

Energy Statement for the construction of a new dwelling at 3 Toot Hill Butts, Headington, Oxford, OX3 8LB

Building Design

The property has been designed with maximum energy efficiency in mind, with a “fabric first” approach. The new dwelling will be insulated to a very high standard, so that it outperforms current building regulations by 40%. Appendix 1 provides the SAP calculations which confirm a TER of 25.2 and a DER of 15.09, which equates to a 40.11% improvement over current building regulations.

Sustainable Construction and Occupation

Sustainable design and construction requirements in accordance with police RE1 will be addressed as follows:

Water consumption

All residential units will aim to meet the higher water efficiency standards within the 2013 Building Regulations Part G2 water consumption target of 110 litres per person per day. This will be achieved by:

- Dual flush WCs
- Spray and aerating taps
- Water efficient appliances
- Low-flow showers

Building Materials

Construction materials are selected in a way to reduce the environmental impact, key issues during selection are:

- Use of sustainably sourced materials
- Low embodied energy materials
- The use of recycled and reclaimed materials where possible, as well as materials with high recycled content
- Use of recycled or secondary aggregate

Construction Waste

The aim will be to reduce construction waste by encouraging reuse, recovery and best practice waste management practices to minimise waste going to landfill.

Measures will include:

- Efficient procurement to ensure minimum wastage of materials.
- Sorting of waste materials into separate key waste groups (bricks, concrete, insulation, timber, tiles, etc.), either on site or through a licensed contractor for recovery.
- Return of pallets and packaging for reuse
- Design to use fewer materials

Appendix 1

SAP Calculations attached on following pages

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Toothill Bus			Issued on Date	15/01/2024
Assessment Reference	001	Prop Type Ref	As design stage		
Property	3 Toot Hill Bus s, Headington, 3, Toot Hill Bus s, Headington, Oxford, Oxfordshire, OX3 8LB				
SAP Rating	86 B	DER	15.09	TER	25.20
Environmental	87 B	% DER<TER	40.11		
CO ₂ Emissions (t/year)	1.07	DFEE	28.67	TFEE	47.83
General Requirements Compliance	Pass	% DFEE<TFEE	40.04		
Assessor Details	Mrs. Elena Sava, Elena Sava, [REDACTED]			Assessor ID	AL21-0001
Client	[REDACTED]				

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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DWELLING AS DESIGNED

Semi-Detached House, total floor area 76 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:Electricity
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 25.20 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.09 kgCO₂/m²OK

1b TPFE and DFEE

Target Fabric Energy Efficiency (TPFE)47.8 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)28.67 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.08 (max. 0.30)	0.08 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.07 (max. 0.25)	0.07 (max. 0.70)	OK
Roof	0.05 (max. 0.20)	0.05 (max. 0.35)	OK
Openings	1.50 (max. 2.00)	1.50 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified ψ -value of 0.011

3 Air permeability

Air permeability at 50 pascals: 2.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Heat pump with radiators or underfloor - Electric
Air-to-water heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water storage Nominal store loss: 1.33 kWh/day
Permitted by DBSG 1.66 OK
Primary pipework insulated: Yes OK

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls:

Cylinderstat OK
Independent timer for DHW 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 (Thames Valley): Medium OK

Based on:

Overshading: Average
Windows facing North East: 12.24 m², No overhang
Windows facing South West: 6.14 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

External wall U-value 0.08 W/m²K
External wall U-value 0.08 W/m²K
External wall U-value 0.08 W/m²K
Party wall U-value 0.00 W/m²K
Roof U-value 0.05 W/m²K
Floor U-value 0.07 W/m²K
Thermal bridging ψ -value 0.011 W/m²K
Air permeability 2.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	38.7600 (1b)	2.4000 (2b)	93.0240 (1b) - (3b)
First floor	37.7300 (1c)	2.4000 (2c)	90.5520 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	76.4900		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 183.5760 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (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)				20.0000 / (5) =	0.1089 (8)
Pressure test				Yes	2.0000
Measured/design AP50					0.2089 (18)
Infiltration rate					0 (19)
Number of sides sheltered					
Shelter factor				(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.2089 (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												
Effective ac	0.2664	0.2612	0.2560	0.2298	0.2246	0.1985	0.1985	0.1933	0.2089	0.2246	0.2351	0.2455 (22b)
	0.5355	0.5341	0.5328	0.5264	0.5252	0.5197	0.5197	0.5187	0.5218	0.5252	0.5276	0.5301 (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
NE French door (Uw = 1.50)			7.9200	1.4151	11.2075		(27)
Window (Uw = 1.50)			10.4600	1.4151	14.8019		(27)
Door			1.6600	1.5000	2.4900		(26)
Heat Loss Floor 1			38.7600	0.0700	2.7132		(28a)
External Wall 1	24.4800	12.2400	12.2400	0.0800	0.9792		(29a)
External Wall 2	24.4800		24.4800	0.0800	1.9584		(29a)
External Wall 3	36.4800	7.8000	28.6800	0.0800	2.2944		(29a)
External Roof 1	38.7600		38.7600	0.0500	1.9380		(30)
Total net area of external elements Aum(A, m ²)			162.9600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	38.3826	(33)
Party Wall 1			36.4800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (User defined value 0.011 * total exposed area)							1.7926 (36)
Total fabric heat loss						(33) + (36) =	40.1752 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	32.4398	32.3563	32.2745	31.8902	31.8183	31.4835	31.4835	31.4215	31.6125	31.8183	31.9637	32.1158 (38)
Heat transfer coeff	72.6150	72.5315	72.4497	72.0654	71.9935	71.6587	71.6587	71.5967	71.7877	71.9935	72.1389	72.2910 (39)
Average = Sum(39)m / 12 =												72.0650 (39)
HLP	0.9493	0.9482	0.9472	0.9422	0.9412	0.9368	0.9368	0.9360	0.9385	0.9412	0.9431	0.9451 (40)
HLP (average)												0.9421 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.3929 (42)
Average daily hot water use (litres/day)												91.0311 (43)
Daily hot water use	100.1342	96.4930	92.8517	89.2105	85.5693	81.9280	81.9280	85.5693	89.2105	92.8517	96.4930	100.1342 (44)
Energy content	148.4962	129.8757	134.0201	116.8420	112.1126	96.7447	89.6482	102.8726	104.1012	121.3199	132.4302	143.8106 (45)
Energy content (annual)												Total = Sum(45)m = 1432.2740 (45)
Distribution loss (46)m = 0.15 x (45)m	22.2744	19.4814	20.1030	17.5263	16.8169	14.5117	13.4472	15.4309	15.6152	18.1980	19.8645	21.5716 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Water storage loss:												
Store volume												100.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0103 (51)
Volume factor from Table 2a												1.0627 (52)
Temperature factor from Table 2b												0.9623 (53)
Enter (49) or (54) in (55)												1.0521 (55)
Total storage loss	32.6142	29.4580	32.6142	31.5622	32.6142	31.5622	32.6142	32.6142	31.5622	32.6142	31.5622	32.6142 (56)
If cylinder contains dedicated solar storage	32.6142	29.4580	32.6142	31.5622	32.6142	31.5622	32.6142	32.6142	31.5622	32.6142	31.5622	32.6142 (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)
Total heat required for water heating calculated for each month	181.1104	159.3337	166.6343	148.4041	144.7269	128.3069	122.2624	135.4868	135.6634	153.9342	163.9924	176.4249 (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	181.1104	159.3337	166.6343	148.4041	144.7269	128.3069	122.2624	135.4868	135.6634	153.9342	163.9924	176.4249 (64)
												Total per year (kWh/year) = Sum(64)m = 1816.2805 (64)
Heat gains from water heating, kWh/month	75.4664	66.7501	70.6531	64.0997	63.3689	57.4173	55.8994	60.2965	59.8634	66.4303	69.2828	73.9084 (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	119.6445	119.6445	119.6445	119.6445	119.6445	119.6445	119.6445	119.6445	119.6445	119.6445	119.6445	119.6445 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.8950	16.7824	13.6483	10.3327	7.7238	6.5207	7.0459	9.1585	12.2926	15.6082	18.2171	19.4201 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	211.9487	214.1481	208.6058	196.8068	181.9127	167.9144	158.5627	156.3633	161.9056	173.7046	188.5987	202.5970 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.9644	34.9644	34.9644	34.9644	34.9644	34.9644	34.9644	34.9644	34.9644	34.9644	34.9644	34.9644 (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)	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156 (71)
Water heating gains (Table 5)	101.4333	99.3305	94.9638	89.0274	85.1732	79.7463	75.1336	81.0437	83.1436	89.2880	96.2261	99.3393 (72)
Total internal gains	391.1704	389.1543	376.1113	355.0602	333.7031	313.0748	299.6355	305.4589	316.2351	337.4942	361.9352	380.2498 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m ²	Table 6a	Specific data	Specific data	factor	W						
		W/m ²	or Table 6b	or Table 6c	Table 6d							
Northeast	7.9200	11.2829	0.7200	0.7000	0.7700	31.2113 (75)						
Northeast	4.3200	11.2829	0.6400	0.7000	0.7700	15.1327 (75)						
Southwest	6.1400	36.7938	0.6400	0.7000	0.7700	70.1382 (79)						
Solar gains	116.4822	213.8058	333.4267	481.6666	602.0621	625.2244	591.3321	497.3049	384.0989	247.3255	142.3221	97.8705 (83)
Total gains	507.6526	602.9601	709.5379	836.7268	935.7652	938.2992	890.9676	802.7638	700.3340	584.8197	504.2573	478.1203 (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	73.1503	73.2344	73.3172	73.7082	73.7818	74.1264	74.1264	74.1906	73.9933	73.7818	73.6330	73.4781
alpha	5.8767	5.8823	5.8878	5.9139	5.9188	5.9418	5.9418	5.9460	5.9329	5.9188	5.9089	5.8985
util living area	0.9965	0.9900	0.9655	0.8724	0.6844	0.4852	0.3534	0.4091	0.6781	0.9381	0.9914	0.9975 (86)
MIT	20.6360	20.6794	20.7450	20.8167	20.8529	20.8616	20.8626	20.8625	20.8560	20.7983	20.7015	20.6265 (87)
Th 2	20.1258	20.1267	20.1276	20.1318	20.1326	20.1363	20.1363	20.1370	20.1349	20.1326	20.1310	20.1293 (88)
util rest of house	0.9954	0.9869	0.9552	0.8408	0.6302	0.4213	0.2843	0.3330	0.6044	0.9143	0.9882	0.9967 (89)
MIT 2	19.6220	19.6858	19.7801	19.8803	19.9226	19.9345	19.9351	19.9359	19.9288	19.8599	19.7224	19.6115 (90)
Living area fraction												fLA = Living area / (4) = 0.3067 (91)
MIT	19.9330	19.9906	20.0761	20.1675	20.2079	20.2189	20.2196	20.2201	20.2132	20.1477	20.0227	19.9228 (92)
Temperature adjustment												-0.1000
adjusted MIT	19.8330	19.8906	19.9761	20.0675	20.1079	20.1189	20.1196	20.1201	20.1132	20.0477	19.9227	19.8228 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9949	0.9859	0.9531	0.8382	0.6286	0.4200	0.2830	0.3315	0.6025	0.9116	0.9872	0.9964 (94)
Useful gains	505.0814	594.4398	676.2375	701.3465	588.2542	394.1243	252.1091	266.0941	421.9526	533.0960	497.7981	476.3839 (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	1127.9291	1087.2888	976.3360	804.7903	605.3167	395.4765	252.2093	266.3462	431.6732	680.1735	925.0171	1129.3909 (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	463.3987	331.1946	223.2733	74.4795	12.6945	0.0000	0.0000	0.0000	0.0000	109.4257	307.5977	485.8372 (98)
Space heating												2007.9010 (98)
Space heating per m ²												(98) / (4) = 26.2505 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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 %)													175.1000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1146.7168 (211)
Space heating requirement	463.3987	331.1946	223.2733	74.4795	12.6945	0.0000	0.0000	0.0000	0.0000	109.4257	307.5977	485.8372	(98)
Space heating efficiency (main heating system 1)	175.1000	175.1000	175.1000	175.1000	175.1000	0.0000	0.0000	0.0000	0.0000	175.1000	175.1000	175.1000	(210)
Space heating fuel (main heating system)	264.6480	189.1460	127.5119	42.5354	7.2499	0.0000	0.0000	0.0000	0.0000	62.4932	175.6697	277.4627	(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	181.1104	159.3337	166.6343	148.4041	144.7269	128.3069	122.2624	135.4868	135.6634	153.9342	163.9924	176.4249	(64)
Efficiency of water heater (217)m	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	(216)
Fuel for water heating, kWh/month	103.4326	90.9959	95.1652	84.7539	82.6539	73.2763	69.8243	77.3768	77.4777	87.9122	93.6564	100.7566	(219)
Water heating fuel used													1037.2818 (219)
Annual totals kWh/year													
Space heating fuel - main system													1146.7168 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans: central heating pump													30.0000 (230c)
Total electricity for the above, kWh/year													30.0000 (231)
Electricity for lighting (calculated in Appendix L)													333.6914 (232)
Total delivered energy for all uses													2547.6900 (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	1146.7168	0.5190	595.1460 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1037.2818	0.5190	538.3493 (264)
Space and water heating			1133.4953 (265)
Pumps and fans	30.0000	0.5190	15.5700 (267)
Energy for lighting	333.6914	0.5190	173.1858 (268)
Total CO2, kg/year			1322.2511 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			15.0900 (273)

