)
Additional standing charges			103.0000 (251)
Energy saving/generation technologies			
PV Unit	-601.2400	36.7200	-220.7753 (252)
Total energy cost			345.6071 (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	1668.1068	0.2160	360.3111 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1034.9441	0.2160	223.5479 (264)
Space and water heating			583.8590 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	383.8789	0.5190	199.2332 (268)
Energy saving/generation technologies			
PV Unit	-601.2400	0.5190	-312.0435 (269)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Total kg/year

535.9236 (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	1668.1068	1.2200	2035.0903 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1034.9441	1.2200	1262.6318 (264)
Space and water heating			3297.7221 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	383.8789	3.0700	1178.5083 (268)
Energy saving/generation technologies			
PV Unit	-601.2400	3.0700	-1845.8067 (269)
Primary energy kWh/year			3014.1737 (272)
Primary energy kWh/m2/year			35.8745 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0645 Plot 49	Issued on Date	03/01/2024
Assessment Reference	As Built	Prop Type Ref	Block L
Project	6, Nuthatch Way, Botley, SO32 2UH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	12.21	TER	16.61
Environmental	91 B	% DER<TER	26.48		
CO ₂ Emissions (t/year)	0.73	DFEE	33.93	TFEE	43.26
General Requirements Compliance	Pass	% DFEE<TFEE	21.55		

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 49	Issued on Date	03/01/2024
Assessment Reference	As Built	Prop Type Ref	Block L
Project	6, Nuthatch Way, Botley, SO32 2UH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	12.21	TER	16.61
Environmental	91 B	% DER<TER	26.48		
CO ₂ Emissions (t/year)	0.73	DFEE	33.93	TFEE	43.26
General Requirements Compliance	Pass	% DFEE<TFEE	21.55		

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 000005

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 49	Issued on Date	03/01/2024
Assessment Reference	As Built	Prop Type Ref	Block L
Project	6, Nuthatch Way, Botley, SO32 2UH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	12.21	TER	16.61
Environmental	91 B	% DER<TER	26.48		
CO ₂ Emissions (t/year)	0.73	DFEE	33.93	TFEE	43.26
General Requirements Compliance	Pass	% DFEE<TFEE	21.55		

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 000008

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				0.1300			
Layer 1	Tiling, clay						
	Main construction	30	1.0000	0.0000	100.00		
Layer 2	Standard cavity						
	Main construction	25	0.0000	0.0000	90.50		
	Main construction	25	0.1300	0.0000	9.50		
	Corrections - Cavity Ventilated, Emissivity: Normal						
Layer 3	Blockwork, dense						
	Main construction	100	1.5900	0.0629	93.18		
	Main construction	100	0.8800	0.1136	6.82		
Layer 4	Supafil 34						
	Main construction	100	0.0340	2.9412	100.00		
Layer 5	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 6	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 7	Plasterboard, standard						
	Main construction	12.5	0.2100	0.0595	100.00	700	1000
Int surface				0.1300			

Total resistance:	Upper limit = 4.349 m ² K/W	Lower limit = 4.137 m ² K/W	Average = 4.243 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: 383 mm	U-value: 0.24 W/m² K	Kappa: 42.22 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0645 Plot 49	Issued on Date	03/01/2024
Assessment Reference	As Built	Prop Type Ref	Block L
Project	6, Nuthatch Way, Botley, SO32 2UH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	12.21	TER	16.61
Environmental	91 B	% DER<TER	26.48		
CO ₂ Emissions (t/year)	0.73	DFEE	33.93	TFEE	43.26
General Requirements Compliance	Pass	% DFEE<TFEE	21.55		

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 000007 - Floor - suspended beam-and-block floor

Floor Type: Suspended Floor

Area = 42.15 m², Perimeter = 9.60 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) = 0.1 W/m² K

Unheated space: None

Total thickness: 450 mm

U-value: 0.10 W/m² K

Kappa: 140.00 kJ/m² K

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Property Reference	SAP 0645 Plot 49	Issued on Date	03/01/2024
Assessment Reference	As Built	Prop Type Ref	Block L
Property	6, Nuthatch Way, Botley, SO32 2UH		
SAP Rating	88 B	DER	12.21
Environmental	91 B	TER	16.61
CO ₂ Emissions (t/year)	0.73	% DER<TER	26.48
General Requirements Compliance	Pass	DFEE	33.93
		TFEE	43.26
		% DFEE<TFEE	21.55
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 East
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	House, Mid-Terrace
2.0 Number of Storeys	2
3.0 Date Built	2019
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements		Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground Floor:	10.20 m	42.01 m ²	2.39 m
	1st Storey:	10.20 m	42.01 m ²	2.67 m

