

SAP CALCULATIONS

[Notional vs Proposed]

(Based on the drawings/specifications supplied)

PROJECT: 3 St Ives Wood, St Ives, Ringwood BH24 2EA

CLIENT: Tony Holt Design

PROJECT REF: 0249-0322-01

DATE: 8 March 2022

SAP Ratings have been calculated as instructed in accordance with Approved Document L1B 2013.

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Appendix 1: Full SAP Calculation (Existing + Notional Extension)

Appendix 2: Full SAP Calculation (Existing + Proposed Extension)

	Notional	Proposed	Result
CO2 Emissions (Tonnes p/year)	5.76	5.44*	PASS

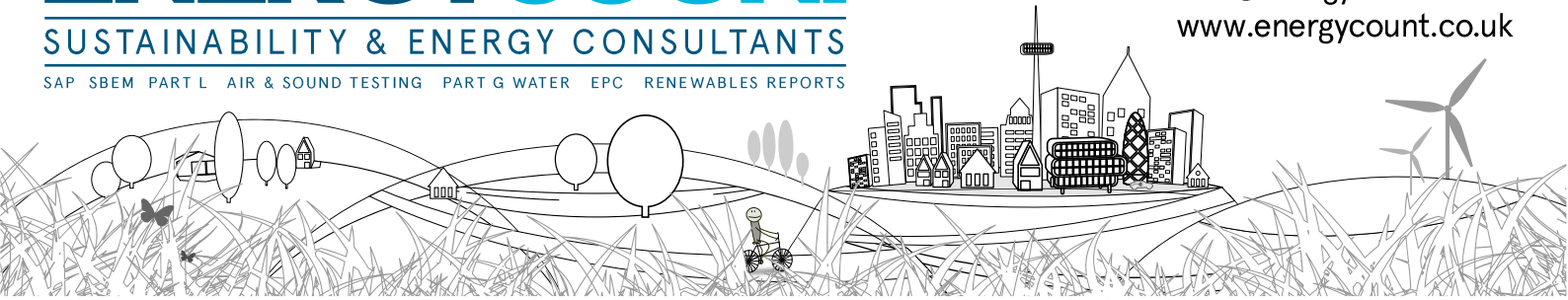
***CO2 emissions for the Proposed are less than the Notional; therefore the Proposed construction is acceptable.**

Notes

The SAP calculations are based on the drawings/specifications supplied

The improvements in the proposed specification consist of:

- Solar gains from additional glazing
- Garage floor u-value (0.11)



Appendix 1: Notional

FULL SAP CALCULATION PRINTOUT

Calculation Type: Existing Dwelling

Property Reference	0249-0322-01	Issued on Date	08/03/2022
Assessment Reference	NOTIONAL	Prop Type Ref	3 St. Ives
Property	3 St. Ives Wood, St. Ives, RINGWOOD, BH24 2EA		

SAP Rating	72 C	DER	N/A	TER	N/A
Environmental	66 D	% DER<TER	N/A		
CO ₂ Emissions (t/year)	5.76	DFEE	N/A	TFFEE	N/A
General Requirements Compliance	N/A	% DFEE<TFFEE	N/A		

Assessor Details	Mr. Rob Carswell, Energycount Limited, Tel: 01202 623236, mail@energycount.co.uk	Assessor ID	7134-0001
Client	Tony Holt Design, 0249		

CALCULATION OF HEAT DEMAND 09 Jan 2014

SAP 2012 WORKSHEET FOR Existing dwelling (SAP) (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	204.0000 (1b)	x 2.4000 (2b)	= 489.6000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	204.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 489.6000 (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				4 * 10 =	40.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.0817 (8)
Number of storeys in the dwelling (ns)					1 (9)
Additional infiltration					[(9) - 1] x 0.1 = 0.0000 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction					0.3500 (11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0					0.0000 (12)
If no draught lobby, enter 0.05, else enter 0					0.0500 (13)
Percentage of windows and doors draught stripped					100.0000 (14)
Window infiltration	0.25 - [0.2 * (14) / 100] =				0.0500 (15)
Pressure test					No
Measured/design AP50					15.0000
Infiltration rate					0.5317 (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) =				0.5317 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.6000	4.3000	4.3000	4.0000	4.0000	3.7000	3.7000	3.5000	3.5000	3.9000	3.9000	4.2000 (22)
Wind factor	1.1500	1.0750	1.0750	1.0000	1.0000	0.9250	0.9250	0.8750	0.8750	0.9750	0.9750	1.0500 (22a)
Adj infilt rate	0.6115	0.5716	0.5716	0.5317	0.5317	0.4918	0.4918	0.4652	0.4652	0.5184	0.5184	0.5583 (22b)
Effective ac	0.6869	0.6634	0.6634	0.6414	0.6414	0.6209	0.6209	0.6082	0.6082	0.6344	0.6344	0.6558 (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
NEW NOTIONAL Window (Uw = 1.60)			29.9400	1.5038	45.0226		(27)
NEW NOTIONAL FullGlzDoor (Uw = 1.80)			4.2400	1.6791	7.1194		(27)
NEW NOTIONAL Door			6.1600	1.8000	11.0880		(26a)
NEW NOTIONAL Rooflight (Uw = 1.60)			4.2400	1.5038	6.3759		(27a)
Existing			132.8000	0.4900	65.0720		(28a)
NEW (Garage & front)			34.5000	0.2500	8.6250		(28a)
NEW NOTIONAL			36.7000	0.2200	8.0740		(28a)
Existing	72.6000	15.1000	57.5000	0.4900	28.1750		(29a)
Garage conversion	25.0000	7.6600	17.3400	0.3000	5.2020		(29a)
NEW Front	21.5000	4.8600	16.6400	0.2800	4.6592		(29a)

FULL SAP CALCULATION PRINTOUT

Calculation Type: Existing Dwelling

CALCULATION OF HEAT DEMAND 09 Jan 2014

Solar gains	398.4380	628.9377	946.5303	1341.8029	1549.7028	1713.1234	1581.9674	1387.2144	1122.7372	732.8529	481.2957	332.1026 (83)
Total gains	1323.8308	1545.7581	1825.8691	2164.2128	2313.5083	2426.6267	2268.0883	2086.5577	1856.7935	1524.0921	1334.9058	1233.1892 (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	30.1411	30.3875	30.3875	30.6209	30.6209	30.8407	30.8407	30.9794	30.9794	30.6958	30.6958	30.4668	
alpha	3.0094	3.0258	3.0258	3.0414	3.0414	3.0560	3.0560	3.0653	3.0653	3.0464	3.0464	3.0311	
util living area	0.9956	0.9927	0.9844	0.9613	0.9094	0.7934	0.6694	0.7024	0.8959	0.9749	0.9923	0.9964 (86)	
MIT	19.1410	19.2693	19.5712	19.9688	20.3737	20.6862	20.8201	20.8075	20.5352	20.0530	19.5429	19.1326 (87)	
Th 2	19.1384	19.1499	19.1499	19.1607	19.1607	19.1708	19.1708	19.1771	19.1771	19.1642	19.1642	19.1536 (88)	
util rest of house	0.9938	0.9897	0.9772	0.9414	0.8523	0.6484	0.4189	0.4500	0.8045	0.9575	0.9884	0.9949 (89)	
MIT 2	17.5284	17.6646	17.9642	18.3613	18.7406	18.9975	19.0692	19.0730	18.9035	18.4528	17.9488	17.5315 (90)	
Living area fraction	fLA = Living area / (4) =												
MIT	18.2296	18.3623	18.6629	19.0602	19.4507	19.7318	19.8305	19.8271	19.6130	19.1485	18.6419	18.2276 (92)	
Temperature adjustment	0.0000												
adjusted MIT	18.2296	18.3623	18.6629	19.0602	19.4507	19.7318	19.8305	19.8271	19.6130	19.1485	18.6419	18.2276 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9925	0.9879	0.9747	0.9400	0.8637	0.7019	0.5234	0.5562	0.8330	0.9573	0.9868	0.9939 (94)
Useful gains	1313.9006	1527.0945	1779.6528	2034.2820	1998.2779	1703.2764	1187.0385	1160.5550	1546.7442	1458.9578	1317.3425	1225.6188 (95)
Ext temp.	5.0000	5.4000	7.1000	9.4000	12.4000	15.1000	17.0000	17.0000	14.5000	11.3000	7.8000	5.0000 (96)
Heat loss rate W	6218.0498	6043.0518	5390.6513	4469.2741	3261.9743	2127.5916	1300.2014	1292.8328	2338.1366	3622.2413	5003.7565	6150.6851 (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	3648.6869	3034.7233	2686.5828	1753.1943	940.1901	0.0000	0.0000	0.0000	0.0000	1609.4829	2654.2180	3664.2493 (98)
Space heating												19991.3278 (98)
RHI space heating demand												19991 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: Existing Dwelling

CALCULATION OF ENERGY RATINGS 09 Jan 2014

SAP 2012 WORKSHEET FOR Existing dwelling (SAP) (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	204.0000 (1b)	x 2.4000 (2b)	= 489.6000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	204.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 489.6000 (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				4 * 10 =	40.0000 (7a)	
Number of passive vents				0 * 10 =	0.0000 (7b)	
Number of flueless gas fires				0 * 40 =	0.0000 (7c)	
Air changes per hour						
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) =	0.0817 (8)
Number of storeys in the dwelling (ns)						1 (9)
Additional infiltration					[(9) - 1] x 0.1 =	0.0000 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction						0.3500 (11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0						0.0000 (12)
If no draught lobby, enter 0.05, else enter 0						0.0500 (13)
Percentage of windows and doors draught stripped						100.0000 (14)
Window infiltration					0.25 - [0.2 * (14) / 100] =	0.0500 (15)
Pressure test						No
Measured/design AP50						15.0000
Infiltration rate						0.5317 (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) =	0.5317 (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 infiltr rate	0.6779	0.6646	0.6513	0.5849	0.5716	0.5051	0.5051	0.4918	0.5317	0.5716	0.5982	0.6247 (22b)
Effective ac	0.7298	0.7209	0.7121	0.6710	0.6634	0.6276	0.6276	0.6209	0.6414	0.6634	0.6789	0.6952 (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
NEW NOTIONAL Window (Uw = 1.60)			29.9400	1.5038	45.0226		(27)
NEW NOTIONAL FullGlxDoor (Uw = 1.80)			4.2400	1.6791	7.1194		(27)
NEW NOTIONAL Door			6.1600	1.8000	11.0880		(26a)
NEW NOTIONAL Rooflight (Uw = 1.60)			4.2400	1.5038	6.3759		(27a)
Existing			132.8000	0.4900	65.0720		(28a)
NEW (Garage & front)			34.5000	0.2500	8.6250		(28a)
NEW NOTIONAL			36.7000	0.2200	8.0740		(28a)
Existing	72.6000	15.1000	57.5000	0.4900	28.1750		(29a)
Garage conversion	25.0000	7.6600	17.3400	0.3000	5.2020		(29a)
NEW Front	21.5000	4.8600	16.6400	0.2800	4.6592		(29a)
NEW NOTIONAL	41.1000	12.7200	28.3800	0.2800	7.9464		(29a)
Existing	132.8000		132.8000	0.4900	65.0720		(30)
NEW (Garage & Front)	34.5000		34.5000	0.1600	5.5200		(30)
NEW NOTIONAL	36.7000	4.2400	32.4600	0.1800	5.8428		(30)
Total net area of external elements Aum(A, m ²)					568.2000		(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	273.7943	(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Default value 0.150 * total exposed area)							85.2300 (36)
Total fabric heat loss						(33) + (36) =	359.0243 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	117.9100	116.4683	115.0552	108.4180	107.1761	101.3953	101.3953	100.3247	103.6220	107.1761	109.6883	112.3147 (38)
Heat transfer coeff	476.9343	475.4926	474.0795	467.4422	466.2004	460.4196	460.4196	459.3490	462.6463	466.2004	468.7126	471.3390 (39)
Average = Sum(39)m / 12 =												467.4363 (39)
HLP	2.3379	2.3308	2.3239	2.2914	2.2853	2.2570	2.2570	2.2517	2.2679	2.2853	2.2976	2.3105 (40)
HLP (average)												2.2914 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