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

	DER	
Total Floor Area	76.4900	TFA
Assumed number of occupants	2.3929	N
CO2 emission factor in Table 12 for electricity displaced from grid	0.5190	EF
CO2 emissions from appliances, equation (L14)	16.4200	ZC2
CO2 emissions from cooking, equation (L16)	2.3066	ZC3
Total CO2 emissions	36.0165	ZC4
Residual CO2 emissions offset from biofuel CHP	0.0000	ZC5
Additional allowable electricity generation, kWh/m ² /year	0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation	0.0000	ZC7
Net CO2 emissions	36.0165	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	38.7600 (1b)	x 2.4000 (2b)	= 93.0240 (1b) - (3b)
First floor	37.7300 (1c)	x 2.4000 (2c)	= 90.5520 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	76.4900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.5760 (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) = 0.1634 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4134 (18)
Number of sides sheltered					0 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.4134 (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												
Effective ac	0.5271	0.5168	0.5064	0.4548	0.4444	0.3927	0.3927	0.3824	0.4134	0.4444	0.4651	0.4858 (22b)
	0.6389	0.6335	0.6282	0.6034	0.5988	0.5771	0.5771	0.5731	0.5855	0.5988	0.6082	0.6180 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.6600	1.0000	1.6600		(26)
TER Opening Type (Uw = 1.40)			17.4500	1.3258	23.1345		(27)
Heat Loss Floor 1			38.7600	0.1300	5.0388		(28a)
External Wall 1	24.4800	11.6200	12.8600	0.1800	2.3148		(29a)
External Wall 2	24.4800		24.4800	0.1800	4.4064		(29a)
External Wall 3	36.4800	7.4900	28.9900	0.1800	5.2182		(29a)
External Roof 1	38.7600		38.7600	0.1300	5.0388		(30)
Total net area of external elements Aum(A, m ²)			162.9600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 46.8115		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 0.0000 (36)
Total fabric heat loss (33) + (36) = 46.8115 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	38.7060	38.3792	38.0589	36.5543	36.2728	34.9623	34.9623	34.7197	35.4671	36.2728	36.8423	37.4376 (38)
Heat transfer coeff	85.5175	85.1907	84.8703	83.3657	83.0842	81.7738	81.7738	81.5311	82.2786	83.0842	83.6537	84.2491 (39)
Average = Sum(39)m / 12 =												83.3644 (39)
HLP	1.1180	1.1137	1.1096	1.0899	1.0862	1.0691	1.0691	1.0659	1.0757	1.0862	1.0937	1.1014 (40)
HLP (average)												1.0899 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												
Average daily hot water use (litres/day)												2.3929 (42)
												91.0311 (43)
Daily hot water use	100.1342	96.4930	92.8517	89.2105	85.5693	81.9280	81.9280	85.5693	89.2105	92.8517	96.4930	100.1342 (44)
Energy content (annual)	148.4962	129.8757	134.0201	116.8420	112.1126	96.7447	89.6482	102.8726	104.1012	121.3199	132.4302	143.8106 (45)
Distribution loss (46)m = 0.15 x (45)m												
	22.2744	19.4814	20.1030	17.5263	16.8169	14.5117	13.4472	15.4309	15.6152	18.1980	19.8645	21.5716 (46)
Water storage loss:												
Store volume												150.0000 (47)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	195.0911	171.9614	180.6150	161.9338	158.7076	141.8365	136.2431	149.4675	149.1931	167.9148	177.5220	190.4055 (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	195.0911	171.9614	180.6150	161.9338	158.7076	141.8365	136.2431	149.4675	149.1931	167.9148	177.5220	190.4055 (64)
Heat gains from water heating, kWh/month	86.6509	76.8522	81.8376	74.9234	74.5534	68.2411	67.0839	71.4811	70.6871	77.6148	80.1065	85.0930 (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	119.6445	119.6445	119.6445	119.6445	119.6445	119.6445	119.6445	119.6445	119.6445	119.6445	119.6445	119.6445 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.8954	16.7827	13.6486	10.3329	7.7240	6.5209	7.0460	9.1587	12.2928	15.6085	18.2175	19.4205 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	211.9487	214.1481	208.6058	196.8068	181.9127	167.9144	158.5627	156.3633	161.9056	173.7046	188.5987	202.5970 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.9644	34.9644	34.9644	34.9644	34.9644	34.9644	34.9644	34.9644	34.9644	34.9644	34.9644	34.9644 (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)	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156 (71)
Water heating gains (Table 5)	116.4663	114.3635	109.9968	104.0603	100.2062	94.7793	90.1666	96.0767	98.1766	104.3210	111.2590	114.3722 (72)
Total internal gains	409.2037	407.1876	394.1445	373.0934	351.7362	331.1079	317.6687	323.4921	334.2684	355.5275	379.9685	398.2831 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b g	Specific data or Table 6c FF	Access factor Table 6d Access factor	Gains W
Northeast	11.6200	11.2829	0.6300	0.7000	0.7700	40.0682 (75)
Southwest	5.8300	36.7938	0.6300	0.7000	0.7700	65.5564 (79)
Solar gains	105.6247	193.2269	299.7328	430.6375	536.4342	556.3449
Total gains	514.8284	600.4146	693.8773	803.7309	888.1704	887.4529
						844.1443
						767.4015
						344.4917
						223.0886
						128.9377
						508.9063
						88.8244 (83)
						487.1075 (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	62.1137	62.3520	62.5873	63.7169	63.9328	64.9573	64.9573	65.1506	64.5588	63.9328	63.4975	63.0488
alpha	5.1409	5.1568	5.1725	5.2478	5.2622	5.3305	5.3305	5.3434	5.3039	5.2622	5.2332	5.2033
util living area	0.9966	0.9920	0.9768	0.9186	0.7766	0.5747	0.4236	0.4832	0.7579	0.9564	0.9925	0.9974 (86)
MIT	19.8699	20.0409	20.3162	20.6643	20.8970	20.9834	20.9973	20.9947	20.9337	20.6141	20.1841	19.8485 (87)
Th 2	19.9861	19.9896	19.9930	20.0091	20.0121	20.0262	20.0262	20.0288	20.0207	20.0121	20.0060	19.9997 (88)
util rest of house	0.9955	0.9894	0.9691	0.8931	0.7195	0.4937	0.3313	0.3841	0.6779	0.9372	0.9896	0.9966 (89)
MIT 2	18.4867	18.7379	19.1366	19.6303	19.9183	20.0160	20.0252	20.0267	19.9715	19.5759	18.9594	18.4653 (90)
Living area fraction										fLA = Living area / (4) =		0.3067 (91)
MIT	18.9110	19.1376	19.4984	19.9475	20.2185	20.3127	20.3233	20.3236	20.2666	19.8943	19.3350	18.8896 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9110	19.1376	19.4984	19.9475	20.2185	20.3127	20.3233	20.3236	20.2666	19.8943	19.3350	18.8896 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	511.6422	592.2351	669.0633	716.3286	650.3892	459.7885	303.6223	318.1519	474.8096	540.6153	502.2134	484.7919 (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	1249.4922	1212.9065	1103.1765	920.9803	707.7522	467.1481	304.4719	319.8974	507.3793	772.2120	1023.5043	1237.5824 (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	548.9604	417.0912	322.9802	147.3493	42.6781	0.0000	0.0000	0.0000	0.0000	172.3080	375.3295	560.0761 (98)
Space heating												2586.7727 (98)
Space heating per m ²												(98) / (4) = 33.8184 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Not applicable