7.0 Living Area	17.06	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	277.64	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	37.13	25.36
External Cladding	Cavity Wall	Other		0.24	42.22	14.48	12.28

9.1 Party Walls				U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Description	Type	Construction				
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill		0.00	110.00	85.54

9.2 Internal Walls				Kappa (kJ/m ² K)	Area (m ²)
Description	Construction				
Ground Floor Block	Dense block, plasterboard on dabs			75.00	46.98
Ground Floor Stud	Plasterboard on timber frame			9.00	23.18
First Floor Stud	Plasterboard on timber frame			9.00	91.63

10.0 External Roofs

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area (m²)	Nett Area (m²)
Pitched Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.10	9.00	42.01	42.01

10.2 Internal Ceilings	Description	Construction	Kappa (kJ/m²K)	Area (m²)
	Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor	9.00	42.01

11.0 Heat Loss Floors	Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)
	Ground Floor	Ground Floor - Solid	Other	0.10	140.00	42.01

11.2 Internal Floors	Description	Construction	Kappa (kJ/m²K)	Area (m²)
	Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	42.01

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	Manufacture r	Half Glazed Door	Double Low-E Soft 0.1			0.63		0.70	1.10
	Windows	Manufacture r	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
	Front Elevation	Half Glazed Door	[1] Brick and Block	North East							2.12	
	Front Elevation	Window	[1] Brick and Block	North East	None	0.00					1.47	
	Front Elevation	Window	[2] External Cladding	North East	None	0.00					2.20	
	Rear Elevation	Window	[1] Brick and Block	South West	None	0.00					8.18	

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)	0.49	0.093	No	Birtley Supatherm
	Independently assessed	E2 Other lintels (including other steel lintels)	3.76	0.071	No	Birtley Supatherm
	Independently assessed	E2 Other lintels (including other steel lintels)	3.91	0.067	No	Birtley Supatherm
	Independently assessed	E2 Other lintels (including other steel lintels)	1.77	0.064	No	Birtley Supatherm
	Independently assessed	E3 Sill	7.40	0.021	No	Knauf P5
	Independently assessed	E4 Jamb	24.60	0.016	No	Knauf P6
	Independently assessed	E5 Ground floor (normal)	10.02	0.062	No	Be-E5-23902
	Independently assessed	E6 Intermediate floor within a dwelling	10.02	0.000	No	CD0029
	Table K1 - Approved	E10 Eaves (insulation at ceiling level)	10.02	0.060	No	
	Independently assessed	E18 Party wall between dwellings	5.05	0.036	No	Knauf P25 Halved
	Independently assessed	E25 Staggered party wall between dwellings	5.05	0.055	No	Knauf P27 Halved
	Table K1 - Default	P1 Party wall - Ground floor	16.94	0.160	No	
	Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	16.94	0.000	No	
	Independently assessed	P4 Party wall - Roof (insulation at ceiling level)	16.94	0.035	No	Knauf P29 Halved

Y-value	0.046 W/m²K
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18.0 Pressure Testing	Yes
Designed AP ₅₀	5.00 m³/(h.m²) @ 50 Pa

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Property Tested ? Yes
As Built AP₅₀ 4.41 m³/(h.m²) @ 50 Pa

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

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 19
Total number of L.E.L. fittings 19
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

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

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Combi keep hot type	Gas/Oil, time clock			
25.0 Main Heating 2	None			
Community Heating	None			
28.0 Water Heating	HWP From main heating 1			
Water Heating	Main Heating 1			
Flue Gas Heat Recovery System	No			
Waste Water Heat Recovery Instantaneous System 1	No			
Waste Water Heat Recovery Instantaneous System 2	No			
Waste Water Heat Recovery Storage System	No			
Solar Panel	No			
Water use <= 125 litres/person/day	Yes			
SAP Code	901			
29.0 Hot Water Cylinder	None			
32.0 Photovoltaic Unit	One Dwelling			
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
0.65	South West	30°	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£84	B 90	