FULL SAP CALCULATION PRINTOUT

Calculation Type: Existing Dwelling

CALCULATION OF ENERGY RATINGS 09 Jan 2014

4. Water heating energy requirements (kWh/year)

Assumed occupancy												3.0071 (42)	
Average daily hot water use (litres/day)												111.1781 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	122.2959	117.8488	113.4017	108.9545	104.5074	100.0603	100.0603	104.5074	108.9545	113.4017	117.8488	122.2959	(44)
Energy content (annual)	181.3613	158.6198	163.6814	142.7014	136.9254	118.1562	109.4891	125.6403	127.1409	148.1704	161.7396	175.6387	(45)
Distribution loss (46)m = 0.15 x (45)m	27.2042	23.7930	24.5522	21.4052	20.5388	17.7234	16.4234	18.8460	19.0711	22.2256	24.2609	26.3458	(46)
Water storage loss:													
Store volume													200.0000 (47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0115 (51)
Volume factor from Table 2a													0.8434 (52)
Temperature factor from Table 2b													0.5400 (53)
Enter (49) or (54) in (55)													1.0519 (55)
Total storage loss	32.6083	29.4527	32.6083	31.5564	32.6083	31.5564	32.6083	32.6083	31.5564	32.6083	31.5564	32.6083	(56)
If cylinder contains dedicated solar storage	32.6083	29.4527	32.6083	31.5564	32.6083	31.5564	32.6083	32.6083	31.5564	32.6083	31.5564	32.6083	(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	237.2320	209.0836	219.5521	196.7698	192.7961	172.2246	165.3598	181.5110	181.2093	204.0411	215.8080	231.5095	(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	237.2320	209.0836	219.5521	196.7698	192.7961	172.2246	165.3598	181.5110	181.2093	204.0411	215.8080	231.5095	(64)
Total per year (kWh/year) = Sum(64)m =													2407.0971 (64)
Heat gains from water heating, kWh/month	104.9992	93.1122	99.1206	90.7030	90.2243	82.5417	81.1017	86.4720	85.5291	93.9632	97.0332	103.0965	(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	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	105.6231	93.8135	76.2942	57.7596	43.1760	36.4510	39.3866	51.1962	68.7154	87.2500	101.8337	108.5587	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	559.4495	565.2548	550.6256	519.4816	480.1680	443.2187	418.5343	412.7289	427.3582	458.5022	497.8158	534.7651	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	(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)	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	(71)
Water heating gains (Table 5)	141.1280	138.5598	133.2267	125.9763	121.2692	114.6412	109.0076	116.2258	118.7904	126.2947	134.7683	138.5705	(72)
Total internal gains	925.3929	916.8204	879.3388	822.4099	763.8055	713.5033	686.1209	699.3433	734.0564	791.2392	853.6101	901.0866	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains							
	m2	Table 6a	Specific data	Specific data	factor	W							
		W/m2	or Table 6b	or Table 6c	Table 6d								
Northeast	6.6600	11.2829	0.6300	0.7000	0.7700	22.9651 (75)							
Southeast	4.2400	36.7938	0.6300	0.7000	0.7700	47.6774 (77)							
Southwest	14.8000	36.7938	0.6300	0.7000	0.7700	166.4212 (79)							
Northwest	4.2400	11.2829	0.6300	0.7000	0.7700	14.6204 (81)							
Northeast	4.2400	11.2829	0.6300	0.7000	0.7700	14.6204 (75)							
Horizontal	4.2400	26.0000	0.6300	0.7000	1.0000	43.7543 (82)							
Solar gains	310.0588	561.8301	851.9965	1185.1236	1438.2726	1474.6677	1402.4069	1207.6866	967.1177	643.9940	377.6636	261.1978	(83)
Total gains	1235.4517	1478.6505	1731.3354	2007.5335	2202.0781	2188.1709	2088.5278	1907.0299	1701.1740	1435.2332	1231.2737	1162.2844	(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	29.7036	29.7937	29.8825	30.3068	30.3875	30.7690	30.7690	30.8407	30.6209	30.3875	30.2246	30.0562	
alpha	2.9802	2.9862	2.9922	3.0205	3.0258	3.0513	3.0513	3.0560	3.0414	3.0258	3.0150	3.0037	
util living area	0.9967	0.9940	0.9879	0.9713	0.9322	0.8518	0.7416	0.7906	0.9253	0.9822	0.9947	0.9973	(86)
MIT	18.9984	19.1522	19.4412	19.8515	20.2579	20.6007	20.7747	20.7379	20.4473	19.9272	19.3999	18.9838	(87)
Th 2	19.1176	19.1219	19.1261	19.1462	19.1499	19.1675	19.1675	19.1708	19.1607	19.1499	19.1423	19.1344	(88)
util rest of house	0.9954	0.9916	0.9825	0.9567	0.8903	0.7380	0.5180	0.5874	0.8572	0.9704	0.9920	0.9963	(89)
MIT 2	17.3704	17.5269	17.8174	18.2370	18.6282	18.9391	19.0505	19.0388	18.8189	18.3190	17.7900	17.3685	(90)
Living area fraction										fLA = Living area / (4) =			0.4348 (91)
MIT	18.0782	18.2336	18.5234	18.9390	19.3368	19.6615	19.8002	19.7776	19.5270	19.0183	18.4900	18.0708	(92)
Temperature adjustment													0.0000
adjusted MIT	18.0782	18.2336	18.5234	18.9390	19.3368	19.6615	19.8002	19.7776	19.5270	19.0183	18.4900	18.0708	(93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: Existing Dwelling

CALCULATION OF ENERGY RATINGS 09 Jan 2014

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9944	0.9900	0.9801	0.9545	0.8958	0.7764	0.6108	0.6712	0.8755	0.9692	0.9907	0.9954	(94)
Useful gains	1228.5524	1463.9318	1696.9432	1916.1353	1972.5843	1698.7875	1275.6319	1279.9173	1489.3496	1391.0815	1219.8731	1156.9442	(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	6571.3136	6340.0137	5700.0667	4692.6462	3560.2818	2330.4352	1473.4320	1551.4961	2510.7601	3924.5969	5338.6209	6537.8637	(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	3975.0143	3276.7270	2978.3239	1999.0878	1181.2469	0.0000	0.0000	0.0000	0.0000	1884.9355	2965.4984	4003.4041	(98)
Space heating												22264.2379	(98)
Space heating per m2												(98) / (4) =	109.1384 (99)

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 %)													91.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													24359.1224 (211)
Space heating requirement	3975.0143	3276.7270	2978.3239	1999.0878	1181.2469	0.0000	0.0000	0.0000	0.0000	1884.9355	2965.4984	4003.4041	(98)
Space heating efficiency (main heating system 1)	91.4000	91.4000	91.4000	91.4000	91.4000	0.0000	0.0000	0.0000	0.0000	91.4000	91.4000	91.4000	(210)
Space heating fuel (main heating system)	4349.0310	3585.0405	3258.5600	2187.1858	1292.3927	0.0000	0.0000	0.0000	0.0000	2062.2926	3244.5278	4380.0920	(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	237.2320	209.0836	219.5521	196.7698	192.7961	172.2246	165.3598	181.5110	181.2093	204.0411	215.8080	231.5095	(64)
Efficiency of water heater (217)m	88.3203	88.2764	88.1728	87.9233	87.3256	78.3000	78.3000	78.3000	78.3000	87.8277	88.1825	88.3401	(217)
Fuel for water heating, kWh/month	268.6043	236.8510	249.0022	223.7970	220.7785	219.9548	211.1875	231.8149	231.4295	232.3198	244.7288	262.0662	(219)
Water heating fuel used												2832.5345	(219)
Annual totals kWh/year													
Space heating fuel - main system													24359.1224 (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)													746.1345 (232)
Total delivered energy for all uses													28012.7914 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	24359.1224	3.4800	847.6975 (240)	
Space heating - secondary	0.0000	0.0000	0.0000 (242)	
Water heating (other fuel)	2832.5345	3.4800	98.5722 (247)	
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)	
Energy for lighting	746.1345	13.1900	98.4151 (250)	
Additional standing charges			120.0000 (251)	
Total energy cost			1174.5773 (255)	

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)		1.9812 (257)
SAP value	$[(255) \times (256)] / [(4) + 45.0] =$	72.3621
SAP rating (Section 12)		72 (258)
SAP band		C

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	24359.1224	0.2160	5261.5704 (261)	
Space heating - secondary	0.0000	0.0000	0.0000 (263)	
Water heating (other fuel)	2832.5345	0.2160	611.8274 (264)	
Space and water heating			5873.3979 (265)	
Pumps and fans	75.0000	0.5190	38.9250 (267)	
Energy for lighting	746.1345	0.5190	387.2438 (268)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: Existing Dwelling

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Total kg/year	6299.5667 (272)
CO2 emissions per m2	30.8800 (273)
EI value	66.0987
EI rating	66 (274)
EI band	D

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.25) / 0.8900 = 4.194$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.25) / 0.8900 = 0.2603$, stars = 4
Water heating energy efficiency	$3.48 / 0.8480 = 4.104$, stars = 4
Water heating environmental impact	$0.216 / 0.8480 = 0.2547$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: Existing Dwelling

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

SAP 2012 WORKSHEET FOR Existing dwelling (SAP) (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	204.0000 (1b)	x 2.4000 (2b)	= 489.6000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	204.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 489.6000 (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				4 * 10 =	40.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.0817 (8)
Number of storeys in the dwelling (ns)					1 (9)
Additional infiltration					[(9) - 1] x 0.1 = 0.0000 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction					0.3500 (11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0					0.0000 (12)
If no draught lobby, enter 0.05, else enter 0					0.0500 (13)
Percentage of windows and doors draught stripped					100.0000 (14)
Window infiltration					0.25 - [0.2 * (14) / 100] = 0.0500 (15)
Pressure test					No
Measured/design AP50					15.0000
Infiltration rate					0.5317 (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) = 0.5317 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.6000	4.3000	4.3000	4.0000	4.0000	3.7000	3.7000	3.5000	3.5000	3.9000	3.9000	4.2000 (22)
Wind factor	1.1500	1.0750	1.0750	1.0000	1.0000	0.9250	0.9250	0.8750	0.8750	0.9750	0.9750	1.0500 (22a)
Adj infiltr rate	0.6115	0.5716	0.5716	0.5317	0.5317	0.4918	0.4918	0.4652	0.4652	0.5184	0.5184	0.5583 (22b)
Effective ac	0.6869	0.6634	0.6634	0.6414	0.6414	0.6209	0.6209	0.6082	0.6082	0.6344	0.6344	0.6558 (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
NEW NOTIONAL Window (Uw = 1.60)			29.9400	1.5038	45.0226		(27)
NEW NOTIONAL FullGlxDoor (Uw = 1.80)			4.2400	1.6791	7.1194		(27)
NEW NOTIONAL Door			6.1600	1.8000	11.0880		(26a)
NEW NOTIONAL Rooflight (Uw = 1.60)			4.2400	1.5038	6.3759		(27a)
Existing			132.8000	0.4900	65.0720		(28a)
NEW (Garage & front)			34.5000	0.2500	8.6250		(28a)
NEW NOTIONAL			36.7000	0.2200	8.0740		(28a)
Existing	72.6000	15.1000	57.5000	0.4900	28.1750		(29a)
Garage conversion	25.0000	7.6600	17.3400	0.3000	5.2020		(29a)
NEW Front	21.5000	4.8600	16.6400	0.2800	4.6592		(29a)
NEW NOTIONAL	41.1000	12.7200	28.3800	0.2800	7.9464		(29a)
Existing	132.8000		132.8000	0.4900	65.0720		(30)
NEW (Garage & Front)	34.5000		34.5000	0.1600	5.5200		(30)
NEW NOTIONAL	36.7000	4.2400	32.4600	0.1800	5.8428		(30)
Total net area of external elements Aum(A, m ²)			568.2000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	273.7943			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		250.0000 (35)
Thermal bridges (Default value 0.150 * total exposed area)		85.2300 (36)
Total fabric heat loss	(33) + (36) =	359.0243 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	110.9872	107.1761	107.1761	103.6220	103.6220	100.3247	100.3247	98.2693	98.2693	102.4944	102.4944	105.9629 (38)
Heat transfer coeff	470.0115	466.2004	466.2004	462.6463	462.6463	459.3490	459.3490	457.2936	457.2936	461.5186	461.5186	464.9872 (39)
Average = Sum(39)m / 12 =	462.4179 (39)											

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	2.3040	2.2853	2.2853	2.2679	2.2679	2.2517	2.2517	2.2416	2.2416	2.2623	2.2623	2.2793 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

FULL SAP CALCULATION PRINTOUT

Calculation Type: Existing Dwelling

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

4. Water heating energy requirements (kWh/year)

Assumed occupancy												3.0071 (42)	
Average daily hot water use (litres/day)												111.1781 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	122.2959	117.8488	113.4017	108.9545	104.5074	100.0603	100.0603	104.5074	108.9545	113.4017	117.8488	122.2959	(44)
Energy content (annual)	181.3613	158.6198	163.6814	142.7014	136.9254	118.1562	109.4891	125.6403	127.1409	148.1704	161.7396	175.6387	(45)
Distribution loss (46)m = 0.15 x (45)m	27.2042	23.7930	24.5522	21.4052	20.5388	17.7234	16.4234	18.8460	19.0711	22.2256	24.2609	26.3458	(46)
Water storage loss:													
Store volume													200.0000 (47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0115 (51)
Volume factor from Table 2a													0.8434 (52)
Temperature factor from Table 2b													0.5400 (53)
Enter (49) or (54) in (55)													1.0519 (55)
Total storage loss	32.6083	29.4527	32.6083	31.5564	32.6083	31.5564	32.6083	32.6083	31.5564	32.6083	31.5564	32.6083	(56)
If cylinder contains dedicated solar storage	32.6083	29.4527	32.6083	31.5564	32.6083	31.5564	32.6083	32.6083	31.5564	32.6083	31.5564	32.6083	(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	237.2320	209.0836	219.5521	196.7698	192.7961	172.2246	165.3598	181.5110	181.2093	204.0411	215.8080	231.5095	(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	237.2320	209.0836	219.5521	196.7698	192.7961	172.2246	165.3598	181.5110	181.2093	204.0411	215.8080	231.5095	(64)
Total per year (kWh/year) = Sum(64)m =													2407.0971 (64)
Heat gains from water heating, kWh/month	104.9992	93.1122	99.1206	90.7030	90.2243	82.5417	81.1017	86.4720	85.5291	93.9632	97.0332	103.0965	(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	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	105.6231	93.8135	76.2942	57.7596	43.1760	36.4510	39.3866	51.1962	68.7154	87.2500	101.8337	108.5587	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	559.4495	565.2548	550.6256	519.4816	480.1680	443.2187	418.5343	412.7289	427.3582	458.5022	497.8158	534.7651	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	(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)	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	(71)
Water heating gains (Table 5)	141.1280	138.5598	133.2267	125.9763	121.2692	114.6412	109.0076	116.2258	118.7904	126.2947	134.7683	138.5705	(72)
Total internal gains	925.3929	916.8204	879.3388	822.4099	763.8055	713.5033	686.1209	699.3433	734.0564	791.2392	853.6101	901.0866	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains							
	m2	Table 6a	Specific data	Specific data	factor	W							
		W/m2	or Table 6b	or Table 6c	Table 6d								
Northeast	6.6600	15.0428	0.6300	0.7000	0.7700	30.6179 (75)							
Southeast	4.2400	46.3896	0.6300	0.7000	0.7700	60.1116 (77)							
Southwest	14.8000	46.3896	0.6300	0.7000	0.7700	209.8235 (79)							
Northwest	4.2400	15.0428	0.6300	0.7000	0.7700	19.4925 (81)							
Northeast	4.2400	15.0428	0.6300	0.7000	0.7700	19.4925 (75)							
Horizontal	4.2400	35.0000	0.6300	0.7000	1.0000	58.9000 (82)							
Solar gains	398.4380	628.9377	946.5303	1341.8029	1549.7028	1713.1234	1581.9674	1387.2144	1122.7372	732.8529	481.2957	332.1026	(83)
Total gains	1323.8308	1545.7581	1825.8691	2164.2128	2313.5083	2426.6267	2268.0883	2086.5577	1856.7935	1524.0921	1334.9058	1233.1892	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, T _{hl} (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	30.1411	30.3875	30.3875	30.6209	30.6209	30.8407	30.8407	30.9794	30.9794	30.6958	30.6958	30.4668	
alpha	3.0094	3.0258	3.0258	3.0414	3.0414	3.0560	3.0560	3.0653	3.0653	3.0464	3.0464	3.0311	
util living area	0.9956	0.9927	0.9844	0.9613	0.9094	0.7934	0.6694	0.7024	0.8959	0.9749	0.9923	0.9964	(86)
MIT	19.1410	19.2693	19.5712	19.9688	20.3737	20.6862	20.8201	20.8075	20.5352	20.0530	19.5429	19.1326	(87)
Th 2	19.1384	19.1499	19.1499	19.1607	19.1607	19.1708	19.1708	19.1771	19.1771	19.1642	19.1642	19.1536	(88)
util rest of house	0.9938	0.9897	0.9772	0.9414	0.8523	0.6484	0.4189	0.4500	0.8045	0.9575	0.9884	0.9949	(89)
MIT 2	17.5284	17.6646	17.9642	18.3613	18.7406	18.9975	19.0692	19.0730	18.9035	18.4528	17.9488	17.5315	(90)
Living area fraction									fLA = Living area / (4) =				0.4348 (91)
MIT	18.2296	18.3623	18.6629	19.0602	19.4507	19.7318	19.8305	19.8271	19.6130	19.1485	18.6419	18.2276	(92)
Temperature adjustment													0.0000
adjusted MIT	18.2296	18.3623	18.6629	19.0602	19.4507	19.7318	19.8305	19.8271	19.6130	19.1485	18.6419	18.2276	(93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: Existing Dwelling