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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 %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2766.6018 (211)
Space heating requirement	548.9604	417.0912	322.9802	147.3493	42.6781	0.0000	0.0000	0.0000	0.0000	172.3080	375.3295	560.0761	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	587.1234	446.0868	345.4334	157.5928	45.6450	0.0000	0.0000	0.0000	0.0000	184.2866	401.4219	599.0119	(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	195.0911	171.9614	180.6150	161.9338	158.7076	141.8365	136.2431	149.4675	149.1931	167.9148	177.5220	190.4055	(64)
Efficiency of water heater (217)m	87.4263	87.0910	86.3476	84.5633	81.8509	79.8000	79.8000	79.8000	79.8000	84.8827	86.7644	87.5226	(217)
Fuel for water heating, kWh/month	223.1491	197.4504	209.1721	191.4942	193.8985	177.7400	170.7307	187.3026	186.9587	197.8198	204.6025	217.5502	(219)
Water heating fuel used													2357.8687 (219)
Annual totals kWh/year													
Space heating fuel - main system													2766.6018 (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)													333.6984 (232)
Total delivered energy for all uses													5533.1689 (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	2766.6018	0.2160	597.5860	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2357.8687	0.2160	509.2996	(264)
Space and water heating			1106.8856	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	333.6984	0.5190	173.1895	(268)
Total CO2, kg/m2/year			1319.0001	(272)
Emissions per m2 for space and water heating			14.4710	(272a)
Fuel factor (electricity)			1.5500	
Emissions per m2 for lighting			2.2642	(272b)
Emissions per m2 for pumps and fans			0.5089	(272c)
Target Carbon Dioxide Emission Rate (TER) = (14.4710 * 1.55) + 2.2642 + 0.5089, rounded to 2 d.p.			25.2000	(273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	38.7600 (1b)	x 2.4000 (2b)	= 93.0240 (1b) - (3b)
First floor	37.7300 (1c)	x 2.4000 (2c)	= 90.5520 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	76.4900		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 183.5760 (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) = 0.1634 (8)
Pressure test					Yes
Measured/design AP50					2.0000
Infiltration rate					0.2634 (18)
Number of sides sheltered					0 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.2634 (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												
Effective ac	0.3359	0.3293	0.3227	0.2898	0.2832	0.2502	0.2502	0.2437	0.2634	0.2832	0.2963	0.3095 (22b)
	0.5564	0.5542	0.5521	0.5420	0.5401	0.5313	0.5313	0.5297	0.5347	0.5401	0.5439	0.5479 (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
NE French door (Uw = 1.50)			7.9200	1.4151	11.2075		(27)
Window (Uw = 1.50)			10.4600	1.4151	14.8019		(27)
Door			1.6600	1.5000	2.4900		(26)
Heat Loss Floor 1			38.7600	0.0700	2.7132		(28a)
External Wall 1	24.4800	12.2400	12.2400	0.0800	0.9792		(29a)
External Wall 2	24.4800		24.4800	0.0800	1.9584		(29a)
External Wall 3	36.4800	7.8000	28.6800	0.0800	2.2944		(29a)
External Roof 1	38.7600		38.7600	0.0500	1.9380		(30)
Total net area of external elements Aum(A, m ²)			162.9600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 38.3826		(33)
Party Wall 1			36.4800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (User defined value 0.011 * total exposed area)							1.7926 (36)
Total fabric heat loss						(33) + (36) =	40.1752 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	33.7068	33.5741	33.4441	32.8333	32.7190	32.1869	32.1869	32.0884	32.3919	32.7190	32.9502	33.1919 (38)
Heat transfer coeff	73.8820	73.7493	73.6193	73.0084	72.8942	72.3621	72.3621	72.2636	72.5671	72.8942	73.1254	73.3671 (39)
Average = Sum(39)m / 12 =												73.0079 (39)
HLP	0.9659	0.9642	0.9625	0.9545	0.9530	0.9460	0.9460	0.9447	0.9487	0.9530	0.9560	0.9592 (40)
HLP (average)												0.9545 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.3929 (42)
Average daily hot water use (litres/day)												91.0311 (43)
Daily hot water use	100.1342	96.4930	92.8517	89.2105	85.5693	81.9280	81.9280	85.5693	89.2105	92.8517	96.4930	100.1342 (44)
Energy content (annual)	148.4962	129.8757	134.0201	116.8420	112.1126	96.7447	89.6482	102.8726	104.1012	121.3199	132.4302	143.8106 (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)
Total = Sum(45)m =												1432.2740 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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												
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month												
	31.5554	27.5986	28.4793	24.8289	23.8239	20.5582	19.0502	21.8604	22.1215	25.7805	28.1414	30.5598 (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	119.6445	119.6445	119.6445	119.6445	119.6445	119.6445	119.6445	119.6445	119.6445	119.6445	119.6445	119.6445 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	18.8950	16.7824	13.6483	10.3327	7.7238	6.5207	7.0459	9.1585	12.2926	15.6082	18.2171	19.4201 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	211.9487	214.1481	208.6058	196.8068	181.9127	167.9144	158.5627	156.3633	161.9056	173.7046	188.5987	202.5970 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	34.9644	34.9644	34.9644	34.9644	34.9644	34.9644	34.9644	34.9644	34.9644	34.9644	34.9644	34.9644 (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)												
	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156 (71)
Water heating gains (Table 5)												
	42.4132	41.0693	38.2786	34.4846	32.0214	28.5531	25.6052	29.3823	30.7243	34.6512	39.0853	41.0749 (72)
Total internal gains	332.1503	330.8931	319.4260	300.5174	280.5513	261.8816	250.1071	253.7975	263.8159	282.8574	304.7944	321.9854 (73)

6. Solar gains

[Jan]		Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
Northeast		7.9200	11.2829	0.7200		0.7000		0.7700	31.2113 (75)
Northeast		4.3200	11.2829	0.6400		0.7000		0.7700	15.1327 (75)
Southwest		6.1400	36.7938	0.6400		0.7000		0.7700	70.1382 (79)

Solar gains	116.4822	213.8058	333.4267	481.6666	602.0621	625.2244	591.3321	497.3049	384.0989	247.3255	142.3221	97.8705 (83)
Total gains	448.6325	544.6990	652.8527	782.1840	882.6134	887.1060	841.4392	751.1024	647.9147	530.1829	447.1165	419.8559 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)												
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	71.8958	72.0251	72.1524	72.7560	72.8701	73.4059	73.4059	73.5060	73.1986	72.8701	72.6397	72.4004
alpha	5.7931	5.8017	5.8102	5.8504	5.8580	5.8937	5.8937	5.9004	5.8799	5.8580	5.8426	5.8267
util living area												
	0.9982	0.9941	0.9769	0.9006	0.7227	0.5166	0.3776	0.4405	0.7263	0.9595	0.9954	0.9988 (86)
MIT	20.0014	20.1792	20.4537	20.7721	20.9490	20.9938	20.9992	20.9981	20.9616	20.6824	20.2727	19.9655 (87)
Th 2	20.1118	20.1133	20.1147	20.1214	20.1227	20.1285	20.1285	20.1296	20.1263	20.1227	20.1202	20.1175 (88)
util rest of house												
	0.9976	0.9922	0.9695	0.8730	0.6681	0.4487	0.3033	0.3583	0.6516	0.9422	0.9936	0.9983 (89)
MIT 2	19.1963	19.3743	19.6451	19.9478	20.0917	20.1260	20.1283	20.1291	20.1070	19.8748	19.4737	19.1652 (90)
Living area fraction fLA = Living area / (4) =												
MIT	19.4432	19.6211	19.8931	20.2006	20.3547	20.3921	20.3954	20.3956	20.3692	20.1225	19.7188	19.4107 (92)
Temperature adjustment												
adjusted MIT	19.4432	19.6211	19.8931	20.2006	20.3547	20.3921	20.3954	20.3956	20.3692	20.1225	19.7188	19.4107 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9970	0.9908	0.9672	0.8758	0.6831	0.4695	0.3261	0.3836	0.6735	0.9422	0.9925	0.9979 (94)
Useful gains	447.2800	539.6896	631.4615	685.0295	602.9090	416.4531	274.3938	288.1066	436.3612	499.5158	443.7499	418.9750 (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												
	1118.8133	1085.6740	985.9936	825.0413	630.8735	419.1319	274.6459	288.7384	454.9340	694.1358	922.7540	1115.9612 (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												
	499.6208	366.9016	263.7719	100.8085	20.8057	0.0000	0.0000	0.0000	0.0000	144.7973	344.8830	518.5577 (98)
Space heating												
Space heating per m2												2260.1464 (98)
												(98) / (4) = 29.5483 (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	680.2041	535.4798	549.2035	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9790	0.9915	0.9843	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	665.9476	530.9320	540.5850	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1125.8633	1070.6560	966.5302	0.0000	0.0000	0.0000	0.0000 (103)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Month fraction	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	331.1393	401.5547	316.9032	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												1049.5972 (104)
Cooled fraction												1.0000 (105)
Intermittency factor (Table 10b)												
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												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	82.7848	100.3887	79.2258	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												262.3993 (107)
Space cooling per m2												3.4305 (108)
Energy for space heating												29.5483 (99)
Energy for space cooling												3.4305 (108)
Total												32.9788 (109)
Dwelling Fabric Energy Efficiency (DFEE)												33.0 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	38.7600 (1b)	x 2.4000 (2b)	= 93.0240 (1b) - (3b)
First floor	37.7300 (1c)	x 2.4000 (2c)	= 90.5520 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	76.4900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.5760 (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) = 0.1634 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4134 (18)
Number of sides sheltered					0 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.4134 (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												
Effective ac	0.5271	0.5168	0.5064	0.4548	0.4444	0.3927	0.3927	0.3824	0.4134	0.4444	0.4651	0.4858 (22b)
	0.6389	0.6335	0.6282	0.6034	0.5988	0.5771	0.5771	0.5731	0.5855	0.5988	0.6082	0.6180 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			1.6600	1.0000	1.6600		(26)
TER Opening Type (Uw = 1.40)			17.4500	1.3258	23.1345		(27)
Heat Loss Floor 1			38.7600	0.1300	5.0388		(28a)
External Wall 1	24.4800	11.6200	12.8600	0.1800	2.3148		(29a)
External Wall 2	24.4800		24.4800	0.1800	4.4064		(29a)
External Wall 3	36.4800	7.4900	28.9900	0.1800	5.2182		(29a)
External Roof 1	38.7600		38.7600	0.1300	5.0388		(30)
Total net area of external elements Aum(A, m2)			162.9600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 46.8115		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)
 Thermal bridges (Sum(L x Psi) calculated using Appendix K) 0.0000 (36)
 Total fabric heat loss (33) + (36) = 46.8115 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	38.7060	38.3792	38.0589	36.5543	36.2728	34.9623	34.9623	34.7197	35.4671	36.2728	36.8423	37.4376 (38)
Heat transfer coeff	85.5175	85.1907	84.8703	83.3657	83.0842	81.7738	81.7738	81.5311	82.2786	83.0842	83.6537	84.2491 (39)
Average = Sum(39)m / 12 =												83.3644 (39)
HLP	1.1180	1.1137	1.1096	1.0899	1.0862	1.0691	1.0691	1.0659	1.0757	1.0862	1.0937	1.1014 (40)
HLP (average)												1.0899 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.3929 (42)
Average daily hot water use (litres/day)												91.0311 (43)
Daily hot water use	100.1342	96.4930	92.8517	89.2105	85.5693	81.9280	81.9280	85.5693	89.2105	92.8517	96.4930	100.1342 (44)
Energy content (annual)	148.4962	129.8757	134.0201	116.8420	112.1126	96.7447	89.6482	102.8726	104.1012	121.3199	132.4302	143.8106 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1432.2740 (45)
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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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	0.0000	0.0000 (56)
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	0.0000 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	31.5554	27.5986	28.4793	24.8289	23.8239	20.5582	19.0502	21.8604	22.1215	25.7805	28.1414	30.5598	(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	119.6445	119.6445	119.6445	119.6445	119.6445	119.6445	119.6445	119.6445	119.6445	119.6445	119.6445	119.6445	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.8954	16.7827	13.6486	10.3329	7.7240	6.5209	7.0460	9.1587	12.2928	15.6085	18.2175	19.4205	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	211.9487	214.1481	208.6058	196.8068	181.9127	167.9144	158.5627	156.3633	161.9056	173.7046	188.5987	202.5970	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.9644	34.9644	34.9644	34.9644	34.9644	34.9644	34.9644	34.9644	34.9644	34.9644	34.9644	34.9644	(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)	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	(71)
Water heating gains (Table 5)	42.4132	41.0693	38.2786	34.4846	32.0214	28.5531	25.6052	29.3823	30.7243	34.6512	39.0853	41.0749	(72)
Total internal gains	332.1507	330.8935	319.4263	300.5176	280.5515	261.8818	250.1072	253.7977	263.8161	282.8577	304.7948	321.9858	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W						
Northeast	11.6200	11.2829	0.6300	0.7000	0.7700	40.0682	(75)						
Southwest	5.8300	36.7938	0.6300	0.7000	0.7700	65.5564	(79)						
Solar gains	105.6247	193.2269	299.7328	430.6375	536.4342	556.3449	526.4756	443.9094	344.4917	223.0886	128.9377	88.8244	(83)
Total gains	437.7754	524.1204	619.1591	731.1552	816.9857	818.2267	776.5828	697.7071	608.3078	505.9462	433.7325	410.8102	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, T_{hl} (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, $n_{ll,m}$ (see Table 9a)	62.1137	62.3520	62.5873	63.7169	63.9328	64.9573	64.9573	65.1506	64.5588	63.9328	63.4975	63.0488	21.0000 (85)
tau	5.1409	5.1568	5.1725	5.2478	5.2622	5.3305	5.3305	5.3434	5.3039	5.2622	5.2332	5.2033	
util living area	0.9984	0.9957	0.9856	0.9413	0.8160	0.6170	0.4592	0.5283	0.8109	0.9743	0.9964	0.9989	(86)
MIT	19.7760	19.9498	20.2326	20.6021	20.8683	20.9769	20.9960	20.9920	20.9074	20.5390	20.0936	19.7550	(87)
Th 2	19.9861	19.9896	19.9930	20.0091	20.0121	20.0262	20.0262	20.0288	20.0207	20.0121	20.0060	19.9997	(88)
util rest of house	0.9979	0.9942	0.9805	0.9211	0.7623	0.5326	0.3598	0.4215	0.7357	0.9618	0.9949	0.9985	(89)
MIT 2	18.8690	19.0448	19.3275	19.6954	19.9279	20.0163	20.0252	20.0266	19.9714	19.6452	19.2020	18.8588	(90)
Living area fraction	19.1472	19.3224	19.6051	19.9735	20.2163	20.3109	20.3229	20.3227	20.2585	19.9193	19.4755	19.1337	(92)
MIT	19.1472	19.3224	19.6051	19.9735	20.2163	20.3109	20.3229	20.3227	20.2585	19.9193	19.4755	19.1337	(93)
Temperature adjustment													0.0000
adjusted MIT	19.1472	19.3224	19.6051	19.9735	20.2163	20.3109	20.3229	20.3227	20.2585	19.9193	19.4755	19.1337	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9972	0.9929	0.9780	0.9202	0.7744	0.5581	0.3904	0.4545	0.7558	0.9603	0.9938	0.9980	(94)
Useful gains	436.5707	520.3862	605.5285	672.8358	632.6604	456.6172	303.1780	317.1204	459.7715	485.8650	431.0649	409.9915	(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	1269.6912	1228.6504	1112.2317	923.1535	707.5726	467.0025	304.4389	319.8215	506.7100	774.2874	1035.2545	1258.1498	(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	619.8417	475.9535	376.9872	180.2287	55.7347	0.0000	0.0000	0.0000	0.0000	214.5863	435.0165	631.0297	(98)
Space heating													2989.3783 (98)
Space heating per m2													(98) / (4) = 39.0819 (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	768.6738	605.1261	619.6366	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9400	0.9711	0.9540	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	722.5800	587.6275	591.1512	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1045.3552	994.8501	904.1204	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	232.3981	302.9737	232.8491	0.0000	0.0000	0.0000	0.0000	(104)