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

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9925	0.9879	0.9747	0.9400	0.8637	0.7019	0.5234	0.5562	0.8330	0.9573	0.9868	0.9939	(94)
Useful gains	1313.9006	1527.0945	1779.6528	2034.2820	1998.2779	1703.2764	1187.0385	1160.5550	1546.7442	1458.9578	1317.3425	1225.6188	(95)
Ext temp.	5.0000	5.4000	7.1000	9.4000	12.4000	15.1000	17.0000	17.0000	14.5000	11.3000	7.8000	5.0000	(96)
Heat loss rate W	6218.0498	6043.0518	5390.6513	4469.2741	3261.9743	2127.5916	1300.2014	1292.8328	2338.1366	3622.2413	5003.7565	6150.6851	(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	3648.6869	3034.7233	2686.5828	1753.1943	940.1901	0.0000	0.0000	0.0000	0.0000	1609.4829	2654.2180	3664.2493	(98)
Space heating												19991.3278	(98)
Space heating per m2												(98) / (4) =	97.9967 (99)

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 %)													91.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													21872.3499 (211)
Space heating requirement	3648.6869	3034.7233	2686.5828	1753.1943	940.1901	0.0000	0.0000	0.0000	0.0000	1609.4829	2654.2180	3664.2493	(98)
Space heating efficiency (main heating system 1)	91.4000	91.4000	91.4000	91.4000	91.4000	0.0000	0.0000	0.0000	0.0000	91.4000	91.4000	91.4000	(210)
Space heating fuel (main heating system)	3991.9988	3320.2662	2939.3685	1918.1557	1028.6544	0.0000	0.0000	0.0000	0.0000	1760.9223	2903.9585	4009.0255	(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	237.2320	209.0836	219.5521	196.7698	192.7961	172.2246	165.3598	181.5110	181.2093	204.0411	215.8080	231.5095	(64)
Efficiency of water heater (217)m	88.2637	88.2229	88.0906	87.7894	86.9774	78.3000	78.3000	78.3000	78.3000	87.6523	88.0948	88.2831	(216)
Fuel for water heating, kWh/month	268.7766	236.9947	249.2345	224.1384	221.6622	219.9548	211.1875	231.8149	231.4295	232.7846	244.9726	262.2354	(219)
Water heating fuel used												2835.1856	(219)
Annual totals kWh/year													
Space heating fuel - main system													21872.3499 (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)													746.1345 (232)
Total delivered energy for all uses													25528.6700 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	21872.3499	3.6300	793.9663 (240)	
Space heating - secondary	0.0000	0.0000	0.0000 (242)	
Water heating (other fuel)	2835.1856	3.6300	102.9172 (247)	
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)	
Energy for lighting	746.1345	19.4400	145.0486 (250)	
Additional standing charges			95.0000 (251)	
Total energy cost			1151.5121 (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	21872.3499	0.2160	4724.4276 (261)	
Space heating - secondary	0.0000	0.0000	0.0000 (263)	
Water heating (other fuel)	2835.1856	0.2160	612.4001 (264)	
Space and water heating			5336.8277 (265)	
Pumps and fans	75.0000	0.5190	38.9250 (267)	
Energy for lighting	746.1345	0.5190	387.2438 (268)	
Total kg/year			5762.9965 (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	21872.3499	1.2200	26684.2669 (261)	
Space heating - secondary	0.0000	0.0000	0.0000 (263)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: Existing Dwelling

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

Water heating (other fuel)	2835.1856	1.2200	3458.9265 (264)
Space and water heating			30143.1933 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	746.1345	3.0700	2290.6330 (268)
Primary energy kWh/year			32664.0763 (272)
Primary energy kWh/m ² /year			160.1180 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: C 72
Current environmental impact rating: D 66

(For testing purposes):

A Loft insulation	Not considered
B Cavity wall insulation	Not considered
C Hot water cylinder insulation	Not considered
D Draughtproofing	Not considered
E Low energy lighting	SAP increase too small
F Cylinder thermostat	Not considered
G Heating controls	Not considered
H Heating controls	Not considered
I Condensing boiler	Not considered
J Biomass boiler	Not considered
K Biomass stove with boiler	Not considered
M Replacement warm air unit	Not considered
N Solar water heating	Recommended
O Double glazing	Not considered
P Secondary glazing	Not considered
R Condensing oil boiler	Not considered
S Condensing boiler	Not considered
T Gas condensing boiler	Not considered
U Solar photovoltaic panels	Recommended
A2 Flat roof insulation	Not considered
A3 Room-in-roof insulation	Not considered
T2 Flue gas heat recovery	Not considered
W Floor insulation	Not considered
X High performance external doors	Not considered
Y Heat recovery system for mixer showers	Not considered
J2 Biomass boiler	Not considered
Q2 External and cavity wall insulation	Not considered
Z1 Air or ground source heat pump	Not considered
Z2 Air or ground source heat pump with underfloor heating	Not considered
Z3 Micro CHP	Not considered
Z4	Not considered
Z5	Not considered
V2 Wind turbine	Not applicable
L2 High heat retention storage heaters	Not considered
Q3 System built wall insulation	Not considered
O3	Not considered

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.0	-£ 42	-283 kg (4.9%)
U Solar photovoltaic panels	+ 5.4	-£ 383	-1023 kg (18.7%)

Measures omitted - SAP change or cost saving too small:

E Low energy lighting	+ 0.4	-£ 26	-59 kg (1.0%)
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Recommended measures	Typical annual savings		Energy efficiency	Environmental impact
Solar water heating	£42	1.39 kg/m ²	C 73	D 68
Solar photovoltaic panels	£383	5.01 kg/m ²	C 79	C 72
Total Savings	£425	6.40 kg/m²		

Potential energy efficiency rating: C 79
Potential environmental impact rating: C 72

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

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

	Current	Potential	Saving
Electricity	£160	£169	-£10
Mains gas	£992	£940	£52
Space heating	£904	£906	-£3
Water heating	£103	£58	£45
Lighting	£145	£145	£0
Generated (PV)	-£0	-£383	£383
Total cost of fuels	£1152	£726	£425
Total cost of uses	£1152	£726	£425
Delivered energy	125 kWh/m ²	109 kWh/m ²	16 kWh/m ²
Carbon dioxide emissions	5.8 tonnes	4.5 tonnes	1.3 tonnes
CO2 emissions per m ²	28 kg/m ²	22 kg/m ²	6 kg/m ²
Primary energy	160 kWh/m ²	123 kWh/m ²	37 kWh/m ²

FULL SAP CALCULATION PRINTOUT

Calculation Type: Existing Dwelling

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: Existing Dwelling

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR Existing dwelling (SAP) (Version 9.92, January 2014)
CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	204.0000 (1b)	x 2.4000 (2b)	= 489.6000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	204.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 489.6000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				4 * 10 =	40.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.0817 (8)
Number of storeys in the dwelling (ns)					1 (9)
Additional infiltration					[(9) - 1] x 0.1 = 0.0000 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction					0.3500 (11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0					0.0000 (12)
If no draught lobby, enter 0.05, else enter 0					0.0500 (13)
Percentage of windows and doors draught stripped					100.0000 (14)
Window infiltration					0.25 - [0.2 * (14) / 100] = 0.0500 (15)
Pressure test					No
Measured/design AP50					15.0000
Infiltration rate					0.5317 (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) = 0.5317 (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 infiltr rate	0.6779	0.6646	0.6513	0.5849	0.5716	0.5051	0.5051	0.4918	0.5317	0.5716	0.5982	0.6247 (22b)
Effective ac	0.7298	0.7209	0.7121	0.6710	0.6634	0.6276	0.6276	0.6209	0.6414	0.6634	0.6789	0.6952 (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
NEW NOTIONAL Window (Uw = 1.60)			29.9400	1.5038	45.0226		(27)
NEW NOTIONAL FullGlxDoor (Uw = 1.80)			4.2400	1.6791	7.1194		(27)
NEW NOTIONAL Door			6.1600	1.8000	11.0880		(26a)
NEW NOTIONAL Rooflight (Uw = 1.60)			4.2400	1.5038	6.3759		(27a)
Existing			132.8000	0.4900	65.0720		(28a)
NEW (Garage & front)			34.5000	0.2500	8.6250		(28a)
NEW NOTIONAL			36.7000	0.2200	8.0740		(28a)
Existing	72.6000	15.1000	57.5000	0.4900	28.1750		(29a)
Garage conversion	25.0000	7.6600	17.3400	0.3000	5.2020		(29a)
NEW Front	21.5000	4.8600	16.6400	0.2800	4.6592		(29a)
NEW NOTIONAL	41.1000	12.7200	28.3800	0.2800	7.9464		(29a)
Existing	132.8000		132.8000	0.4900	65.0720		(30)
NEW (Garage & Front)	34.5000		34.5000	0.1600	5.5200		(30)
NEW NOTIONAL	36.7000	4.2400	32.4600	0.1800	5.8428		(30)
Total net area of external elements Aum(A, m2)			568.2000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 273.7943		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Default value 0.150 * total exposed area)							85.2300 (36)
Total fabric heat loss							(33) + (36) = 359.0243 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	117.9100	116.4683	115.0552	108.4180	107.1761	101.3953	101.3953	100.3247	103.6220	107.1761	109.6883	112.3147 (38)
Heat transfer coeff	476.9343	475.4926	474.0795	467.4422	466.2004	460.4196	460.4196	459.3490	462.6463	466.2004	468.7126	471.3390 (39)
Average = Sum(39)m / 12 =	467.4363 (39)											
HLP	2.3379	2.3308	2.3239	2.2914	2.2853	2.2570	2.2570	2.2517	2.2679	2.2853	2.2976	2.3105 (40)
HLP (average)	2.2914 (40)											
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

FULL SAP CALCULATION PRINTOUT

Calculation Type: Existing Dwelling

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

4. Water heating energy requirements (kWh/year)

Assumed occupancy												3.0071 (42)	
Average daily hot water use (litres/day)												111.1781 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	122.2959	117.8488	113.4017	108.9545	104.5074	100.0603	100.0603	104.5074	108.9545	113.4017	117.8488	122.2959	(44)
Energy content	181.3613	158.6198	163.6814	142.7014	136.9254	118.1562	109.4891	125.6403	127.1409	148.1704	161.7396	175.6387	(45)
Energy content (annual)	Total = Sum(45)m =											1749.2645 (45)	
Distribution loss (46)m = 0.15 x (45)m	27.2042	23.7930	24.5522	21.4052	20.5388	17.7234	16.4234	18.8460	19.0711	22.2256	24.2609	26.3458	(46)
Water storage loss:													
Store volume												200.0000 (47)	
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0115 (51)	
Volume factor from Table 2a												0.8434 (52)	
Temperature factor from Table 2b												0.5400 (53)	
Enter (49) or (54) in (55)												1.0519 (55)	
Total storage loss	32.6083	29.4527	32.6083	31.5564	32.6083	31.5564	32.6083	32.6083	31.5564	32.6083	31.5564	32.6083	(56)
If cylinder contains dedicated solar storage	20.3802	18.4079	20.3802	19.7228	20.3802	19.7228	20.3802	20.3802	19.7228	20.3802	19.7228	20.3802	(57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month	225.0039	198.0389	205.9282	178.1826	167.7737	147.7842	140.1047	157.1865	163.9728	190.4173	203.9744	219.2813	(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												1.0368 (H8)	
Utilisation factor												0.6188 (H9)	
Collector performance factor												0.8793 (H10)	
Dedicated solar storage volume												75.0000 (H11)	
Effective solar volume												112.5000 (H13)	
Daily hot water demand												111.1781 (H14)	
Volume ratio Veff/V												1.0119 (H15)	
Solar storage volume factor												1.0000 (H16)	
Solar input												-986.8501 (H17)	
Solar input	-28.6167	-47.7530	-81.3289	-108.9967	-134.6562	-132.3885	-130.6390	-114.1399	-89.3945	-61.0459	-33.9435	-23.9473	(63)
Solar input (sum of months) = Sum(63)m =												-986.8501 (63)	
Output from w/h	196.3872	150.2859	124.5994	69.1859	33.1174	15.3957	9.4658	43.0465	74.5783	129.3714	170.0309	195.3341	(64)
Heat gains from water heating, kWh/month	95.2167	84.2764	88.2215	75.8331	70.2063	62.9894	60.8976	67.0123	71.7399	83.0641	87.5662	93.3140	(65)
Total per year (kWh/year) = Sum(64)m =												1210.7984 (64)	

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

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	105.6231	93.8135	76.2942	57.7596	43.1760	36.4510	39.3866	51.1962	68.7154	87.2500	101.8337	108.5587	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	559.4495	565.2548	550.6256	519.4816	480.1680	443.2187	418.5343	412.7289	427.3582	458.5022	497.8158	534.7651	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	(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)	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	(71)
Water heating gains (Table 5)	127.9794	125.4113	118.5773	105.3238	94.3633	87.4852	81.8517	90.0703	99.6387	111.6454	121.6198	125.4220	(72)
Total internal gains	912.2443	903.6719	864.6895	801.7574	736.8996	686.3473	658.9649	673.1878	714.9047	776.5899	840.4616	887.9381	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W							
Northeast	6.6600	11.2829	0.6300	0.7000	0.7700	22.9651 (75)							
Southeast	4.2400	36.7938	0.6300	0.7000	0.7700	47.6774 (77)							
Southwest	14.8000	36.7938	0.6300	0.7000	0.7700	166.4212 (79)							
Northwest	4.2400	11.2829	0.6300	0.7000	0.7700	14.6204 (81)							
Northeast	4.2400	11.2829	0.6300	0.7000	0.7700	14.6204 (75)							
Horizontal	4.2400	26.0000	0.6300	0.7000	1.0000	43.7543 (82)							
Solar gains	310.0588	561.8301	851.9965	1185.1236	1438.2726	1474.6677	1402.4069	1207.6866	967.1177	643.9940	377.6636	261.1978	(83)
Total gains	1222.3031	1465.5020	1716.6860	1986.8810	2175.1723	2161.0149	2061.3718	1880.8744	1682.0223	1420.5839	1218.1252	1149.1358	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)
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FULL SAP CALCULATION PRINTOUT