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling												768.2208 (104)
Cooled fraction												1.0000 (105)
Intermittency factor (Table 10b)												
	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	58.0995	75.7434	58.2123	0.0000	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												192.0552 (107)
Space cooling per m2												2.5109 (108)
Energy for space heating												39.0819 (99)
Energy for space cooling												2.5109 (108)
Total												41.5928 (109)
Target Fabric Energy Efficiency (TFEE)												47.8 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	38.7600 (1b)	x 2.4000 (2b)	= 93.0240 (1b) - (3b)
First floor	37.7300 (1c)	x 2.4000 (2c)	= 90.5520 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	76.4900		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 183.5760 (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					2 * 10 = 20.0000 (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)					20.0000 / (5) = 0.1089 (8)
Pressure test					Yes
Measured/design AP50					2.0000
Infiltration rate					0.2089 (18)
Number of sides sheltered					0 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.2089 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.6000	4.1000	4.1000	4.0000	3.8000	3.3000	3.3000	3.2000	3.4000	3.9000	3.8000	3.9000 (22)
Wind factor	1.1500	1.0250	1.0250	1.0000	0.9500	0.8250	0.8250	0.8000	0.8500	0.9750	0.9500	0.9750 (22a)
Adj infilt rate	0.2403	0.2142	0.2142	0.2089	0.1985	0.1724	0.1724	0.1672	0.1776	0.2037	0.1985	0.2037 (22b)
Effective ac	0.5289	0.5229	0.5229	0.5218	0.5197	0.5149	0.5149	0.5140	0.5158	0.5208	0.5197	0.5208 (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
NE French door (Uw = 1.50)			7.9200	1.4151	11.2075		(27)
Window (Uw = 1.50)			10.4600	1.4151	14.8019		(27)
Door			1.6600	1.5000	2.4900		(26)
Heat Loss Floor 1			38.7600	0.0700	2.7132		(28a)
External Wall 1	24.4800	12.2400	12.2400	0.0800	0.9792		(29a)
External Wall 2	24.4800		24.4800	0.0800	1.9584		(29a)
External Wall 3	36.4800	7.8000	28.6800	0.0800	2.2944		(29a)
External Roof 1	38.7600		38.7600	0.0500	1.9380		(30)
Total net area of external elements Aum(A, m ²)			162.9600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 38.3826		(33)
Party Wall 1			36.4800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (User defined value 0.011 * total exposed area)							1.7926 (36)
Total fabric heat loss						(33) + (36) =	40.1752 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	32.0389	31.6794	31.6794	31.6125	31.4835	31.1901	31.1901	31.1364	31.2455	31.5472	31.4835	31.5472 (38)
Heat transfer coeff	72.2141	71.8546	71.8546	71.7877	71.6587	71.3653	71.3653	71.3116	71.4207	71.7224	71.6587	71.7224 (39)
Average = Sum(39)m / 12 =												71.6613 (39)
HLP	0.9441	0.9394	0.9394	0.9385	0.9368	0.9330	0.9330	0.9323	0.9337	0.9377	0.9368	0.9377 (40)
HLP (average)												0.9369 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.3929 (42)
Average daily hot water use (litres/day)												91.0311 (43)
Daily hot water use	100.1342	96.4930	92.8517	89.2105	85.5693	81.9280	81.9280	85.5693	89.2105	92.8517	96.4930	100.1342 (44)
Energy content (annual)	148.4962	129.8757	134.0201	116.8420	112.1126	96.7447	89.6482	102.8726	104.1012	121.3199	132.4302	143.8106 (45)
Distribution loss (46)m = 0.15 x (45)m	22.2744	19.4814	20.1030	17.5263	16.8169	14.5117	13.4472	15.4309	15.6152	18.1980	19.8645	21.5716 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Water storage loss:												
Store volume											100.0000 (47)	
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)											0.0103 (51)	
Volume factor from Table 2a											1.0627 (52)	
Temperature factor from Table 2b											0.9623 (53)	
Enter (49) or (54) in (55)											1.0521 (55)	
Total storage loss												
	32.6142	29.4580	32.6142	31.5622	32.6142	31.5622	32.6142	32.6142	31.5622	32.6142	31.5622	32.6142 (56)
If cylinder contains dedicated solar storage												
	32.6142	29.4580	32.6142	31.5622	32.6142	31.5622	32.6142	32.6142	31.5622	32.6142	31.5622	32.6142 (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)
Total heat required for water heating calculated for each month												
	181.1104	159.3337	166.6343	148.4041	144.7269	128.3069	122.2624	135.4868	135.6634	153.9342	163.9924	176.4249 (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												
	181.1104	159.3337	166.6343	148.4041	144.7269	128.3069	122.2624	135.4868	135.6634	153.9342	163.9924	176.4249 (64)
Total per year (kWh/year) = Sum(64)m = 1816 (64)												
RHI water heating demand												
Heat gains from water heating, kWh/month												
	75.4664	66.7501	70.6531	64.0997	63.3689	57.4173	55.8994	60.2965	59.8634	66.4303	69.2828	73.9084 (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	143.5734	143.5734	143.5734	143.5734	143.5734	143.5734	143.5734	143.5734	143.5734	143.5734	143.5734	143.5734 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	47.2375	41.9559	34.1208	25.8317	19.3095	16.3019	17.6147	22.8963	30.7314	39.0205	45.5427	48.5503 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	316.3414	319.6240	311.3519	293.7415	271.5116	250.6185	236.6607	233.3781	241.6502	259.2606	281.4906	302.3836 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	51.7502	51.7502	51.7502	51.7502	51.7502	51.7502	51.7502	51.7502	51.7502	51.7502	51.7502	51.7502 (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)												
	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156 (71)
Water heating gains (Table 5)												
	101.4333	99.3305	94.9638	89.0274	85.1732	79.7463	75.1336	81.0437	83.1436	89.2880	96.2261	99.3393 (72)
Total internal gains												
	564.6202	560.5184	540.0446	508.2085	475.6022	446.2747	429.0171	436.9261	455.1332	487.1772	522.8674	549.8812 (73)