Calculation Type: Existing Dwelling

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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	29.7036	29.7937	29.8825	30.3068	30.3875	30.7690	30.7690	30.8407	30.6209	30.3875	30.2246	30.0562
alpha	2.9802	2.9862	2.9922	3.0205	3.0258	3.0513	3.0513	3.0560	3.0414	3.0258	3.0150	3.0037
util living area	0.9968	0.9942	0.9881	0.9721	0.9341	0.8553	0.7466	0.7954	0.9271	0.9826	0.9948	0.9974 (86)
MIT	18.9947	19.1486	19.4372	19.8462	20.2519	20.5962	20.7719	20.7345	20.4431	19.9232	19.3962	18.9801 (87)
Th 2	19.1176	19.1219	19.1261	19.1462	19.1499	19.1675	19.1675	19.1708	19.1607	19.1499	19.1423	19.1344 (88)
util rest of house	0.9956	0.9918	0.9829	0.9577	0.8930	0.7428	0.5234	0.5932	0.8603	0.9712	0.9923	0.9964 (89)
MIT 2	17.3667	17.5232	17.8135	18.2319	18.6231	18.9363	19.0497	19.0376	18.8157	18.3153	17.7863	17.3648 (90)
Living area fraction									fLA = Living area / (4) =			0.4348 (91)
MIT	18.0746	18.2299	18.5195	18.9338	19.3313	19.6580	19.7985	19.7754	19.5233	19.0144	18.4863	18.0671 (92)
Temperature adjustment												0.0000
adjusted MIT	18.0746	18.2299	18.5195	18.9338	19.3313	19.6580	19.7985	19.7754	19.5233	19.0144	18.4863	18.0671 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9946	0.9903	0.9806	0.9555	0.8983	0.7806	0.6161	0.6766	0.8781	0.9700	0.9910	0.9955 (94)
Useful gains	1215.6707	1451.2507	1683.2996	1898.5430	1953.9008	1686.8171	1270.0506	1272.6514	1477.0045	1377.9509	1207.1623	1144.0174 (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	6569.5601	6338.2850	5698.1988	4690.2356	3557.7086	2328.8159	1472.6492	1550.5016	2509.0767	3922.8112	5336.9054	6536.1190 (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	3983.2937	3284.0870	2987.0851	2010.0186	1193.2330	0.0000	0.0000	0.0000	0.0000	1893.3761	2973.4150	4011.7236 (98)
Space heating												22336.2320 (98)
Space heating per m2										(98) / (4) =		109.4913 (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 %)												91.4000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												24437.8906 (211)
Space heating requirement	3983.2937	3284.0870	2987.0851	2010.0186	1193.2330	0.0000	0.0000	0.0000	0.0000	1893.3761	2973.4150	4011.7236 (98)
Space heating efficiency (main heating system 1)	91.4000	91.4000	91.4000	91.4000	91.4000	0.0000	0.0000	0.0000	0.0000	91.4000	91.4000	91.4000 (210)
Space heating fuel (main heating system)	4358.0893	3593.0930	3268.1456	2199.1451	1305.5066	0.0000	0.0000	0.0000	0.0000	2071.5274	3253.1893	4389.1943 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	196.3872	150.2859	124.5994	69.1859	33.1174	15.3957	9.4658	43.0465	74.5783	129.3714	170.0309	195.3341 (64)
Efficiency of water heater (217)m	88.4322	88.4710	88.5156	88.5971	88.6728	78.3000	78.3000	78.3000	78.3000	88.2289	88.3470	78.3000 (216)
Fuel for water heating, kWh/month	222.0766	169.8703	140.7654	78.0904	37.3479	19.6625	12.0891	54.9764	95.2469	146.6316	192.4581	220.8690 (219)
Water heating fuel used												1390.0841 (219)
Annual totals kWh/year												
Space heating fuel - main system												24437.8906 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
pump for solar water heating												50.0000 (230g)
Total electricity for the above, kWh/year												125.0000 (231)
Electricity for lighting (calculated in Appendix L)												746.1345 (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												24971.8699 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	24437.8906	3.4800	850.4386 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1390.0841	3.4800	48.3749 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Pump for solar water heating	50.0000	13.1900	6.5950 (249)
Energy for lighting	746.1345	13.1900	98.4151 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-1727.2394	13.1900	-227.8229 (252)

FULL SAP CALCULATION PRINTOUT

Calculation Type: Existing Dwelling

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Total energy cost 905.8933 (255)

 11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.5280 (257)
SAP value		78.6842
SAP rating (Section 12)		79 (258)
SAP band		C

 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	24437.8906	0.2160	5278.5844 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1390.0841	0.2160	300.2582 (264)
Space and water heating			5578.8425 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	746.1345	0.5190	387.2438 (268)
Energy saving/generation technologies			
PV Unit	-1727.2394	0.5190	-896.4372 (269)
Total kg/year			5134.5241 (272)
CO2 emissions per m2			25.1700 (273)
EI value			72.3684
EI rating			72 (274)
EI band			C

FULL SAP CALCULATION PRINTOUT

Calculation Type: Existing Dwelling

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

SAP 2012 WORKSHEET FOR Existing dwelling (SAP) (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	204.0000 (1b)	x 2.4000 (2b)	= 489.6000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	204.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 489.6000 (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				4 * 10 =	40.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.0817 (8)
Number of storeys in the dwelling (ns)					1 (9)
Additional infiltration					[(9) - 1] x 0.1 = 0.0000 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction					0.3500 (11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0					0.0000 (12)
If no draught lobby, enter 0.05, else enter 0					0.0500 (13)
Percentage of windows and doors draught stripped					100.0000 (14)
Window infiltration					0.25 - [0.2 * (14) / 100] = 0.0500 (15)
Pressure test					No
Measured/design AP50					15.0000
Infiltration rate					0.5317 (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) = 0.5317 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.6000	4.3000	4.3000	4.0000	4.0000	3.7000	3.7000	3.5000	3.5000	3.9000	3.9000	4.2000 (22)
Wind factor	1.1500	1.0750	1.0750	1.0000	1.0000	0.9250	0.9250	0.8750	0.8750	0.9750	0.9750	1.0500 (22a)
Adj infiltr rate	0.6115	0.5716	0.5716	0.5317	0.5317	0.4918	0.4918	0.4652	0.4652	0.5184	0.5184	0.5583 (22b)
Effective ac	0.6869	0.6634	0.6634	0.6414	0.6414	0.6209	0.6209	0.6082	0.6082	0.6344	0.6344	0.6558 (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
NEW NOTIONAL Window (Uw = 1.60)			29.9400	1.5038	45.0226		(27)
NEW NOTIONAL FullGlxDoor (Uw = 1.80)			4.2400	1.6791	7.1194		(27)
NEW NOTIONAL Door			6.1600	1.8000	11.0880		(26a)
NEW NOTIONAL Rooflight (Uw = 1.60)			4.2400	1.5038	6.3759		(27a)
Existing			132.8000	0.4900	65.0720		(28a)
NEW (Garage & front)			34.5000	0.2500	8.6250		(28a)
NEW NOTIONAL			36.7000	0.2200	8.0740		(28a)
Existing	72.6000	15.1000	57.5000	0.4900	28.1750		(29a)
Garage conversion	25.0000	7.6600	17.3400	0.3000	5.2020		(29a)
NEW Front	21.5000	4.8600	16.6400	0.2800	4.6592		(29a)
NEW NOTIONAL	41.1000	12.7200	28.3800	0.2800	7.9464		(29a)
Existing	132.8000		132.8000	0.4900	65.0720		(30)
NEW (Garage & Front)	34.5000		34.5000	0.1600	5.5200		(30)
NEW NOTIONAL	36.7000	4.2400	32.4600	0.1800	5.8428		(30)
Total net area of external elements Aum(A, m ²)			568.2000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	273.7943			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		250.0000 (35)
Thermal bridges (Default value 0.150 * total exposed area)		85.2300 (36)
Total fabric heat loss	(33) + (36) =	359.0243 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	110.9872	107.1761	107.1761	103.6220	103.6220	100.3247	100.3247	98.2693	98.2693	102.4944	102.4944	105.9629 (38)
Heat transfer coeff	470.0115	466.2004	466.2004	462.6463	462.6463	459.3490	459.3490	457.2936	457.2936	461.5186	461.5186	464.9872 (39)
Average = Sum(39)m / 12 =	462.4179 (39)											

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	2.3040	2.2853	2.2853	2.2679	2.2679	2.2517	2.2517	2.2416	2.2416	2.2623	2.2623	2.2793 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

FULL SAP CALCULATION PRINTOUT

Calculation Type: Existing Dwelling

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

4. Water heating energy requirements (kWh/year)

Assumed occupancy												3.0071 (42)	
Average daily hot water use (litres/day)												111.1781 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	122.2959	117.8488	113.4017	108.9545	104.5074	100.0603	100.0603	104.5074	108.9545	113.4017	117.8488	122.2959	(44)
Energy content (annual)	181.3613	158.6198	163.6814	142.7014	136.9254	118.1562	109.4891	125.6403	127.1409	148.1704	161.7396	175.6387	(45)
Distribution loss (46)m = 0.15 x (45)m	27.2042	23.7930	24.5522	21.4052	20.5388	17.7234	16.4234	18.8460	19.0711	22.2256	24.2609	26.3458	(46)
Water storage loss:													
Store volume												200.0000 (47)	
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0115 (51)	
Volume factor from Table 2a												0.8434 (52)	
Temperature factor from Table 2b												0.5400 (53)	
Enter (49) or (54) in (55)												1.0519 (55)	
Total storage loss	32.6083	29.4527	32.6083	31.5564	32.6083	31.5564	32.6083	32.6083	31.5564	32.6083	31.5564	32.6083	(56)
If cylinder contains dedicated solar storage	20.3802	18.4079	20.3802	19.7228	20.3802	19.7228	20.3802	20.3802	19.7228	20.3802	19.7228	20.3802	(57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month	225.0039	198.0389	205.9282	178.1826	167.7737	147.7842	140.1047	157.1865	163.9728	190.4173	203.9744	219.2813	(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												1231.7237 (H5)	
Overshading factor												0.8000 (H6)	
Solar energy available												2069.2959 (H7)	
Adjustment factor for showers												1.0000 (H7a)	
Solar-to-load ratio												1.1830 (H8)	
Utilisation factor												0.5706 (H9)	
Collector performance factor												0.8793 (H10)	
Dedicated solar storage volume												75.0000 (H11)	
Effective solar volume												112.5000 (H13)	
Daily hot water demand												111.1781 (H14)	
Volume ratio Veff/V												1.0119 (H15)	
Solar storage volume factor												1.0000 (H16)	
Solar input												-1038.1987 (H17)	
Solar input	-34.1461	-49.5308	-83.3718	-113.3871	-133.0480	-140.9857	-135.1041	-120.3367	-95.5826	-64.2748	-40.1456	-28.2853	(63)
Solar input (sum of months) = Sum(63)m =												-1038.1987 (63)	
Output from w/h	190.8578	148.5081	122.5565	64.7955	34.7256	6.7985	5.0006	36.8498	68.3901	126.1424	163.8288	190.9960	(64)
Total per year (kWh/year) = Sum(64)m =												1159.4497 (64)	
Heat gains from water heating, kWh/month	95.2167	84.2764	88.2215	75.8331	70.2063	62.9894	60.8976	67.0123	71.7399	83.0641	87.5662	93.3140	(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	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	105.6231	93.8135	76.2942	57.7596	43.1760	36.4510	39.3866	51.1962	68.7154	87.2500	101.8337	108.5587	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	559.4495	565.2548	550.6256	519.4816	480.1680	443.2187	418.5343	412.7289	427.3582	458.5022	497.8158	534.7651	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	(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)	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	(71)
Water heating gains (Table 5)	127.9794	125.4113	118.5773	105.3238	94.3633	87.4852	81.8517	90.0703	99.6387	111.6454	121.6198	125.4220	(72)
Total internal gains	912.2443	903.6719	864.6895	801.7574	736.8996	686.3473	658.9649	673.1878	714.9047	776.5899	840.4616	887.9381	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W							
Northeast	6.6600	15.0428	0.6300	0.7000	0.7700	30.6179 (75)							
Southeast	4.2400	46.3896	0.6300	0.7000	0.7700	60.1116 (77)							
Southwest	14.8000	46.3896	0.6300	0.7000	0.7700	209.8235 (79)							
Northwest	4.2400	15.0428	0.6300	0.7000	0.7700	19.4925 (81)							
Northeast	4.2400	15.0428	0.6300	0.7000	0.7700	19.4925 (75)							
Horizontal	4.2400	35.0000	0.6300	0.7000	1.0000	58.9000 (82)							
Solar gains	398.4380	628.9377	946.5303	1341.8029	1549.7028	1713.1234	1581.9674	1387.2144	1122.7372	732.8529	481.2957	332.1026	(83)
Total gains	1310.6823	1532.6096	1811.2198	2143.5603	2286.6025	2399.4707	2240.9323	2060.4022	1837.6418	1509.4428	1321.7572	1220.0407	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)
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FULL SAP CALCULATION PRINTOUT