6. Solar gains

[Jan]		Area	Solar flux	g	FF	Access	Gains					
		m ²	Table 6a	Specific data	Specific data	factor	W					
			W/m ²	or Table 6b	or Table 6c	Table 6d						
Northeast		7.9200	13.3637	0.7200	0.7000	0.7700	36.9670 (75)					
Northeast		4.3200	13.3637	0.6400	0.7000	0.7700	17.9234 (75)					
Southwest		6.1400	42.0302	0.6400	0.7000	0.7700	80.1200 (79)					
Solar gains	135.0104	224.2743	345.4542	510.3708	619.8053	690.7674	637.7628	542.5014	422.5744	271.6169	163.7025	113.1470 (83)
Total gains	699.6306	784.7927	885.4988	1018.5793	1095.4075	1137.0421	1066.7799	979.4275	877.7076	758.7941	686.5699	663.0282 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												
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	73.5563	73.9244	73.9244	73.9933	74.1264	74.4312	74.4312	74.4873	74.3735	74.0607	74.1264	74.0607
alpha	5.9038	5.9283	5.9283	5.9329	5.9418	5.9621	5.9621	5.9658	5.9582	5.9374	5.9418	5.9374
util living area												
	0.9789	0.9593	0.8943	0.7387	0.5302	0.3261	0.2141	0.2475	0.4769	0.8060	0.9542	0.9839 (86)
MIT	20.7118	20.7472	20.8032	20.8460	20.8605	20.8631	20.8631	20.8632	20.8622	20.8403	20.7698	20.7022 (87)
Th 2	20.1302	20.1341	20.1341	20.1349	20.1363	20.1395	20.1395	20.1401	20.1389	20.1356	20.1363	20.1356 (88)
util rest of house												
	0.9729	0.9484	0.8693	0.6944	0.4767	0.2723	0.1565	0.1849	0.4088	0.7568	0.9399	0.9791 (89)
MIT 2	19.7354	19.7890	19.8647	19.9173	19.9336	19.9391	19.9391	19.9398	19.9379	19.9132	19.8235	19.7269 (90)
Living area fraction												
	fLA = Living area / (4) = 0.3067 (91)											
MIT	20.0348	20.0829	20.1525	20.2021	20.2179	20.2225	20.2225	20.2230	20.2214	20.1976	20.1138	20.0260 (92)
Temperature adjustment												
	-0.1000											
adjusted MIT	19.9348	19.9829	20.0525	20.1021	20.1179	20.1225	20.1225	20.1230	20.1214	20.0976	20.0138	19.9260 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9713	0.9462	0.8667	0.6927	0.4756	0.2712	0.1554	0.1837	0.4074	0.7544	0.9375	0.9777 (94)
Useful gains	679.5226	742.6026	767.4534	705.5412	520.9335	308.3795	165.7452	179.9159	357.6030	572.4510	643.6340	648.2593 (95)
Ext temp.	5.0000	5.5000	7.4000	9.8000	12.8000	15.8000	17.8000	17.6000	15.1000	11.5000	7.8000	4.9000 (96)
Heat loss rate W												
	1078.5060	1040.6600	909.1430	739.5667	524.3884	308.4736	165.7473	179.9219	358.6296	616.6390	875.2230	1077.7022 (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												
	296.8436	200.2946	105.4171	24.4984	2.5705	0.0000	0.0000	0.0000	0.0000	32.8759	166.7441	319.5055 (98)
Space heating												
	1148.7497 (98)											
RHI space heating demand												
	1149 (98)											

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	38.7600 (1b)	x 2.4000 (2b)	= 93.0240 (1b) - (3b)
First floor	37.7300 (1c)	x 2.4000 (2c)	= 90.5520 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	76.4900		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 183.5760 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (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)				20.0000 / (5) =	0.1089 (8)
Pressure test				Yes	2.0000
Measured/design AP50					0.2089 (18)
Infiltration rate					0 (19)
Number of sides sheltered					
Shelter factor			(20) = 1 - [0.075 x (19)] =		1.0000 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.2089 (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												
Effective ac	0.2664	0.2612	0.2560	0.2298	0.2246	0.1985	0.1985	0.1933	0.2089	0.2246	0.2351	0.2455 (22b)
	0.5355	0.5341	0.5328	0.5264	0.5252	0.5197	0.5197	0.5187	0.5218	0.5252	0.5276	0.5301 (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
NE French door (Uw = 1.50)			7.9200	1.4151	11.2075		(27)
Window (Uw = 1.50)			10.4600	1.4151	14.8019		(27)
Door			1.6600	1.5000	2.4900		(26)
Heat Loss Floor 1			38.7600	0.0700	2.7132		(28a)
External Wall 1	24.4800	12.2400	12.2400	0.0800	0.9792		(29a)
External Wall 2	24.4800		24.4800	0.0800	1.9584		(29a)
External Wall 3	36.4800	7.8000	28.6800	0.0800	2.2944		(29a)
External Roof 1	38.7600		38.7600	0.0500	1.9380		(30)
Total net area of external elements Aum(A, m ²)			162.9600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	38.3826	(33)
Party Wall 1			36.4800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (User defined value 0.011 * total exposed area)							1.7926 (36)
Total fabric heat loss						(33) + (36) =	40.1752 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	32.4398	32.3563	32.2745	31.8902	31.8183	31.4835	31.4835	31.4215	31.6125	31.8183	31.9637	32.1158 (38)
Heat transfer coeff	72.6150	72.5315	72.4497	72.0654	71.9935	71.6587	71.6587	71.5967	71.7877	71.9935	72.1389	72.2910 (39)
Average = Sum(39)m / 12 =												72.0650 (39)
HLP	0.9493	0.9482	0.9472	0.9422	0.9412	0.9368	0.9368	0.9360	0.9385	0.9412	0.9431	0.9451 (40)
HLP (average)												0.9421 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.3929 (42)
Average daily hot water use (litres/day)												91.0311 (43)
Daily hot water use	100.1342	96.4930	92.8517	89.2105	85.5693	81.9280	81.9280	85.5693	89.2105	92.8517	96.4930	100.1342 (44)
Energy conte	148.4962	129.8757	134.0201	116.8420	112.1126	96.7447	89.6482	102.8726	104.1012	121.3199	132.4302	143.8106 (45)
Energy content (annual)												Total = Sum(45)m = 1432.2740 (45)
Distribution loss (46)m = 0.15 x (45)m	22.2744	19.4814	20.1030	17.5263	16.8169	14.5117	13.4472	15.4309	15.6152	18.1980	19.8645	21.5716 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Water storage loss:													
Store volume												100.0000 (47)	
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0103 (51)	
Volume factor from Table 2a												1.0627 (52)	
Temperature factor from Table 2b												0.9623 (53)	
Enter (49) or (54) in (55)												1.0521 (55)	
Total storage loss													
If cylinder contains dedicated solar storage													
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	0.0000 (59)
Total heat required for water heating calculated for each month													
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	0.0000 (63)
Output from w/h													
Heat gains from water heating, kWh/month													

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	143.5734	143.5734	143.5734	143.5734	143.5734	143.5734	143.5734	143.5734	143.5734	143.5734	143.5734	143.5734	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	47.2375	41.9559	34.1208	25.8317	19.3095	16.3019	17.6147	22.8963	30.7314	39.0205	45.5427	48.5503	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	316.3414	319.6240	311.3519	293.7415	271.5116	250.6185	236.6607	233.3781	241.6502	259.2606	281.4906	302.3836	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	51.7502	51.7502	51.7502	51.7502	51.7502	51.7502	51.7502	51.7502	51.7502	51.7502	51.7502	51.7502	(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)													
	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	(71)
Water heating gains (Table 5)													
	101.4333	99.3305	94.9638	89.0274	85.1732	79.7463	75.1336	81.0437	83.1436	89.2880	96.2261	99.3393	(72)
Total internal gains	564.6202	560.5184	540.0446	508.2085	475.6022	446.2747	429.0171	436.9261	455.1332	487.1772	522.8674	549.8812	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W					
Northeast	7.9200	11.2829	0.7200	0.7000	0.7700		31.2113 (75)						
Northeast	4.3200	11.2829	0.6400	0.7000	0.7700		15.1327 (75)						
Southwest	6.1400	36.7938	0.6400	0.7000	0.7700		70.1382 (79)						
Solar gains	116.4822	213.8058	333.4267	481.6666	602.0621	625.2244	591.3321	497.3049	384.0989	247.3255	142.3221	97.8705	(83)
Total gains	681.1024	774.3243	873.4712	989.8752	1077.6644	1071.4991	1020.3492	934.2311	839.2321	734.5027	665.1895	647.7517	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9. Th1 (C)													
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	73.1503	73.2344	73.3172	73.7082	73.7818	74.1264	74.1264	74.1906	73.9933	73.7818	73.6330	73.4781	
alpha	5.8767	5.8823	5.8878	5.9139	5.9188	5.9418	5.9418	5.9460	5.9329	5.9188	5.9089	5.8985	
util living area	0.9849	0.9681	0.9210	0.7960	0.6067	0.4264	0.3088	0.3521	0.5793	0.8635	0.9684	0.9884	(86)
MIT	20.6886	20.7281	20.7830	20.8352	20.8571	20.8622	20.8626	20.8627	20.8596	20.8256	20.7476	20.6786	(87)
Th 2	20.1258	20.1267	20.1276	20.1318	20.1326	20.1363	20.1363	20.1370	20.1349	20.1326	20.1310	20.1293	(88)
util rest of house	0.9806	0.9595	0.9017	0.7574	0.5549	0.3696	0.2483	0.2863	0.5112	0.8249	0.9583	0.9850	(89)
MIT 2	19.6979	19.7549	19.8314	19.9019	19.9265	19.9349	19.9352	19.9360	19.9315	19.8932	19.7874	19.6870	(90)
Living area fraction	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	(91)
MIT	20.0017	20.0533	20.1233	20.1881	20.2119	20.2193	20.2196	20.2202	20.2162	20.1792	20.0819	19.9911	(92)
Temperature adjustment													-0.1000
adjusted MIT	19.9017	19.9533	20.0233	20.0881	20.1119	20.1193	20.1196	20.1202	20.1162	20.0792	19.9819	19.8911	(93)

8. Space heating requirement

Utilisation	0.9793	0.9575	0.8991	0.7553	0.5537	0.3685	0.2471	0.2850	0.5097	0.8222	0.9562	0.9839	(94)
Useful gains	667.0213	741.3994	785.2989	747.6284	596.6838	394.8349	252.1651	266.2439	427.7735	603.9203	636.0844	637.3350	(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													
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	346.6282	235.4974	144.6770	42.2271	6.6369	0.0000	0.0000	0.0000	0.0000	58.4165	211.1057	369.7609	(98)
Space heating per m2													1414.9496 (98)
												(98) / (4) =	
												18.4985 (99)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 %)												175.1000 (206)	
Efficiency of secondary/supplementary heating system, %												0.0000 (208)	
Space heating requirement												808.0809 (211)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	346.6282	235.4974	144.6770	42.2271	6.6369	0.0000	0.0000	0.0000	0.0000	58.4165	211.1057	369.7609	(98)
Space heating efficiency (main heating system 1)	175.1000	175.1000	175.1000	175.1000	175.1000	0.0000	0.0000	0.0000	0.0000	175.1000	175.1000	175.1000	(210)
Space heating fuel (main heating system)	197.9601	134.4931	82.6253	24.1160	3.7904	0.0000	0.0000	0.0000	0.0000	33.3618	120.5629	211.1713	(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	181.1104	159.3337	166.6343	148.4041	144.7269	128.3069	122.2624	135.4868	135.6634	153.9342	163.9924	176.4249	(64)
Efficiency of water heater (217)m	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	(216)
Fuel for water heating, kWh/month	103.4326	90.9959	95.1652	84.7539	82.6539	73.2763	69.8243	77.3768	77.4777	87.9122	93.6564	100.7566	(219)
Water heating fuel used													1037.2818 (219)
Annual totals kWh/year													
Space heating fuel - main system													808.0809 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans: central heating pump													30.0000 (230c)
Total electricity for the above, kWh/year													30.0000 (231)
Electricity for lighting (calculated in Appendix L)													333.6914 (232)
Total delivered energy for all uses													2209.0541 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	808.0809	13.1900	106.5859 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1037.2818	13.1900	136.8175 (247)
Pumps and fans for heating	30.0000	13.1900	3.9570 (249)
Energy for lighting	333.6914	13.1900	44.0139 (250)
Additional standing charges			0.0000 (251)
Total energy cost			291.3742 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.0073 (257)
SAP value		85.9481
SAP rating (Section 12)		86 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	808.0809	0.5190	419.3940 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1037.2818	0.5190	538.3493 (264)
Space and water heating			957.7432 (265)
Pumps and fans	30.0000	0.5190	15.5700 (267)
Energy for lighting	333.6914	0.5190	173.1858 (268)
Total kg/year			1146.4991 (272)
CO2 emissions per m2			14.9900 (273)
EI value			87.3544
EI rating			87 (274)
EI band			B