Calculation Type: Existing Dwelling

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

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	30.1411	30.3875	30.3875	30.6209	30.6209	30.8407	30.8407	30.9794	30.9794	30.6958	30.6958	30.4668
alpha	3.0094	3.0258	3.0258	3.0414	3.0414	3.0560	3.0560	3.0653	3.0653	3.0464	3.0464	3.0311
util living area	0.9957	0.9929	0.9847	0.9622	0.9117	0.7973	0.6744	0.7075	0.8982	0.9755	0.9925	0.9965 (86)
MIT	19.1374	19.2656	19.5673	19.9637	20.3682	20.6827	20.8182	20.8052	20.5315	20.0491	19.5392	19.1288 (87)
Th 2	19.1384	19.1499	19.1499	19.1607	19.1607	19.1708	19.1708	19.1771	19.1771	19.1642	19.1642	19.1536 (88)
util rest of house	0.9939	0.9899	0.9777	0.9427	0.8555	0.6532	0.4234	0.4549	0.8079	0.9585	0.9887	0.9951 (89)
MIT 2	17.5247	17.6610	17.9604	18.3565	18.7362	18.9957	19.0688	19.0725	18.9009	18.4492	17.9452	17.5278 (90)
Living area fraction										fLA = Living area / (4) =		0.4348 (91)
MIT	18.2259	18.3587	18.6591	19.0553	19.4458	19.7292	19.8294	19.8259	19.6099	19.1448	18.6383	18.2239 (92)
Temperature adjustment												0.0000
adjusted MIT	18.2259	18.3587	18.6591	19.0553	19.4458	19.7292	19.8294	19.8259	19.6099	19.1448	18.6383	18.2239 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9927	0.9882	0.9752	0.9412	0.8666	0.7062	0.5282	0.5613	0.8360	0.9582	0.9872	0.9940 (94)
Useful gains	1301.1095	1514.5130	1766.2741	2017.5675	1981.6560	1694.5994	1183.6661	1156.6025	1536.2299	1446.3697	1304.8109	1212.7659 (95)
Ext temp.	5.0000	5.4000	7.1000	9.4000	12.4000	15.1000	17.0000	17.0000	14.5000	11.3000	7.8000	5.0000 (96)
Heat loss rate W	6216.3224	6041.3561	5388.8347	4466.9915	3259.6990	2126.4207	1299.6985	1292.2556	2336.7173	3620.5343	5002.0777	6148.9634 (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	3656.9184	3042.0386	2695.1851	1763.5853	950.8640	0.0000	0.0000	0.0000	0.0000	1617.5785	2662.0321	3672.5310 (98)
Space heating												20060.7329 (98)
Space heating per m2										(98) / (4) =		98.3369 (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 %)												91.4000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												21948.2855 (211)
Space heating requirement	3656.9184	3042.0386	2695.1851	1763.5853	950.8640	0.0000	0.0000	0.0000	0.0000	1617.5785	2662.0321	3672.5310 (98)
Space heating efficiency (main heating system 1)	91.4000	91.4000	91.4000	91.4000	91.4000	0.0000	0.0000	0.0000	0.0000	91.4000	91.4000	91.4000 (210)
Space heating fuel (main heating system)	4001.0048	3328.2698	2948.7802	1929.5244	1040.3326	0.0000	0.0000	0.0000	0.0000	1769.7795	2912.5078	4018.0864 (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	190.8578	148.5081	122.5565	64.7955	34.7256	6.7985	5.0006	36.8498	68.3901	126.1424	163.8288	190.9960 (64)
Efficiency of water heater (217)m	88.4008	88.4375	88.4741	88.5711	88.5735	78.3000	78.3000	78.3000	78.3000	88.1288	88.3004	78.3000 (216)
Fuel for water heating, kWh/month	215.9005	167.9244	138.5224	73.1565	39.2054	8.6827	6.3865	47.0623	87.3437	143.1342	185.5357	216.0520 (219)
Water heating fuel used												1328.9062 (219)
Annual totals kWh/year												
Space heating fuel - main system												21948.2855 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
pump for solar water heating												50.0000 (230g)
Total electricity for the above, kWh/year												125.0000 (231)
Electricity for lighting (calculated in Appendix L)												746.1345 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 2.50 * 1232 * 0.80) =									-1970.7580			-1970.7580 (233)
Total delivered energy for all uses												22177.5682 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	21948.2855	3.6300	796.7228 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1328.9062	3.6300	48.2393 (247)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Pump for solar water heating	50.0000	19.4400	9.7200 (249)
Energy for lighting	746.1345	19.4400	145.0486 (250)
Additional standing charges			95.0000 (251)
Energy saving/generation technologies			
PV Unit	-1970.7580	19.4400	-383.1153 (252)

FULL SAP CALCULATION PRINTOUT

Calculation Type: Existing Dwelling

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

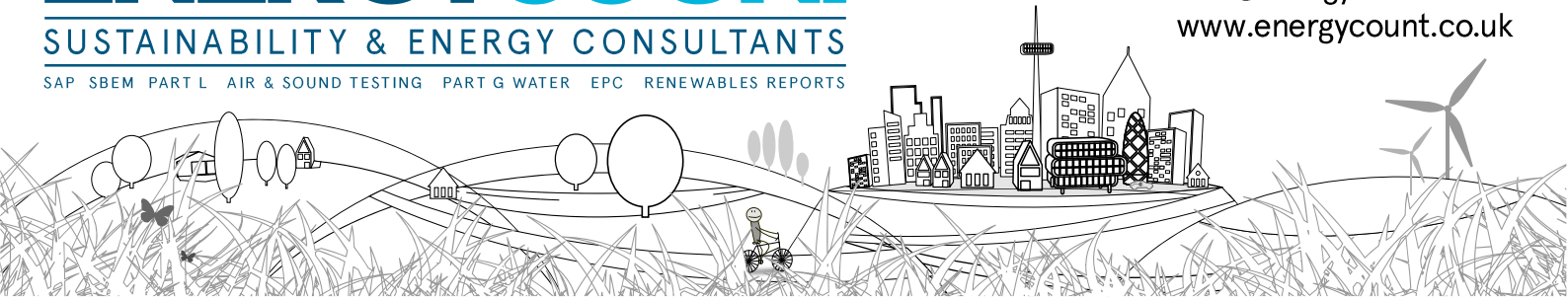
Total energy cost 726.1953 (255)

 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	21948.2855	0.2160	4740.8297 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1328.9062	0.2160	287.0437 (264)
Space and water heating			5027.8734 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	746.1345	0.5190	387.2438 (268)
Energy saving/generation technologies			
PV Unit	-1970.7580	0.5190	-1022.8234 (269)
Total kg/year			4457.1688 (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	21948.2855	1.2200	26776.9083 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1328.9062	1.2200	1621.2655 (264)
Space and water heating			28398.1738 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	746.1345	3.0700	2290.6330 (268)
Energy saving/generation technologies			
PV Unit	-1970.7580	3.0700	-6050.2270 (269)
Primary energy kWh/year			25022.3298 (272)
Primary energy kWh/m2/year			122.6585 (273)



Appendix 2: Proposed

FULL SAP CALCULATION PRINTOUT

Calculation Type: Existing Dwelling

Property Reference	0249-0322-01	Issued on Date	08/03/2022
Assessment Reference	PROPOSED	Prop Type Ref	3 St. Ives
Property	3 St. Ives Wood, St. Ives, RINGWOOD, BH24 2EA		

SAP Rating	73 C	DER	N/A	TER	N/A
Environmental	68 D	% DER<TER	N/A		
CO ₂ Emissions (t/year)	5.44	DFEE	N/A	TFEE	N/A
General Requirements Compliance	N/A	% DFEE<TFEE	N/A		

Assessor Details	Mr. Rob Carswell, Energycount Limited, Tel: 01202 623236, mail@energycount.co.uk	Assessor ID	7134-0001
Client	Tony Holt Design, 0249		

CALCULATION OF HEAT DEMAND 09 Jan 2014

SAP 2012 WORKSHEET FOR Existing dwelling (SAP) (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	204.0000 (1b)	x 2.4000 (2b)	= 489.6000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	204.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 489.6000 (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				4 * 10 =	40.0000 (7a)	
Number of passive vents				0 * 10 =	0.0000 (7b)	
Number of flueless gas fires				0 * 40 =	0.0000 (7c)	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) =	0.0817 (8)
Number of storeys in the dwelling (ns)						1 (9)
Additional infiltration					[(9) - 1] x 0.1 =	0.0000 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction						0.3500 (11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0						0.0000 (12)
If no draught lobby, enter 0.05, else enter 0						0.0500 (13)
Percentage of windows and doors draught stripped						100.0000 (14)
Window infiltration					0.25 - [0.2 * (14) / 100] =	0.0500 (15)
Pressure test						No
Measured/design AP50						15.0000
Infiltration rate						0.5317 (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) =	0.5317 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.6000	4.3000	4.3000	4.0000	4.0000	3.7000	3.7000	3.5000	3.5000	3.9000	3.9000	4.2000 (22)
Wind factor	1.1500	1.0750	1.0750	1.0000	1.0000	0.9250	0.9250	0.8750	0.8750	0.9750	0.9750	1.0500 (22a)
Adj infilt rate	0.6115	0.5716	0.5716	0.5317	0.5317	0.4918	0.4918	0.4652	0.4652	0.5184	0.5184	0.5583 (22b)
Effective ac	0.6869	0.6634	0.6634	0.6414	0.6414	0.6209	0.6209	0.6082	0.6082	0.6344	0.6344	0.6558 (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
NEW PROPOSED Window (Uw = 1.60)			26.6900	1.5038	40.1353		(27)
NEW PROPOSED FullGlzDoor (Uw = 1.80)			14.7000	1.6791	24.6828		(27)
NEW PROPOSED Door			6.1600	1.8000	11.0880		(26a)
NEW PROPOSED Rooflight (Uw = 1.60)			11.5000	1.5038	17.2932		(27a)
Existing			132.8000	0.4900	65.0720		(28a)
NEW (Garage & front)			34.5000	0.1100	3.7950		(28a)
NEW PROPOSED			36.7000	0.2200	8.0740		(28a)
Existing	72.6000	15.1000	57.5000	0.4900	28.1750		(29a)
Garage conversion	25.0000	7.6600	17.3400	0.3000	5.2020		(29a)
NEW Front	21.5000	4.8600	16.6400	0.2800	4.6592		(29a)

FULL SAP CALCULATION PRINTOUT

Calculation Type: Existing Dwelling

CALCULATION OF HEAT DEMAND 09 Jan 2014

NEW PROPOSED	41.1000	19.9300	21.1700	0.2800	5.9276								(29a)
Existing	132.8000		132.8000	0.4900	65.0720								(30)
NEW (Garage & Front)	34.5000		34.5000	0.1600	5.5200								(30)
NEW PROPOSED	36.7000	11.5000	25.2000	0.1800	4.5360								(30)
Total net area of external elements Aum(A, m2)			568.2000										(31)
Fabric heat loss, W/K = Sum (A x U)						(26) ... (30) + (32) =	289.2322						(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K													250.0000 (35)
Thermal bridges (Default value 0.150 * total exposed area)													85.2300 (36)
Total fabric heat loss													(33) + (36) = 374.4622 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	110.9872	107.1761	107.1761	103.6220	103.6220	100.3247	100.3247	98.2693	98.2693	102.4944	102.4944	105.9629	(38)
Average = Sum(39)m / 12 =	485.4494	481.6383	481.6383	478.0842	478.0842	474.7870	474.7870	472.7315	472.7315	476.9566	476.9566	480.4251	(39)
												477.8558	(39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	2.3797	2.3610	2.3610	2.3435	2.3435	2.3274	2.3274	2.3173	2.3173	2.3380	2.3380	2.3550	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.0071 (42)
Average daily hot water use (litres/day)													111.1781 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	122.2959	117.8488	113.4017	108.9545	104.5074	100.0603	100.0603	104.5074	108.9545	113.4017	117.8488	122.2959	(44)
Energy content (annual)	181.3613	158.6198	163.6814	142.7014	136.9254	118.1562	109.4891	125.6403	127.1409	148.1704	161.7396	175.6387	(45)
Distribution loss (46)m = 0.15 x (45)m	27.2042	23.7930	24.5522	21.4052	20.5388	17.7234	16.4234	18.8460	19.0711	22.2256	24.2609	26.3458	(46)
Water storage loss:													
Store volume													200.0000 (47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0115 (51)
Volume factor from Table 2a													0.8434 (52)
Temperature factor from Table 2b													0.5400 (53)
Enter (49) or (54) in (55)													1.0519 (55)
Total storage loss	32.6083	29.4527	32.6083	31.5564	32.6083	31.5564	32.6083	32.6083	31.5564	32.6083	31.5564	32.6083	(56)
If cylinder contains dedicated solar storage	32.6083	29.4527	32.6083	31.5564	32.6083	31.5564	32.6083	32.6083	31.5564	32.6083	31.5564	32.6083	(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	237.2320	209.0836	219.5521	196.7698	192.7961	172.2246	165.3598	181.5110	181.2093	204.0411	215.8080	231.5095	(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	237.2320	209.0836	219.5521	196.7698	192.7961	172.2246	165.3598	181.5110	181.2093	204.0411	215.8080	231.5095	(64)
Total per year (kWh/year) = Sum(64)m =													2407.0971 (64)
RHI water heating demand													2407 (64)
Heat gains from water heating, kWh/month	104.9992	93.1122	99.1206	90.7030	90.2243	82.5417	81.1017	86.4720	85.5291	93.9632	97.0332	103.0965	(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	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.4265	92.7507	75.4299	57.1053	42.6869	36.0381	38.9404	50.6162	67.9370	86.2616	100.6800	107.3288	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	559.4495	565.2548	550.6256	519.4816	480.1680	443.2187	418.5343	412.7289	427.3582	458.5022	497.8158	534.7651	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	(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)	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	(71)
Water heating gains (Table 5)	141.1280	138.5598	133.2267	125.9763	121.2692	114.6412	109.0076	116.2258	118.7904	126.2947	134.7683	138.5705	(72)
Total internal gains	924.1963	915.7576	878.4745	821.7556	763.3164	713.0903	685.6747	698.7633	733.2779	790.2507	852.4564	899.8567	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
	m2	Table 6a	Specific data	Specific data	factor	W
		W/m2	or Table 6b	or Table 6c	Table 6d	
Northeast	6.6600	15.0428	0.6300	0.7000	0.7700	30.6179 (75)
Southeast	4.6200	46.3896	0.6300	0.7000	0.7700	65.4990 (77)
Southwest	14.8000	46.3896	0.6300	0.7000	0.7700	209.8235 (79)
Northwest	0.6100	15.0428	0.6300	0.7000	0.7700	2.8043 (81)
Northeast	14.7000	15.0428	0.6300	0.7000	0.7700	67.5801 (75)
Horizontal	11.5000	35.0000	0.6300	0.7000	1.0000	159.7523 (82)

FULL SAP CALCULATION PRINTOUT

Calculation Type: Existing Dwelling

CALCULATION OF HEAT DEMAND 09 Jan 2014

Solar gains	536.0771	874.3181	1374.1135	2019.8028	2377.0395	2644.1002	2435.4598	2107.3837	1656.5236	1036.0038	653.7093	442.6823 (83)
Total gains	1460.2733	1790.0757	2252.5880	2841.5584	3140.3558	3357.1905	3121.1345	2806.1470	2389.8015	1826.2546	1506.1658	1342.5391 (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	29.1826	29.4135	29.4135	29.6322	29.6322	29.8379	29.8379	29.9677	29.9677	29.7022	29.7022	29.4878	
alpha	2.9455	2.9609	2.9609	2.9755	2.9755	2.9892	2.9892	2.9978	2.9978	2.9801	2.9801	2.9659	
util living area	0.9941	0.9891	0.9733	0.9283	0.8388	0.6780	0.5459	0.5890	0.8350	0.9611	0.9892	0.9953 (86)	
MIT	19.1271	19.2845	19.6355	20.0848	20.4906	20.7608	20.8545	20.8425	20.6035	20.0947	19.5456	19.1113 (87)	
Th 2	19.0922	19.1035	19.1035	19.1141	19.1141	19.1240	19.1240	19.1302	19.1302	19.1175	19.1175	19.1072 (88)	
util rest of house	0.9917	0.9846	0.9616	0.8951	0.7566	0.5183	0.3156	0.3480	0.7160	0.9354	0.9838	0.9934 (89)	
MIT 2	17.4796	17.6442	17.9900	18.4280	18.7872	18.9855	19.0273	19.0318	18.9044	18.4538	17.9156	17.4751 (90)	
Living area fraction	fLA = Living area / (4) =												
MIT	18.1959	18.3574	18.7055	19.1484	19.5279	19.7574	19.8218	19.8191	19.6432	19.1673	18.6243	18.1865 (92)	
Temperature adjustment	-0.1500												
adjusted MIT	18.0459	18.2074	18.5555	18.9984	19.3779	19.6074	19.6718	19.6691	19.4932	19.0173	18.4743	18.0365 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9898	0.9817	0.9571	0.8925	0.7706	0.5653	0.3896	0.4261	0.7452	0.9335	0.9812	0.9918 (94)
Useful gains	1445.3076	1757.2414	2155.8629	2536.1812	2419.9761	1897.9229	1216.0309	1195.8273	1780.9079	1704.8322	1477.8109	1331.5647 (95)
Ext temp.	5.0000	5.4000	7.1000	9.4000	12.4000	15.1000	17.0000	17.0000	14.5000	11.3000	7.8000	5.0000 (96)
Heat loss rate W	6333.1423	6168.5553	5517.4006	4588.8351	3336.0056	2140.0459	1268.5219	1261.7647	2360.4419	3680.8008	5091.1922	6263.0775 (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	3636.5490	2964.4029	2500.9841	1477.9108	681.5260	0.0000	0.0000	0.0000	0.0000	1470.1206	2601.6345	3669.0455 (98)
Space heating												19002.1735 (98)
RHI space heating demand												19002 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: Existing Dwelling

CALCULATION OF ENERGY RATINGS 09 Jan 2014

SAP 2012 WORKSHEET FOR Existing dwelling (SAP) (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	204.0000 (1b)	2.4000 (2b)	489.6000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	204.0000		489.6000 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 489.6000 (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				4 * 10 =	40.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.0817 (8)
Number of storeys in the dwelling (ns)					1 (9)
Additional infiltration					[(9) - 1] x 0.1 = 0.0000 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction					0.3500 (11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0					0.0000 (12)
If no draught lobby, enter 0.05, else enter 0					0.0500 (13)
Percentage of windows and doors draught stripped					100.0000 (14)
Window infiltration					0.25 - [0.2 * (14) / 100] = 0.0500 (15)
Pressure test					No
Measured/design AP50					15.0000
Infiltration rate					0.5317 (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) = 0.5317 (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 infiltr rate	0.6779	0.6646	0.6513	0.5849	0.5716	0.5051	0.5051	0.4918	0.5317	0.5716	0.5982	0.6247 (22b)
Effective ac	0.7298	0.7209	0.7121	0.6710	0.6634	0.6276	0.6276	0.6209	0.6414	0.6634	0.6789	0.6952 (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
NEW PROPOSED Window (Uw = 1.60)			26.6900	1.5038	40.1353		(27)
NEW PROPOSED FullGlxDoor (Uw = 1.80)			14.7000	1.6791	24.6828		(27)
NEW PROPOSED Door			6.1600	1.8000	11.0880		(26a)
NEW PROPOSED Rooflight (Uw = 1.60)			11.5000	1.5038	17.2932		(27a)
Existing			132.8000	0.4900	65.0720		(28a)
NEW (Garage & front)			34.5000	0.1100	3.7950		(28a)
NEW PROPOSED			36.7000	0.2200	8.0740		(28a)
Existing	72.6000	15.1000	57.5000	0.4900	28.1750		(29a)
Garage conversion	25.0000	7.6600	17.3400	0.3000	5.2020		(29a)
NEW Front	21.5000	4.8600	16.6400	0.2800	4.6592		(29a)
NEW PROPOSED	41.1000	19.9300	21.1700	0.2800	5.9276		(29a)
Existing	132.8000		132.8000	0.4900	65.0720		(30)
NEW (Garage & Front)	34.5000		34.5000	0.1600	5.5200		(30)
NEW PROPOSED	36.7000	11.5000	25.2000	0.1800	4.5360		(30)
Total net area of external elements Aum(A, m ²)			568.2000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	289.2322	(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		250.0000 (35)
Thermal bridges (Default value 0.150 * total exposed area)		85.2300 (36)
Total fabric heat loss	(33) + (36) =	374.4622 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	117.9100	116.4683	115.0552	108.4180	107.1761	101.3953	101.3953	100.3247	103.6220	107.1761	109.6883	112.3147 (38)
Heat transfer coeff	492.3722	490.9305	489.5174	482.8802	481.6383	475.8575	475.8575	474.7870	478.0842	481.6383	484.1505	486.7769 (39)
Average = Sum(39)m / 12 =	482.8742 (39)											
HLP	2.4136	2.4065	2.3996	2.3671	2.3610	2.3326	2.3326	2.3274	2.3435	2.3610	2.3733	2.3862 (40)
HLP (average)	2.3670 (40)											
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

FULL SAP CALCULATION PRINTOUT

Calculation Type: Existing Dwelling

CALCULATION OF ENERGY RATINGS 09 Jan 2014

4. Water heating energy requirements (kWh/year)

Assumed occupancy												3.0071 (42)	
Average daily hot water use (litres/day)												111.1781 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	122.2959	117.8488	113.4017	108.9545	104.5074	100.0603	100.0603	104.5074	108.9545	113.4017	117.8488	122.2959	(44)
Energy content (annual)	181.3613	158.6198	163.6814	142.7014	136.9254	118.1562	109.4891	125.6403	127.1409	148.1704	161.7396	175.6387	(45)
Distribution loss (46)m = 0.15 x (45)m	27.2042	23.7930	24.5522	21.4052	20.5388	17.7234	16.4234	18.8460	19.0711	22.2256	24.2609	26.3458	(46)
Water storage loss:												200.0000 (47)	
Store volume												0.0115 (51)	
b) If manufacturer declared loss factor is not known :												0.8434 (52)	
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.5400 (53)	
Volume factor from Table 2a												1.0519 (55)	
Temperature factor from Table 2b													
Enter (49) or (54) in (55)													
Total storage loss	32.6083	29.4527	32.6083	31.5564	32.6083	31.5564	32.6083	32.6083	31.5564	32.6083	31.5564	32.6083	(56)
If cylinder contains dedicated solar storage	32.6083	29.4527	32.6083	31.5564	32.6083	31.5564	32.6083	32.6083	31.5564	32.6083	31.5564	32.6083	(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	237.2320	209.0836	219.5521	196.7698	192.7961	172.2246	165.3598	181.5110	181.2093	204.0411	215.8080	231.5095	(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	237.2320	209.0836	219.5521	196.7698	192.7961	172.2246	165.3598	181.5110	181.2093	204.0411	215.8080	231.5095	(64)
Total per year (kWh/year) = Sum(64)m =												2407.0971 (64)	
Heat gains from water heating, kWh/month	104.9992	93.1122	99.1206	90.7030	90.2243	82.5417	81.1017	86.4720	85.5291	93.9632	97.0332	103.0965	(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	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.4265	92.7507	75.4299	57.1053	42.6869	36.0381	38.9404	50.6162	67.9370	86.2616	100.6800	107.3288	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	559.4495	565.2548	550.6256	519.4816	480.1680	443.2187	418.5343	412.7289	427.3582	458.5022	497.8158	534.7651	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	(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)	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	(71)
Water heating gains (Table 5)	141.1280	138.5598	133.2267	125.9763	121.2692	114.6412	109.0076	116.2258	118.7904	126.2947	134.7683	138.5705	(72)
Total internal gains	924.1963	915.7576	878.4745	821.7556	763.3164	713.0903	685.6747	698.7633	733.2779	790.2507	852.4564	899.8567	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W							
Northeast	6.6600	11.2829	0.6300	0.7000	0.7700	22.9651 (75)							
Southeast	4.6200	36.7938	0.6300	0.7000	0.7700	51.9504 (77)							
Southwest	14.8000	36.7938	0.6300	0.7000	0.7700	166.4212 (79)							
Northwest	0.6100	11.2829	0.6300	0.7000	0.7700	2.1034 (81)							
Northeast	14.7000	11.2829	0.6300	0.7000	0.7700	50.6887 (75)							
Horizontal	11.5000	26.0000	0.6300	0.7000	1.0000	118.6731 (82)							
Solar gains	412.8019	772.6485	1224.9501	1771.5338	2196.0104	2267.9618	2150.3968	1823.8012	1414.5176	900.8025	507.5046	344.5991	(83)
Total gains	1336.9982	1688.4061	2103.4246	2593.2894	2959.3267	2981.0521	2836.0715	2522.5645	2147.7955	1691.0533	1359.9610	1244.4558	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, T _{hl} (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	28.7723	28.8568	28.9401	29.3379	29.4135	29.7708	29.7708	29.8379	29.6322	29.4135	29.2609	29.1030	
alpha	2.9182	2.9238	2.9293	2.9559	2.9609	2.9847	2.9847	2.9892	2.9755	2.9609	2.9507	2.9402	
util living area	0.9958	0.9914	0.9799	0.9475	0.8767	0.7570	0.6269	0.6931	0.8811	0.9730	0.9929	0.9967	(86)
MIT	18.9736	19.1575	19.4915	19.9521	20.3760	20.6858	20.8202	20.7861	20.5107	19.9577	19.3899	18.9534	(87)
Th 2	19.0719	19.0761	19.0802	19.0999	19.1035	19.1208	19.1208	19.1240	19.1141	19.1035	19.0961	19.0883	(88)
util rest of house	0.9942	0.9879	0.9713	0.9228	0.8124	0.6173	0.4036	0.4763	0.7880	0.9559	0.9894	0.9953	(89)
MIT 2	17.3113	17.4974	17.8310	18.2932	18.6841	18.9424	19.0151	19.0079	18.8238	18.3114	17.7449	17.3035	(90)
Living area fraction												0.4348 (91)	
MIT	18.0341	18.2192	18.5530	19.0145	19.4197	19.7004	19.7999	19.7811	19.5573	19.0272	18.4602	18.0209	(92)
Temperature adjustment												-0.1500	
adjusted MIT	17.8841	18.0692	18.4030	18.8645	19.2697	19.5504	19.6499	19.6311	19.4073	18.8772	18.3102	17.8709	(93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: Existing Dwelling

CALCULATION OF ENERGY RATINGS 09 Jan 2014

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9927	0.9853	0.9671	0.9188	0.8195	0.6553	0.4754	0.5457	0.8070	0.9530	0.9873	0.9941	(94)
Useful gains	1327.2322	1663.6657	2034.2087	2382.6690	2425.0625	1953.6048	1348.2535	1376.4633	1733.3193	1611.5377	1342.7220	1237.1316	(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	6688.4422	6465.1637	5826.7204	4811.6583	3645.8773	2355.6843	1451.3404	1534.0660	2537.3383	3986.6162	5427.4083	6654.6556	(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	3988.7402	3226.6066	2821.6287	1748.8723	908.2862	0.0000	0.0000	0.0000	0.0000	1767.0584	2940.9741	4030.6378	(98)
Space heating												21432.8045	(98)
Space heating per m2												(98) / (4) =	105.0628 (99)

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 %)													92.9000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													23070.8336 (211)
Space heating requirement	3988.7402	3226.6066	2821.6287	1748.8723	908.2862	0.0000	0.0000	0.0000	0.0000	1767.0584	2940.9741	4030.6378	(98)
Space heating efficiency (main heating system 1)	92.9000	92.9000	92.9000	92.9000	92.9000	0.0000	0.0000	0.0000	0.0000	92.9000	92.9000	92.9000	(210)
Space heating fuel (main heating system)	4293.5847	3473.2041	3037.2752	1882.5321	977.7032	0.0000	0.0000	0.0000	0.0000	1902.1081	3165.7418	4338.6844	(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	237.2320	209.0836	219.5521	196.7698	192.7961	172.2246	165.3598	181.5110	181.2093	204.0411	215.8080	231.5095	(64)
Efficiency of water heater (217)m	89.8239	89.7675	89.6324	89.2892	88.4240	79.8000	79.8000	79.8000	79.8000	89.2611	89.6780	89.8456	(217)
Fuel for water heating, kWh/month	264.1079	232.9168	244.9474	220.3736	218.0360	215.8203	207.2178	227.4574	227.0793	228.5892	240.6478	257.6747	(219)
Water heating fuel used												2784.8683	(219)
Annual totals kWh/year													
Space heating fuel - main system													23070.8336 (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)													737.6816 (232)
Total delivered energy for all uses													26668.3836 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	23070.8336	3.4800	802.8650 (240)	
Space heating - secondary	0.0000	0.0000	0.0000 (242)	
Water heating (other fuel)	2784.8683	3.4800	96.9134 (247)	
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)	
Energy for lighting	737.6816	13.1900	97.3002 (250)	
Additional standing charges			120.0000 (251)	
Total energy cost			1126.9711 (255)	

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)		1.9009 (257)
SAP value	$[(255) \times (256)] / [(4) + 45.0] =$	73.4822
SAP rating (Section 12)		73 (258)
SAP band		C

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	23070.8336	0.2160	4983.3001 (261)	
Space heating - secondary	0.0000	0.0000	0.0000 (263)	
Water heating (other fuel)	2784.8683	0.2160	601.5315 (264)	
Space and water heating			5584.8316 (265)	
Pumps and fans	75.0000	0.5190	38.9250 (267)	
Energy for lighting	737.6816	0.5190	382.8568 (268)	

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Calculation Type: Existing Dwelling

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Total kg/year	6006.6134 (272)
CO2 emissions per m2	29.4400 (273)
EI value	67.6753
EI rating	68 (274)
EI band	D

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.25) / 0.9050 = 4.124$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.25) / 0.9050 = 0.2560$, stars = 4
Water heating energy efficiency	$3.48 / 0.8624 = 4.035$, stars = 4
Water heating environmental impact	$0.216 / 0.8624 = 0.2505$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: Existing Dwelling