Calculation of stars for heating and DHW

Main heating energy efficiency	$13.19 \times (1 + 0.29 \times 0.75) / 1.7510 = 9.171$, stars = 2
Main heating environmental impact	$0.519 \times (1 + 0.29 \times 0.75) / 1.7510 = 0.3609$, stars = 3
Water heating energy efficiency	$13.19 / 1.7510 = 7.533$, stars = 2
Water heating environmental impact	$0.519 / 1.7510 = 0.2964$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	38.7600 (1b)	x 2.4000 (2b)	= 93.0240 (1b) - (3b)
First floor	37.7300 (1c)	x 2.4000 (2c)	= 90.5520 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	76.4900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.5760 (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					2 * 10 = 20.0000 (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)					20.0000 / (5) = 0.1089 (8)
Pressure test					Yes
Measured/design AP50					2.0000
Infiltration rate					0.2089 (18)
Number of sides sheltered					0 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.2089 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.6000	4.1000	4.1000	4.0000	3.8000	3.3000	3.3000	3.2000	3.4000	3.9000	3.8000	3.9000 (22)
Wind factor	1.1500	1.0250	1.0250	1.0000	0.9500	0.8250	0.8250	0.8000	0.8500	0.9750	0.9500	0.9750 (22a)
Adj infilt rate												
Effective ac	0.2403	0.2142	0.2142	0.2089	0.1985	0.1724	0.1724	0.1672	0.1776	0.2037	0.1985	0.2037 (22b)
	0.5289	0.5229	0.5229	0.5218	0.5197	0.5149	0.5149	0.5140	0.5158	0.5208	0.5197	0.5208 (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
NE French door (Uw = 1.50)			7.9200	1.4151	11.2075		(27)
Window (Uw = 1.50)			10.4600	1.4151	14.8019		(27)
Door			1.6600	1.5000	2.4900		(26)
Heat Loss Floor 1			38.7600	0.0700	2.7132		(28a)
External Wall 1	24.4800	12.2400	12.2400	0.0800	0.9792		(29a)
External Wall 2	24.4800		24.4800	0.0800	1.9584		(29a)
External Wall 3	36.4800	7.8000	28.6800	0.0800	2.2944		(29a)
External Roof 1	38.7600		38.7600	0.0500	1.9380		(30)
Total net area of external elements Aum(A, m ²)			162.9600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	38.3826	(33)
Party Wall 1			36.4800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (User defined value 0.011 * total exposed area)							1.7926 (36)
Total fabric heat loss						(33) + (36) =	40.1752 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	32.0389	31.6794	31.6794	31.6125	31.4835	31.1901	31.1901	31.1364	31.2455	31.5472	31.4835	31.5472 (38)
Heat transfer coeff	72.2141	71.8546	71.8546	71.7877	71.6587	71.3653	71.3653	71.3116	71.4207	71.7224	71.6587	71.7224 (39)
Average = Sum(39)m / 12 =												71.6613 (39)
HLP	0.9441	0.9394	0.9394	0.9385	0.9368	0.9330	0.9330	0.9323	0.9337	0.9377	0.9368	0.9377 (40)
HLP (average)												0.9369 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.3929 (42)
Average daily hot water use (litres/day)												91.0311 (43)
Daily hot water use	100.1342	96.4930	92.8517	89.2105	85.5693	81.9280	81.9280	85.5693	89.2105	92.8517	96.4930	100.1342 (44)
Energy content (annual)	148.4962	129.8757	134.0201	116.8420	112.1126	96.7447	96.7447	102.8726	104.1012	121.3199	132.4302	143.8106 (45)
Distribution loss (46)m = 0.15 x (45)m	22.2744	19.4814	20.1030	17.5263	16.8169	14.5117	14.5117	15.4309	15.6152	18.1980	19.8645	21.5716 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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 %)													175.1000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													656.0535 (211)
Space heating requirement	296.8436	200.2946	105.4171	24.4984	2.5705	0.0000	0.0000	0.0000	0.0000	32.8759	166.7441	319.5055	(98)
Space heating efficiency (main heating system 1)	175.1000	175.1000	175.1000	175.1000	175.1000	0.0000	0.0000	0.0000	0.0000	175.1000	175.1000	175.1000	(210)
Space heating fuel (main heating system)	169.5280	114.3887	60.2039	13.9911	1.4680	0.0000	0.0000	0.0000	0.0000	18.7755	95.2279	182.4703	(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	181.1104	159.3337	166.6343	148.4041	144.7269	128.3069	122.2624	135.4868	135.6634	153.9342	163.9924	176.4249	(64)
Efficiency of water heater (217)m	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	(216)
Fuel for water heating, kWh/month	103.4326	90.9959	95.1652	84.7539	82.6539	73.2763	69.8243	77.3768	77.4777	87.9122	93.6564	100.7566	(219)
Water heating fuel used													1037.2818 (219)
Annual totals kWh/year													
Space heating fuel - main system													656.0535 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans: central heating pump													30.0000 (230c)
Total electricity for the above, kWh/year													30.0000 (231)
Electricity for lighting (calculated in Appendix L)													333.6914 (232)
Total delivered energy for all uses													2057.0267 (238)

10a. Fuel costs - using BEDF prices (436)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	656.0535	16.9600	111.2667 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1037.2818	16.9600	175.9230 (247)
Pumps and fans for heating	30.0000	16.9600	5.0880 (249)
Energy for lighting	333.6914	16.9600	56.5941 (250)
Additional standing charges			0.0000 (251)
Total energy cost			348.8717 (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	656.0535	0.5190	340.4918 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1037.2818	0.5190	538.3493 (264)
Space and water heating			878.8410 (265)
Pumps and fans	30.0000	0.5190	15.5700 (267)
Energy for lighting	333.6914	0.5190	173.1858 (268)
Total kg/year			1067.5969 (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	656.0535	3.0700	2014.0842 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1037.2818	3.0700	3184.4552 (264)
Space and water heating			5198.5394 (265)
Pumps and fans	30.0000	3.0700	92.1000 (267)
Energy for lighting	333.6914	3.0700	1024.4325 (268)
Primary energy kWh/year			6315.0720 (272)
Primary energy kWh/m2/year			82.5608 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:

B 86

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Current environmental impact rating:

B 87

(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	Recommended
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	+ 2.7	-£ 75	-228 kg (21.4%)
U Solar photovoltaic panels	+ 11.0	-£ 314	-962 kg (114.6%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£75	2.98 kg/m ²	B 89 B 90
Solar photovoltaic panels	£314	12.58 kg/m ²	A 100 A 100
Total Savings	£389	15.56 kg/m ²	

Potential energy efficiency rating: A 100
 Potential environmental impact rating: A 100

Fuel prices for cost data on this page from database revision number 436 TEST (13 Dec 2018)
 Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£349	£274	£75
Space heating	£116	£116	£0
Water heating	£176	£101	£75
Lighting	£57	£57	£0
Generated (PV)	-£0	-£314	£314
Total cost of fuels	£349	-£40	£389
Total cost of uses	£349	-£40	£389
Delivered energy	27 kWh/m ²	-3 kWh/m ²	30 kWh/m ²
Carbon dioxide emissions	1.1 tonnes	-0.1 tonnes	1.2 tonnes
CO2 emissions per m ²	14 kg/m ²	-2 kg/m ²	16 kg/m ²
Primary energy	83 kWh/m ²	-9 kWh/m ²	92 kWh/m ²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	38.7600 (1b)	x 2.4000 (2b)	= 93.0240 (1b) - (3b)
First floor	37.7300 (1c)	x 2.4000 (2c)	= 90.5520 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	76.4900		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 183.5760 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (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)				20.0000 / (5) =	0.1089 (8)
Pressure test				Yes	2.0000
Measured/design AP50					0.2089 (18)
Infiltration rate					0 (19)
Number of sides sheltered					
Shelter factor			(20) = 1 - [0.075 x (19)] =		1.0000 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.2089 (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												
Effective ac	0.2664	0.2612	0.2560	0.2298	0.2246	0.1985	0.1985	0.1933	0.2089	0.2246	0.2351	0.2455 (22b)
	0.5355	0.5341	0.5328	0.5264	0.5252	0.5197	0.5197	0.5187	0.5218	0.5252	0.5276	0.5301 (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
NE French door (Uw = 1.50)			7.9200	1.4151	11.2075		(27)
Window (Uw = 1.50)			10.4600	1.4151	14.8019		(27)
Door			1.6600	1.5000	2.4900		(26)
Heat Loss Floor 1			38.7600	0.0700	2.7132		(28a)
External Wall 1	24.4800	12.2400	12.2400	0.0800	0.9792		(29a)
External Wall 2	24.4800		24.4800	0.0800	1.9584		(29a)
External Wall 3	36.4800	7.8000	28.6800	0.0800	2.2944		(29a)
External Roof 1	38.7600		38.7600	0.0500	1.9380		(30)
Total net area of external elements Aum(A, m ²)			162.9600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	38.3826	(33)
Party Wall 1			36.4800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (User defined value 0.011 * total exposed area)							1.7926 (36)
Total fabric heat loss						(33) + (36) =	40.1752 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	32.4398	32.3563	32.2745	31.8902	31.8183	31.4835	31.4835	31.4215	31.6125	31.8183	31.9637	32.1158 (38)
Heat transfer coeff	72.6150	72.5315	72.4497	72.0654	71.9935	71.6587	71.6587	71.5967	71.7877	71.9935	72.1389	72.2910 (39)
Average = Sum(39)m / 12 =												72.0650 (39)
HLP	0.9493	0.9482	0.9472	0.9422	0.9412	0.9368	0.9368	0.9360	0.9385	0.9412	0.9431	0.9451 (40)
HLP (average)												0.9421 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.3929 (42)
Average daily hot water use (litres/day)												91.0311 (43)
Daily hot water use	100.1342	96.4930	92.8517	89.2105	85.5693	81.9280	81.9280	85.5693	89.2105	92.8517	96.4930	100.1342 (44)
Energy conte	148.4962	129.8757	134.0201	116.8420	112.1126	96.7447	89.6482	102.8726	104.1012	121.3199	132.4302	143.8106 (45)
Energy content (annual)												Total = Sum(45)m = 1432.2740 (45)
Distribution loss (46)m = 0.15 x (45)m	22.2744	19.4814	20.1030	17.5263	16.8169	14.5117	13.4472	15.4309	15.6152	18.1980	19.8645	21.5716 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Water storage loss:												
Store volume												100.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0103 (51)
Volume factor from Table 2a												1.0627 (52)
Temperature factor from Table 2b												0.9623 (53)
Enter (49) or (54) in (55)												1.0521 (55)
Total storage loss	32.6142	29.4580	32.6142	31.5622	32.6142	31.5622	32.6142	32.6142	31.5622	32.6142	31.5622	32.6142 (56)
If cylinder contains dedicated solar storage	32.6142	29.4580	32.6142	31.5622	32.6142	31.5622	32.6142	32.6142	31.5622	32.6142	31.5622	32.6142 (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)
Total heat required for water heating calculated for each month	181.1104	159.3337	166.6343	148.4041	144.7269	128.3069	122.2624	135.4868	135.6634	153.9342	163.9924	176.4249 (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												1.2662 (H8)
Utilisation factor												0.5460 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												91.0311 (H14)
Volume ratio Veff/V												0.8239 (H15)
Solar storage volume factor												0.9613 (H16)
Solar input												-837.0235 (H17)
Solar input	-24.2720	-40.5030	-68.9813	-92.4485	-114.2123	-112.2889	-110.8050	-96.8109	-75.8223	-51.7777	-28.7901	-20.3115 (63)
Solar input (sum of months) = Sum(63)m =												-837.0235 (63)
Output from w/h	156.8384	118.8307	97.6531	55.9556	30.5146	16.0180	11.4575	38.6760	59.8411	102.1565	135.2023	156.1133 (64)
Total per year (kWh/year) = Sum(64)m =												979.2570 (64)
Heat gains from water heating, kWh/month	75.4664	66.7501	70.6531	64.0997	63.3689	57.4173	55.8994	60.2965	59.8634	66.4303	69.2828	73.9084 (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	143.5734	143.5734	143.5734	143.5734	143.5734	143.5734	143.5734	143.5734	143.5734	143.5734	143.5734	143.5734 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	47.2375	41.9559	34.1208	25.8317	19.3095	16.3019	17.6147	22.8963	30.7314	39.0205	45.5427	48.5503 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	316.3414	319.6240	311.3519	293.7415	271.5116	250.6185	236.6607	233.3781	241.6502	259.2606	281.4906	302.3836 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.7502	51.7502	51.7502	51.7502	51.7502	51.7502	51.7502	51.7502	51.7502	51.7502	51.7502	51.7502 (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)	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156	-95.7156 (71)
Water heating gains (Table 5)	101.4333	99.3305	94.9638	89.0274	85.1732	79.7463	75.1336	81.0437	83.1436	89.2880	96.2261	99.3393 (72)
Total internal gains	564.6202	560.5184	540.0446	508.2085	475.6022	446.2747	429.0171	436.9261	455.1332	487.1772	522.8674	549.8812 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W				
Northeast	7.9200	11.2829	0.7200	0.7000	0.7000	0.7700	31.2113 (75)					
Northeast	4.3200	11.2829	0.6400	0.7000	0.7000	0.7700	15.1327 (75)					
Southwest	6.1400	36.7938	0.6400	0.7000	0.7000	0.7700	70.1382 (79)					
Solar gains	116.4822	213.8058	333.4267	481.6666	602.0621	625.2244	591.3321	497.3049	384.0989	247.3255	142.3221	97.8705 (83)
Total gains	681.1024	774.3243	873.4712	989.8752	1077.6644	1071.4991	1020.3492	934.2311	839.2321	734.5027	665.1895	647.7517 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, T _{hl} (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains for living area, nil _m (see Table 9a)	73.1503	73.2344	73.3172	73.7082	73.7818	74.1264	74.1264	74.1906	73.9933	73.7818	73.6330	73.4781
tau	5.8767	5.8823	5.8878	5.9139	5.9188	5.9418	5.9418	5.9460	5.9329	5.9188	5.9089	5.8985
util living area	0.9849	0.9681	0.9210	0.7960	0.6067	0.4264	0.3088	0.3521	0.5793	0.8635	0.9684	0.9884 (86)
MIT	20.6886	20.7281	20.7830	20.8352	20.8571	20.8622	20.8626	20.8627	20.8596	20.8256	20.7476	20.6786 (87)
Th 2	20.1258	20.1267	20.1276	20.1318	20.1326	20.1363	20.1363	20.1370	20.1349	20.1326	20.1310	20.1293 (88)
util rest of house	0.9806	0.9595	0.9017	0.7574	0.5549	0.3696	0.2483	0.2863	0.5112	0.8249	0.9583	0.9850 (89)
MIT 2	19.6979	19.7549	19.8314	19.9019	19.9265	19.9349	19.9352	19.9360	19.9315	19.8932	19.7874	19.6870 (90)
Living area fraction	20.0017	20.0533	20.1233	20.1881	20.2119	20.2193	20.2196	20.2202	20.2162	20.1792	20.0819	19.9911 (92)
MIT	19.9017	19.9533	20.0233	20.0881	20.1119	20.1193	20.1196	20.1202	20.1162	20.0792	19.9819	19.8911 (93)
Temperature adjustment												
adjusted MIT	19.9017	19.9533	20.0233	20.0881	20.1119	20.1193	20.1196	20.1202	20.1162	20.0792	19.9819	19.8911 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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	0.9793	0.9575	0.8991	0.7553	0.5537	0.3685	0.2471	0.2850	0.5097	0.8222	0.9562	0.9839 (94)
Useful gains	667.0213	741.3994	785.2989	747.6284	596.6838	394.8349	252.1651	266.2439	427.7735	603.9203	636.0844	637.3350 (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												
	1132.9194	1091.8419	979.7572	806.2770	605.6044	395.5043	252.2121	266.3534	431.8859	682.4371	929.2867	1134.3255 (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												
	346.6282	235.4974	144.6770	42.2271	6.6369	0.0000	0.0000	0.0000	0.0000	58.4165	211.1057	369.7609 (98)
Space heating												1414.9496 (98)
Space heating per m2												(98) / (4) = 18.4985 (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 %)												175.1000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												808.0809 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	346.6282	235.4974	144.6770	42.2271	6.6369	0.0000	0.0000	0.0000	0.0000	58.4165	211.1057	369.7609 (98)
Space heating efficiency (main heating system 1)	175.1000	175.1000	175.1000	175.1000	175.1000	0.0000	0.0000	0.0000	0.0000	175.1000	175.1000	175.1000 (210)
Space heating fuel (main heating system)	197.9601	134.4931	82.6253	24.1160	3.7904	0.0000	0.0000	0.0000	0.0000	33.3618	120.5629	211.1713 (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	156.8384	118.8307	97.6531	55.9556	30.5146	16.0180	11.4575	38.6760	59.8411	102.1565	135.2023	156.1133 (64)
Efficiency of water heater (217)m	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000 (216)
Fuel for water heating, kWh/month	89.5708	67.8645	55.7699	31.9564	17.4269	9.1479	6.5434	22.0879	34.1754	58.3418	77.2143	89.1567 (219)
Water heating fuel used												559.2558 (219)
Annual totals kWh/year												
Space heating fuel - main system												808.0809 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
central heating pump												30.0000 (230c)
pump for solar water heating												50.0000 (230g)
Total electricity for the above, kWh/year												80.0000 (231)
Electricity for lighting (calculated in Appendix L)												333.6914 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 2.50 * 1080 * 0.80) =										-1727.2394		-1727.2394 (233)
Total delivered energy for all uses												53.7887 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	808.0809	13.1900	106.5859 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	559.2558	13.1900	73.7658 (247)
Pumps and fans for heating	30.0000	13.1900	3.9570 (249)
Pump for solar water heating	50.0000	13.1900	6.5950 (249)
Energy for lighting	333.6914	13.1900	44.0139 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit			-227.8229 (252)
Total energy cost		-1727.2394	7.0947 (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] =	0.0245 (257)
SAP value		99.6578
SAP rating (Section 12)		100 (258)
SAP band		A

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	808.0809	0.5190	419.3940 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	559.2558	0.5190	290.2538 (264)
Space and water heating			709.6478 (265)
Pumps and fans	80.0000	0.5190	41.5200 (267)
Energy for lighting	333.6914	0.5190	173.1858 (268)
Energy saving/generation technologies			
PV Unit	-1727.2394	0.5190	-896.4372 (269)
Total kg/year			27.9163 (272)
CO2 emissions per m2			0.3600 (273)
EI value			99.6921
EI rating			100 (274)
EI band			A

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	38.7600 (1b)	x 2.4000 (2b)	= 93.0240 (1b) - (3b)
First floor	37.7300 (1c)	x 2.4000 (2c)	= 90.5520 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	76.4900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.5760 (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					2 * 10 = 20.0000 (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)					20.0000 / (5) = 0.1089 (8)
Pressure test					Yes
Measured/design AP50					2.0000
Infiltration rate					0.2089 (18)
Number of sides sheltered					0 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		1.0000 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.2089 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.6000	4.1000	4.1000	4.0000	3.8000	3.3000	3.3000	3.2000	3.4000	3.9000	3.8000	3.9000 (22)
Wind factor	1.1500	1.0250	1.0250	1.0000	0.9500	0.8250	0.8250	0.8000	0.8500	0.9750	0.9500	0.9750 (22a)
Adj infilt rate												
Effective ac	0.2403	0.2142	0.2142	0.2089	0.1985	0.1724	0.1724	0.1672	0.1776	0.2037	0.1985	0.2037 (22b)
	0.5289	0.5229	0.5229	0.5218	0.5197	0.5149	0.5149	0.5140	0.5158	0.5208	0.5197	0.5208 (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
NE French door (Uw = 1.50)			7.9200	1.4151	11.2075		(27)
Window (Uw = 1.50)			10.4600	1.4151	14.8019		(27)
Door			1.6600	1.5000	2.4900		(26)
Heat Loss Floor 1			38.7600	0.0700	2.7132		(28a)
External Wall 1	24.4800	12.2400	12.2400	0.0800	0.9792		(29a)
External Wall 2	24.4800		24.4800	0.0800	1.9584		(29a)
External Wall 3	36.4800	7.8000	28.6800	0.0800	2.2944		(29a)
External Roof 1	38.7600		38.7600	0.0500	1.9380		(30)
Total net area of external elements Aum(A, m ²)			162.9600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	38.3826	(33)
Party Wall 1			36.4800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (User defined value 0.011 * total exposed area)							1.7926 (36)
Total fabric heat loss						(33) + (36) =	40.1752 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	32.0389	31.6794	31.6794	31.6125	31.4835	31.1901	31.1901	31.1364	31.2455	31.5472	31.4835	31.5472 (38)
Heat transfer coeff	72.2141	71.8546	71.8546	71.7877	71.6587	71.3653	71.3653	71.3116	71.4207	71.7224	71.6587	71.7224 (39)
Average = Sum(39)m / 12 =												71.6613 (39)
HLP	0.9441	0.9394	0.9394	0.9385	0.9368	0.9330	0.9330	0.9323	0.9337	0.9377	0.9368	0.9377 (40)
HLP (average)												0.9369 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.3929 (42)
Average daily hot water use (litres/day)												91.0311 (43)
Daily hot water use	100.1342	96.4930	92.8517	89.2105	85.5693	81.9280	81.9280	85.5693	89.2105	92.8517	96.4930	100.1342 (44)
Energy content (annual)	148.4962	129.8757	134.0201	116.8420	112.1126	96.7447	96.7447	102.8726	104.1012	121.3199	132.4302	143.8106 (45)
Distribution loss (46)m = 0.15 x (45)m	22.2744	19.4814	20.1030	17.5263	16.8169	14.5117	14.5117	15.4309	15.6152	18.1980	19.8645	21.5716 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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	0.9713	0.9462	0.8667	0.6927	0.4756	0.2712	0.1554	0.1837	0.4074	0.7544	0.9375	0.9777 (94)
Useful gains	679.5226	742.6026	767.4534	705.5412	520.9335	308.3795	165.7452	179.9159	357.6030	572.4510	643.6340	648.2593 (95)
Ext temp.	5.0000	5.5000	7.4000	9.8000	12.8000	15.8000	17.8000	17.6000	15.1000	11.5000	7.8000	4.9000 (96)
Heat loss rate W												
	1078.5060	1040.6600	909.1430	739.5667	524.3884	308.4736	165.7473	179.9219	358.6296	616.6390	875.2230	1077.7022 (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												
	296.8436	200.2946	105.4171	24.4984	2.5705	0.0000	0.0000	0.0000	0.0000	32.8759	166.7441	319.5055 (98)
Space heating												1148.7497 (98)
Space heating per m2												(98) / (4) = 15.0183 (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 %)												175.1000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												656.0535 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	296.8436	200.2946	105.4171	24.4984	2.5705	0.0000	0.0000	0.0000	0.0000	32.8759	166.7441	319.5055 (98)
Space heating efficiency (main heating system 1)	175.1000	175.1000	175.1000	175.1000	175.1000	0.0000	0.0000	0.0000	0.0000	175.1000	175.1000	175.1000 (210)
Space heating fuel (main heating system)	169.5280	114.3887	60.2039	13.9911	1.4680	0.0000	0.0000	0.0000	0.0000	18.7755	95.2279	182.4703 (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	154.2042	118.8101	98.7569	55.6825	33.5207	10.9405	9.2232	35.5787	56.5667	99.7841	132.3439	153.9520 (64)
Efficiency of water heater (217)m	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000 (216)
Fuel for water heating, kWh/month	88.0663	67.8527	56.4003	31.8004	19.1437	6.2481	5.2674	20.3191	32.3054	56.9869	75.5819	87.9223 (219)
Water heating fuel used												547.8945 (219)
Annual totals kWh/year												
Space heating fuel - main system												656.0535 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
central heating pump												30.0000 (230c)
pump for solar water heating												50.0000 (230g)
Total electricity for the above, kWh/year												80.0000 (231)
Electricity for lighting (calculated in Appendix L)												333.6914 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 2.50 * 1158 * 0.80) =										-1853.3719		-1853.3719 (233)
Total delivered energy for all uses												-235.7325 (238)