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

SAP 2012 WORKSHEET FOR Existing dwelling (SAP) (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	204.0000 (1b)	x 2.4000 (2b)	= 489.6000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	204.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 489.6000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour	
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)	
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)	
Number of intermittent fans				4 * 10 =	40.0000 (7a)	
Number of passive vents				0 * 10 =	0.0000 (7b)	
Number of flueless gas fires				0 * 40 =	0.0000 (7c)	
Air changes per hour						
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) =	0.0817 (8)
Number of storeys in the dwelling (ns)						1 (9)
Additional infiltration					[(9) - 1] x 0.1 =	0.0000 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction						0.3500 (11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0						0.0000 (12)
If no draught lobby, enter 0.05, else enter 0						0.0500 (13)
Percentage of windows and doors draught stripped						100.0000 (14)
Window infiltration					0.25 - [0.2 * (14) / 100] =	0.0500 (15)
Pressure test						No
Measured/design AP50						15.0000
Infiltration rate						0.5317 (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) =	0.5317 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.6000	4.3000	4.3000	4.0000	4.0000	3.7000	3.7000	3.5000	3.5000	3.9000	3.9000	4.2000 (22)
Wind factor	1.1500	1.0750	1.0750	1.0000	1.0000	0.9250	0.9250	0.8750	0.8750	0.9750	0.9750	1.0500 (22a)
Adj infiltr rate	0.6115	0.5716	0.5716	0.5317	0.5317	0.4918	0.4918	0.4652	0.4652	0.5184	0.5184	0.5583 (22b)
Effective ac	0.6869	0.6634	0.6634	0.6414	0.6414	0.6209	0.6209	0.6082	0.6082	0.6344	0.6344	0.6558 (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
NEW PROPOSED Window (Uw = 1.60)			26.6900	1.5038	40.1353		(27)
NEW PROPOSED FullGlzDoor (Uw = 1.80)			14.7000	1.6791	24.6828		(27)
NEW PROPOSED Door			6.1600	1.8000	11.0880		(26a)
NEW PROPOSED Rooflight (Uw = 1.60)			11.5000	1.5038	17.2932		(27a)
Existing			132.8000	0.4900	65.0720		(28a)
NEW (Garage & front)			34.5000	0.1100	3.7950		(28a)
NEW PROPOSED			36.7000	0.2200	8.0740		(28a)
Existing	72.6000	15.1000	57.5000	0.4900	28.1750		(29a)
Garage conversion	25.0000	7.6600	17.3400	0.3000	5.2020		(29a)
NEW Front	21.5000	4.8600	16.6400	0.2800	4.6592		(29a)
NEW PROPOSED	41.1000	19.9300	21.1700	0.2800	5.9276		(29a)
Existing	132.8000		132.8000	0.4900	65.0720		(30)
NEW (Garage & Front)	34.5000		34.5000	0.1600	5.5200		(30)
NEW PROPOSED	36.7000	11.5000	25.2000	0.1800	4.5360		(30)
Total net area of external elements Aum(A, m ²)			568.2000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	289.2322	(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		250.0000 (35)
Thermal bridges (Default value 0.150 * total exposed area)		85.2300 (36)
Total fabric heat loss	(33) + (36) =	374.4622 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	110.9872	107.1761	107.1761	103.6220	103.6220	100.3247	100.3247	98.2693	98.2693	102.4944	102.4944	105.9629 (38)
Heat transfer coeff	485.4494	481.6383	481.6383	478.0842	478.0842	474.7870	474.7870	472.7315	472.7315	476.9566	476.9566	480.4251 (39)
Average = Sum(39)m / 12 =	477.8558 (39)											

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	2.3797	2.3610	2.3610	2.3435	2.3435	2.3274	2.3274	2.3173	2.3173	2.3380	2.3380	2.3550 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

FULL SAP CALCULATION PRINTOUT

Calculation Type: Existing Dwelling

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

4. Water heating energy requirements (kWh/year)

Assumed occupancy												3.0071 (42)	
Average daily hot water use (litres/day)												111.1781 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	122.2959	117.8488	113.4017	108.9545	104.5074	100.0603	100.0603	104.5074	108.9545	113.4017	117.8488	122.2959	(44)
Energy content	181.3613	158.6198	163.6814	142.7014	136.9254	118.1562	109.4891	125.6403	127.1409	148.1704	161.7396	175.6387	(45)
Energy content (annual)	Total = Sum(45)m =											1749.2645 (45)	
Distribution loss (46)m = 0.15 x (45)m	27.2042	23.7930	24.5522	21.4052	20.5388	17.7234	16.4234	18.8460	19.0711	22.2256	24.2609	26.3458	(46)
Water storage loss:													
Store volume													200.0000 (47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0115 (51)
Volume factor from Table 2a													0.8434 (52)
Temperature factor from Table 2b													0.5400 (53)
Enter (49) or (54) in (55)													1.0519 (55)
Total storage loss	32.6083	29.4527	32.6083	31.5564	32.6083	31.5564	32.6083	32.6083	31.5564	32.6083	31.5564	32.6083	(56)
If cylinder contains dedicated solar storage	32.6083	29.4527	32.6083	31.5564	32.6083	31.5564	32.6083	32.6083	31.5564	32.6083	31.5564	32.6083	(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	237.2320	209.0836	219.5521	196.7698	192.7961	172.2246	165.3598	181.5110	181.2093	204.0411	215.8080	231.5095	(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	237.2320	209.0836	219.5521	196.7698	192.7961	172.2246	165.3598	181.5110	181.2093	204.0411	215.8080	231.5095	(64)
Total per year (kWh/year) = Sum(64)m =													2407.0971 (64)
Heat gains from water heating, kWh/month	104.9992	93.1122	99.1206	90.7030	90.2243	82.5417	81.1017	86.4720	85.5291	93.9632	97.0332	103.0965	(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	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.4265	92.7507	75.4299	57.1053	42.6869	36.0381	38.9404	50.6162	67.9370	86.2616	100.6800	107.3288	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	559.4495	565.2548	550.6256	519.4816	480.1680	443.2187	418.5343	412.7289	427.3582	458.5022	497.8158	534.7651	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	(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)	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	(71)
Water heating gains (Table 5)	141.1280	138.5598	133.2267	125.9763	121.2692	114.6412	109.0076	116.2258	118.7904	126.2947	134.7683	138.5705	(72)
Total internal gains	924.1963	915.7576	878.4745	821.7556	763.3164	713.0903	685.6747	698.7633	733.2779	790.2507	852.4564	899.8567	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains							
	m2	Table 6a	Specific data	Specific data	factor	W							
		W/m2	or Table 6b	or Table 6c	Table 6d								
Northeast	6.6600	15.0428	0.6300	0.7000	0.7700	30.6179 (75)							
Southeast	4.6200	46.3896	0.6300	0.7000	0.7700	65.4990 (77)							
Southwest	14.8000	46.3896	0.6300	0.7000	0.7700	209.8235 (79)							
Northwest	0.6100	15.0428	0.6300	0.7000	0.7700	2.8043 (81)							
Northeast	14.7000	15.0428	0.6300	0.7000	0.7700	67.5801 (75)							
Horizontal	11.5000	35.0000	0.6300	0.7000	1.0000	159.7523 (82)							
Solar gains	536.0771	874.3181	1374.1135	2019.8028	2377.0395	2644.1002	2435.4598	2107.3837	1656.5236	1036.0038	653.7093	442.6823	(83)
Total gains	1460.2733	1790.0757	2252.5880	2841.5584	3140.3558	3357.1905	3121.1345	2806.1470	2389.8015	1826.2546	1506.1658	1342.5391	(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	29.1826	29.4135	29.4135	29.6322	29.6322	29.8379	29.8379	29.9677	29.9677	29.7022	29.7022	29.4878	
alpha	2.9455	2.9609	2.9609	2.9755	2.9755	2.9892	2.9892	2.9978	2.9978	2.9801	2.9801	2.9659	
util living area	0.9941	0.9891	0.9733	0.9283	0.8388	0.6780	0.5459	0.5890	0.8350	0.9611	0.9892	0.9953	(86)
MIT	19.1271	19.2845	19.6355	20.0848	20.4906	20.7608	20.8545	20.8425	20.6035	20.0947	19.5456	19.1113	(87)
Th 2	19.0922	19.1035	19.1035	19.1141	19.1141	19.1240	19.1240	19.1302	19.1302	19.1175	19.1175	19.1072	(88)
util rest of house	0.9917	0.9846	0.9616	0.8951	0.7566	0.5183	0.3156	0.3480	0.7160	0.9354	0.9838	0.9934	(89)
MIT 2	17.4796	17.6442	17.9900	18.4280	18.7872	18.9855	19.0273	19.0318	18.9044	18.4538	17.9156	17.4751	(90)
Living area fraction	fLA = Living area / (4) =												0.4348 (91)
MIT	18.1959	18.3574	18.7055	19.1484	19.5279	19.7574	19.8218	19.8191	19.6432	19.1673	18.6243	18.1865	(92)
Temperature adjustment													-0.1500
adjusted MIT	18.0459	18.2074	18.5555	18.9984	19.3779	19.6074	19.6718	19.6691	19.4932	19.0173	18.4743	18.0365	(93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: Existing Dwelling

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

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9898	0.9817	0.9571	0.8925	0.7706	0.5653	0.3896	0.4261	0.7452	0.9335	0.9812	0.9918	(94)
Useful gains	1445.3076	1757.2414	2155.8629	2536.1812	2419.9761	1897.9229	1216.0309	1195.8273	1780.9079	1704.8322	1477.8109	1331.5647	(95)
Ext temp.	5.0000	5.4000	7.1000	9.4000	12.4000	15.1000	17.0000	17.0000	14.5000	11.3000	7.8000	5.0000	(96)
Heat loss rate W	6333.1423	6168.5553	5517.4006	4588.8351	3336.0056	2140.0459	1268.5219	1261.7647	2360.4419	3680.8008	5091.1922	6263.0775	(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	3636.5490	2964.4029	2500.9841	1477.9108	681.5260	0.0000	0.0000	0.0000	0.0000	1470.1206	2601.6345	3669.0455	(98)
Space heating												19002.1735	(98)
Space heating per m2												(98) / (4) =	93.1479 (99)

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 %)													92.9000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													20454.4386 (211)
Space heating requirement	3636.5490	2964.4029	2500.9841	1477.9108	681.5260	0.0000	0.0000	0.0000	0.0000	1470.1206	2601.6345	3669.0455	(98)
Space heating efficiency (main heating system 1)	92.9000	92.9000	92.9000	92.9000	92.9000	0.0000	0.0000	0.0000	0.0000	92.9000	92.9000	92.9000	(210)
Space heating fuel (main heating system)	3914.4769	3190.9612	2692.1250	1590.8620	733.6125	0.0000	0.0000	0.0000	0.0000	1582.4765	2800.4677	3949.4569	(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	237.2320	209.0836	219.5521	196.7698	192.7961	172.2246	165.3598	181.5110	181.2093	204.0411	215.8080	231.5095	(64)
Efficiency of water heater (217)m	89.7629	89.7075	89.5312	89.0963	87.9010	79.8000	79.8000	79.8000	79.8000	89.0448	89.5800	89.7855	(216)
Fuel for water heating, kWh/month	264.2873	233.0726	245.2241	220.8507	219.3332	215.8203	207.2178	227.4574	227.0793	229.1443	240.9111	257.8474	(219)
Water heating fuel used												2788.2455	(219)
Annual totals kWh/year													
Space heating fuel - main system													20454.4386 (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)													737.6816 (232)
Total delivered energy for all uses													24055.3657 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	20454.4386	3.6300	742.4961 (240)	
Space heating - secondary	0.0000	0.0000	0.0000 (242)	
Water heating (other fuel)	2788.2455	3.6300	101.2133 (247)	
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)	
Energy for lighting	737.6816	19.4400	143.4053 (250)	
Additional standing charges			95.0000 (251)	
Total energy cost			1096.6947 (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	20454.4386	0.2160	4418.1587 (261)	
Space heating - secondary	0.0000	0.0000	0.0000 (263)	
Water heating (other fuel)	2788.2455	0.2160	602.2610 (264)	
Space and water heating			5020.4198 (265)	
Pumps and fans	75.0000	0.5190	38.9250 (267)	
Energy for lighting	737.6816	0.5190	382.8568 (268)	
Total kg/year			5442.2015 (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	20454.4386	1.2200	24954.4151 (261)	
Space heating - secondary	0.0000	0.0000	0.0000 (263)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: Existing Dwelling

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

Water heating (other fuel)	2788.2455	1.2200	3401.6595 (264)
Space and water heating			28356.0746 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	737.6816	3.0700	2264.6826 (268)
Primary energy kWh/year			30851.0072 (272)
Primary energy kWh/m ² /year			151.2304 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: C 73
Current environmental impact rating: D 68

(For testing purposes):

A Loft insulation	Not considered
B Cavity wall insulation	Not considered
C Hot water cylinder insulation	Not considered
D Draughtproofing	Not considered
E Low energy lighting	SAP increase too small
F Cylinder thermostat	Not considered
G Heating controls	Not considered
H Heating controls	Not considered
I Condensing boiler	Not considered
J Biomass boiler	Not considered
K Biomass stove with boiler	Not considered
M Replacement warm air unit	Not considered
N Solar water heating	SAP increase too small
O Double glazing	Not considered
P Secondary glazing	Not considered
R Condensing oil boiler	Not considered
S Condensing boiler	Not considered
T Gas condensing boiler	Not considered
U Solar photovoltaic panels	Recommended
A2 Flat roof insulation	Not considered
A3 Room-in-roof insulation	Not considered
T2 Flue gas heat recovery	Not considered
W Floor insulation	Not considered
X High performance external doors	Not considered
Y Heat recovery system for mixer showers	Not considered
J2 Biomass boiler	Not considered
Q2 External and cavity wall insulation	Not considered
Z1 Air or ground source heat pump	Not considered
Z2 Air or ground source heat pump with underfloor heating	Not considered
Z3 Micro CHP	Not considered
Z4	Not considered
Z5	Not considered
V2 Wind turbine	Not applicable
L2 High heat retention storage heaters	Not considered
Q3 System built wall insulation	Not considered
O3	Not considered

Recommended measures:	SAP change	Cost change	CO2 change
U Solar photovoltaic panels	+ 5.4	-£ 383	-1023 kg (18.8%)
Measures omitted - SAP change or cost saving too small:			
E Low energy lighting	+ 0.4	-£ 26	-60 kg (1.1%)
N Solar water heating	+ 0.9	-£ 42	-279 kg (5.1%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar photovoltaic panels	£383	5.01 kg/m ²	C 79 C 72
Total Savings	£383	5.01 kg/m ²	

Potential energy efficiency rating: C 79
Potential environmental impact rating: C 72

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

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

	Current	Potential	Saving
Electricity	£158	£158	£0
Mains gas	£939	£939	£0
Space heating	£852	£852	£0
Water heating	£101	£101	£0
Lighting	£143	£143	£0
Generated (PV)	-£0	-£383	£383
Total cost of fuels	£1097	£714	£383
Total cost of uses	£1096	£713	£383
Delivered energy	118 kWh/m ²	108 kWh/m ²	10 kWh/m ²
Carbon dioxide emissions	5.4 tonnes	4.4 tonnes	1.0 tonnes
CO2 emissions per m ²	27 kg/m ²	22 kg/m ²	5 kg/m ²
Primary energy	151 kWh/m ²	122 kWh/m ²	30 kWh/m ²