10a. Fuel costs - using BEDF prices (436)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	656.0535	16.9600	111.2667 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	547.8945	16.9600	92.9229 (247)
Pumps and fans for heating	30.0000	16.9600	5.0880 (249)
Pump for solar water heating	50.0000	16.9600	8.4800 (249)
Energy for lighting	333.6914	16.9600	56.5941 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit		-1853.3719	-314.3319 (252)
Total energy cost		16.9600	-39.9802 (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	656.0535	0.5190	340.4918 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	547.8945	0.5190	284.3573 (264)
Space and water heating			624.8490 (265)
Pumps and fans	80.0000	0.5190	41.5200 (267)
Energy for lighting	333.6914	0.5190	173.1858 (268)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Energy saving/generation technologies			
PV Unit	-1853.3719	0.5190	-961.9000 (269)
Total kg/year			-122.3452 (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	656.0535	3.0700	2014.0842 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	547.8945	3.0700	1682.0362 (264)
Space and water heating			3696.1204 (265)
Pumps and fans	80.0000	3.0700	245.6000 (267)
Energy for lighting	333.6914	3.0700	1024.4325 (268)
Energy saving/generation technologies			
PV Unit	-1853.3719	3.0700	-5689.8518 (269)
Primary energy kWh/year			-723.6988 (272)
Primary energy kWh/m2/year			-9.4614 (273)

SAP 2012 OVERHEATING ASSESSMENT FOR New Build (As Designed) 9.92

Overheating Calculation Input Data

Dwelling type	SemiDetached House
Number of storeys	2
Cross ventilation possible	Yes
SAP Region	Thames Valley
Front of dwelling faces	South West
Overshading	Average or unknown
Thermal mass parameter	250.0
Night ventilation	No
Ventilation rate during hot weather (ach)	4.00 (Windows half open)

Overheating Calculation

Summer ventilation heat loss coefficient	242.32 (P1)
Transmission heat loss coefficient	40.18 (37)
Summer heat loss coefficient	282.50 (P2)

Overhangs

Orientation	Ratio	Z_overhangs	Overhang type
North East	0.000	1.000	None
South West	0.000	1.000	None

Solar shading

Orientation	Z blinds	Solar access	Z overhangs	Z summer
North East	1.000	0.90	1.000	0.900 (P8)
South West	1.000	0.90	1.000	0.900 (P8)

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
North East	7.9200	98.8453	0.7200	0.7000	0.9000	319.5925
North East	4.3200	98.8453	0.6400	0.7000	0.9000	154.9540
South West	6.1400	119.9223	0.6400	0.7000	0.9000	267.1970

total: 741.7435

Solar gains	Jun 793	Jul 742	Aug 637	(P3)
Internal gains	446	429	437	
Total summer gains	1239	1171	1074	(P5)

Summer gain/loss ratio	4.39	4.14	3.80	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 250.0)	0.25	0.25	0.25	
Threshold temperature	20.64	22.29	21.85	(P7)
Likelihood of high internal temperature	Slight	Medium	Slight	

Assessment of likelihood of high internal temperature: Medium

ASSESSMENT NOTES

Calculation Type: New Build (As Designed)

Property Reference	Toothill Bus s		Issued on Date	15/01/2024
Assessment Reference	001	Prop Type Ref	As design stage	
Property	3 Toot Hill Bus s, Headington, 3, Toot Hill Bus s, Headington, Oxford, Oxfordshire, OX3 8LB			

SAP Rating	86 B	DER	15.09	TER	25.20
Environmental	87 B	% DER<TER	40.11		
CO ₂ Emissions (t/year)	1.07	DFEE	28.67	TFEE	47.83
General Requirements Compliance	Pass	% DFEE<TFEE	40.04		

Assessor Details	Mrs. Elena Sava, Elena Sava, [REDACTED]	Assessor ID	AL21-0001
Client	[REDACTED]		

ASSESSMENT NOTES - Last time updated on: 22.01.2024

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Property Reference	Toothill BuΣ s		Issued on Date	15/01/2024
Assessment Reference	001	Prop Type Ref	As design stage	
Property	3 Toot Hill BuΣ s, Headington, 3, Toot Hill BuΣ s, Headington, Oxford, Oxfordshire, OX3 8LB			

SAP Rating	86 B	DER	15.09	TER	25.20
Environmental	87 B	% DER<TER	40.11		
CO ₂ Emissions (t/year)	1.07	DFEE	28.67	TFEE	47.83
General Requirements Compliance	Pass	% DFEE<TFEE	40.04		

Assessor Details	Mrs. Elena Sava, Elena Sava, [REDACTED]	Assessor ID	AL21-0001
Client			

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

Orientation	South West
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	House, Semi-Detached
2.0 Number of Storeys	2
3.0 Date Built	2024
4.0 Sheltered Sides	0
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	17.80 m	38.76 m ²	2.40 m
1st Storey:	27.30 m	37.73 m ²	2.40 m

7.0 Living Area	23.46	m ²
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8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m ² K

9.0 External Walls	Description	Type	U-Value (W/m ² K)	Gross Area (m ²)	Net Area (m ²)
External Wall 1	Cavity Wall		0.08	24.48	12.24
External Wall 2	Cavity Wall		0.08	24.48	24.48
External Wall 3	Cavity Wall		0.08	36.48	28.68

9.1 Party Walls	Description	Type	Construction	U-Value (W/m ² K)	Area (m ²)
Party Wall 1	Filled Cavity with Edge Sealing			0.00	36.48

10.0 External Roofs	Description	Type	U-Value (W/m ² K)	Gross Area (m ²)	Net Area (m ²)
External Roof 1	External Slope Roof		0.05	38.76	38.76

11.0 Heat Loss Floors	Description	Type	Construction	U-Value (W/m ² K)	Area (m ²)
Heat Loss Floor 1	Ground Floor - Solid			0.07	38.76

12.0 Opening Types

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m ² K)
NE French door	Manufacturer	Window	Double Low-E Hard	0.15		0.72		0.70	1.50
Window	Manufacturer	Window	Triple Low-E Hard	0.15		0.64		0.70	1.50
Door	Manufacturer	Solid Door							1.50

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m ²)	Curtain Closed
NE French door 1	Window	[1] External Wall 1	North East	None	0.00					7.92	
Window 1,2	Window	[1] External Wall 1	North East	None	0.00					4.32	
SE window 3	Window	[3] External Wall 3	South West	None	0.00					1.44	
SW window 4, 5	Window	[3] External Wall 3	South West	None	0.00					4.32	
SW window 6	Window	[3] External Wall 3	South West	None	0.00					0.38	
Door 1	Solid Door	[3] External Wall 3	South West							1.66	

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

17.1 List of Bridges

Bridge Type	Length	Imported

Y-value W/m²K

Description

18.0 Pressure Testing

Designed AP₅₀ m³/(h.m²) @ 50 Pa

Property Tested?

As Built AP₅₀ m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather

Cross ventilation possible

Night Ventilation

Air change rate

Mechanical Ventilation

Mechanical Ventilation System Present

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open fires	0		0	0
Number of intermittent fans				2
Number of passive vents				0
Number of fuelless gas fires				0

21.0 Fixed Cooling System

22.0 Lighting

Internal

Total number of light fittings

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Total number of L.E.L. fittings	12	
Percentage of L.E.L. fittings	100.00	%
External		
External lights fitted	Yes	
Light and motion sensor	Yes	
<hr/>		
23.0 Electricity Tariff	Standard	
<hr/>		
24.0 Main Heating 1	SAP table	
Description	heat pump	
Percentage of Heat	100	%
Main Heating	PET	
SAP Code	224	
Efficiency (SAP Table)	175.1	%
Controls	CHD Time and temperature zone control	
PCDF Controls	0	
Sap Code	2207	
Boiler Compensator	Vaillant Group UK Ltd, Vaillant, VRC 470 f	
Is MHS Pumped	in unheated space	
Heat Emitter	Radiators and Underfloor	
Underfloor Heating	Yes - Pipes in Concrete	
Flow Temperature	<= 35°C	
<hr/>		
25.0 Main Heating 2	None	
<hr/>		
Community Heating	None	
<hr/>		
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	
Supplementary Immersion	No	
Immersion Only Heating Hot Water	No	
<hr/>		
29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Foam	
Insulation Thickness	100 mm	
Cylinder Volume	100.00	L
Pipes insulation	Fully insulated primary pipework	

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

In Airing Cupboard	No
31.0 Thermal Store	Integrated
Thermal Store Pipework	within a single casing

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Rating after improvement	Environmental Impact
Solar water heating	£4,000 - £6,000	£75	SAP rating B 89	Environmental Impact B 89
Solar photovoltaic panels, 2.5 kWp	£5,000 - £8,000	£314	SAP rating A 100	Environmental Impact A 100