FULL SAP CALCULATION PRINTOUT

Calculation Type: Existing Dwelling

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR Existing dwelling (SAP) (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	204.0000 (1b)	x 2.4000 (2b)	= 489.6000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	204.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 489.6000 (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				4 * 10 =	40.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.0817 (8)
Number of storeys in the dwelling (ns)					1 (9)
Additional infiltration					[(9) - 1] x 0.1 = 0.0000 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction					0.3500 (11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0					0.0000 (12)
If no draught lobby, enter 0.05, else enter 0					0.0500 (13)
Percentage of windows and doors draught stripped					100.0000 (14)
Window infiltration					0.25 - [0.2 * (14) / 100] = 0.0500 (15)
Pressure test					No
Measured/design AP50					15.0000
Infiltration rate					0.5317 (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) = 0.5317 (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 infiltr rate	0.6779	0.6646	0.6513	0.5849	0.5716	0.5051	0.5051	0.4918	0.5317	0.5716	0.5982	0.6247 (22b)
Effective ac	0.7298	0.7209	0.7121	0.6710	0.6634	0.6276	0.6276	0.6209	0.6414	0.6634	0.6789	0.6952 (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
NEW PROPOSED Window (Uw = 1.60)			26.6900	1.5038	40.1353		(27)
NEW PROPOSED FullGlxDoor (Uw = 1.80)			14.7000	1.6791	24.6828		(27)
NEW PROPOSED Door			6.1600	1.8000	11.0880		(26a)
NEW PROPOSED Rooflight (Uw = 1.60)			11.5000	1.5038	17.2932		(27a)
Existing			132.8000	0.4900	65.0720		(28a)
NEW (Garage & front)			34.5000	0.1100	3.7950		(28a)
NEW PROPOSED			36.7000	0.2200	8.0740		(28a)
Existing	72.6000	15.1000	57.5000	0.4900	28.1750		(29a)
Garage conversion	25.0000	7.6600	17.3400	0.3000	5.2020		(29a)
NEW Front	21.5000	4.8600	16.6400	0.2800	4.6592		(29a)
NEW PROPOSED	41.1000	19.9300	21.1700	0.2800	5.9276		(29a)
Existing	132.8000		132.8000	0.4900	65.0720		(30)
NEW (Garage & Front)	34.5000		34.5000	0.1600	5.5200		(30)
NEW PROPOSED	36.7000	11.5000	25.2000	0.1800	4.5360		(30)
Total net area of external elements Aum(A, m ²)					568.2000		(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 289.2322		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		250.0000 (35)
Thermal bridges (Default value 0.150 * total exposed area)		85.2300 (36)
Total fabric heat loss	(33) + (36) =	374.4622 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	117.9100	116.4683	115.0552	108.4180	107.1761	101.3953	101.3953	100.3247	103.6220	107.1761	109.6883	112.3147 (38)
Heat transfer coeff	492.3722	490.9305	489.5174	482.8802	481.6383	475.8575	475.8575	474.7870	478.0842	481.6383	484.1505	486.7769 (39)
Average = Sum(39)m / 12 =	482.8742 (39)											
HLP	2.4136	2.4065	2.3996	2.3671	2.3610	2.3326	2.3326	2.3274	2.3435	2.3610	2.3733	2.3862 (40)
HLP (average)	2.3670 (40)											
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

FULL SAP CALCULATION PRINTOUT

Calculation Type: Existing Dwelling

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

4. Water heating energy requirements (kWh/year)

Assumed occupancy												3.0071 (42)	
Average daily hot water use (litres/day)												111.1781 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	122.2959	117.8488	113.4017	108.9545	104.5074	100.0603	100.0603	104.5074	108.9545	113.4017	117.8488	122.2959	(44)
Energy content	181.3613	158.6198	163.6814	142.7014	136.9254	118.1562	109.4891	125.6403	127.1409	148.1704	161.7396	175.6387	(45)
Energy content (annual)	Total = Sum(45)m =											1749.2645 (45)	
Distribution loss (46)m = 0.15 x (45)m	27.2042	23.7930	24.5522	21.4052	20.5388	17.7234	16.4234	18.8460	19.0711	22.2256	24.2609	26.3458	(46)
Water storage loss:													
Store volume													200.0000 (47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0115 (51)
Volume factor from Table 2a													0.8434 (52)
Temperature factor from Table 2b													0.5400 (53)
Enter (49) or (54) in (55)													1.0519 (55)
Total storage loss	32.6083	29.4527	32.6083	31.5564	32.6083	31.5564	32.6083	32.6083	31.5564	32.6083	31.5564	32.6083	(56)
If cylinder contains dedicated solar storage	32.6083	29.4527	32.6083	31.5564	32.6083	31.5564	32.6083	32.6083	31.5564	32.6083	31.5564	32.6083	(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	237.2320	209.0836	219.5521	196.7698	192.7961	172.2246	165.3598	181.5110	181.2093	204.0411	215.8080	231.5095	(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	237.2320	209.0836	219.5521	196.7698	192.7961	172.2246	165.3598	181.5110	181.2093	204.0411	215.8080	231.5095	(64)
Total per year (kWh/year) = Sum(64)m =													2407.0971 (64)
Heat gains from water heating, kWh/month	104.9992	93.1122	99.1206	90.7030	90.2243	82.5417	81.1017	86.4720	85.5291	93.9632	97.0332	103.0965	(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	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.4265	92.7507	75.4299	57.1053	42.6869	36.0381	38.9404	50.6162	67.9370	86.2616	100.6800	107.3288	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	559.4495	565.2548	550.6256	519.4816	480.1680	443.2187	418.5343	412.7289	427.3582	458.5022	497.8158	534.7651	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	(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)	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	(71)
Water heating gains (Table 5)	141.1280	138.5598	133.2267	125.9763	121.2692	114.6412	109.0076	116.2258	118.7904	126.2947	134.7683	138.5705	(72)
Total internal gains	924.1963	915.7576	878.4745	821.7556	763.3164	713.0903	685.6747	698.7633	733.2779	790.2507	852.4564	899.8567	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W							
Northeast	6.6600	11.2829	0.6300	0.7000	0.7700	22.9651 (75)							
Southeast	4.6200	36.7938	0.6300	0.7000	0.7700	51.9504 (77)							
Southwest	14.8000	36.7938	0.6300	0.7000	0.7700	166.4212 (79)							
Northwest	0.6100	11.2829	0.6300	0.7000	0.7700	2.1034 (81)							
Northeast	14.7000	11.2829	0.6300	0.7000	0.7700	50.6887 (75)							
Horizontal	11.5000	26.0000	0.6300	0.7000	1.0000	118.6731 (82)							
Solar gains	412.8019	772.6485	1224.9501	1771.5338	2196.0104	2267.9618	2150.3968	1823.8012	1414.5176	900.8025	507.5046	344.5991	(83)
Total gains	1336.9982	1688.4061	2103.4246	2593.2894	2959.3267	2981.0521	2836.0715	2522.5645	2147.7955	1691.0533	1359.9610	1244.4558	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, T _{hl} (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	28.7723	28.8568	28.9401	29.3379	29.4135	29.7708	29.7708	29.8379	29.6322	29.4135	29.2609	29.1030	
alpha	2.9182	2.9238	2.9293	2.9559	2.9609	2.9847	2.9847	2.9892	2.9755	2.9609	2.9507	2.9402	
util living area	0.9958	0.9914	0.9799	0.9475	0.8767	0.7570	0.6269	0.6931	0.8811	0.9730	0.9929	0.9967	(86)
MIT	18.9736	19.1575	19.4915	19.9521	20.3760	20.6858	20.8202	20.7861	20.5107	19.9577	19.3899	18.9534	(87)
Th 2	19.0719	19.0761	19.0802	19.0999	19.1035	19.1208	19.1208	19.1240	19.1141	19.1035	19.0961	19.0883	(88)
util rest of house	0.9942	0.9879	0.9713	0.9228	0.8124	0.6173	0.4036	0.4763	0.7880	0.9559	0.9894	0.9953	(89)
MIT 2	17.3113	17.4974	17.8310	18.2932	18.6841	18.9424	19.0151	19.0079	18.8238	18.3114	17.7449	17.3035	(90)
Living area fraction	fLA = Living area / (4) =												0.4348 (91)
MIT	18.0341	18.2192	18.5530	19.0145	19.4197	19.7004	19.7999	19.7811	19.5573	19.0272	18.4602	18.0209	(92)
Temperature adjustment													-0.1500
adjusted MIT	17.8841	18.0692	18.4030	18.8645	19.2697	19.5504	19.6499	19.6311	19.4073	18.8772	18.3102	17.8709	(93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: Existing Dwelling

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	0.9927	0.9853	0.9671	0.9188	0.8195	0.6553	0.4754	0.5457	0.8070	0.9530	0.9873	0.9941	(94)
Useful gains	1327.2322	1663.6657	2034.2087	2382.6690	2425.0625	1953.6048	1348.2535	1376.4633	1733.3193	1611.5377	1342.7220	1237.1316	(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	6688.4422	6465.1637	5826.7204	4811.6583	3645.8773	2355.6843	1451.3404	1534.0660	2537.3383	3986.6162	5427.4083	6654.6556	(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	3988.7402	3226.6066	2821.6287	1748.8723	908.2862	0.0000	0.0000	0.0000	0.0000	1767.0584	2940.9741	4030.6378	(98)
Space heating per m2													(98) / (4) = 105.0628 (99)

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 %)													92.9000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													23070.8336 (211)
Space heating requirement	3988.7402	3226.6066	2821.6287	1748.8723	908.2862	0.0000	0.0000	0.0000	0.0000	1767.0584	2940.9741	4030.6378	(98)
Space heating efficiency (main heating system 1)	92.9000	92.9000	92.9000	92.9000	92.9000	0.0000	0.0000	0.0000	0.0000	92.9000	92.9000	92.9000	(210)
Space heating fuel (main heating system)	4293.5847	3473.2041	3037.2752	1882.5321	977.7032	0.0000	0.0000	0.0000	0.0000	1902.1081	3165.7418	4338.6844	(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	237.2320	209.0836	219.5521	196.7698	192.7961	172.2246	165.3598	181.5110	181.2093	204.0411	215.8080	231.5095	(64)
Efficiency of water heater (217)m	89.8239	89.7675	89.6324	89.2892	88.4240	79.8000	79.8000	79.8000	79.8000	89.2611	89.6780	89.8456	(217)
Fuel for water heating, kWh/month	264.1079	232.9168	244.9474	220.3736	218.0360	215.8203	207.2178	227.4574	227.0793	228.5892	240.6478	257.6747	(219)
Water heating fuel used													2784.8683 (219)
Annual totals kWh/year													
Space heating fuel - main system													23070.8336 (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)													737.6816 (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													24941.1442 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	23070.8336	3.4800	802.8650	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	2784.8683	3.4800	96.9134	(247)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Energy for lighting	737.6816	13.1900	97.3002	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-1727.2394	13.1900	-227.8229	(252)
Total energy cost			899.1483	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200	(256)
Energy cost factor (ECF)		1.5166	(257)
SAP value	$[(255) \times (256)] / [(4) + 45.0] =$	78.8429	
SAP rating (Section 12)		79	(258)
SAP band		C	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
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FULL SAP CALCULATION PRINTOUT

Calculation Type: Existing Dwelling

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Space heating - main system 1	23070.8336	0.2160	4983.3001 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2784.8683	0.2160	601.5315 (264)
Space and water heating			5584.8316 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	737.6816	0.5190	382.8568 (268)
Energy saving/generation technologies			
PV Unit			
Total kg/year	-1727.2394	0.5190	-896.4372 (269)
CO2 emissions per m2			5110.1761 (272)
EI value			25.0500 (273)
EI rating			72.4995
EI band			72 (274)
			C

FULL SAP CALCULATION PRINTOUT

Calculation Type: Existing Dwelling

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

SAP 2012 WORKSHEET FOR Existing dwelling (SAP) (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	204.0000 (1b)	x 2.4000 (2b)	= 489.6000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	204.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 489.6000 (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				4 * 10 =	40.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.0817 (8)
Number of storeys in the dwelling (ns)					1 (9)
Additional infiltration					[(9) - 1] x 0.1 = 0.0000 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction					0.3500 (11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0					0.0000 (12)
If no draught lobby, enter 0.05, else enter 0					0.0500 (13)
Percentage of windows and doors draught stripped					100.0000 (14)
Window infiltration					0.25 - [0.2 * (14) / 100] = 0.0500 (15)
Pressure test					No
Measured/design AP50					15.0000
Infiltration rate					0.5317 (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) = 0.5317 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.6000	4.3000	4.3000	4.0000	4.0000	3.7000	3.7000	3.5000	3.5000	3.9000	3.9000	4.2000 (22)
Wind factor	1.1500	1.0750	1.0750	1.0000	1.0000	0.9250	0.9250	0.8750	0.8750	0.9750	0.9750	1.0500 (22a)
Adj infiltr rate	0.6115	0.5716	0.5716	0.5317	0.5317	0.4918	0.4918	0.4652	0.4652	0.5184	0.5184	0.5583 (22b)
Effective ac	0.6869	0.6634	0.6634	0.6414	0.6414	0.6209	0.6209	0.6082	0.6082	0.6344	0.6344	0.6558 (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
NEW PROPOSED Window (Uw = 1.60)			26.6900	1.5038	40.1353		(27)
NEW PROPOSED FullGlxDoor (Uw = 1.80)			14.7000	1.6791	24.6828		(27)
NEW PROPOSED Door			6.1600	1.8000	11.0880		(26a)
NEW PROPOSED Rooflight (Uw = 1.60)			11.5000	1.5038	17.2932		(27a)
Existing			132.8000	0.4900	65.0720		(28a)
NEW (Garage & front)			34.5000	0.1100	3.7950		(28a)
NEW PROPOSED			36.7000	0.2200	8.0740		(28a)
Existing	72.6000	15.1000	57.5000	0.4900	28.1750		(29a)
Garage conversion	25.0000	7.6600	17.3400	0.3000	5.2020		(29a)
NEW Front	21.5000	4.8600	16.6400	0.2800	4.6592		(29a)
NEW PROPOSED	41.1000	19.9300	21.1700	0.2800	5.9276		(29a)
Existing	132.8000		132.8000	0.4900	65.0720		(30)
NEW (Garage & Front)	34.5000		34.5000	0.1600	5.5200		(30)
NEW PROPOSED	36.7000	11.5000	25.2000	0.1800	4.5360		(30)
Total net area of external elements Aum(A, m ²)				568.2000			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	289.2322		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		250.0000 (35)
Thermal bridges (Default value 0.150 * total exposed area)		85.2300 (36)
Total fabric heat loss	(33) + (36) =	374.4622 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	110.9872	107.1761	107.1761	103.6220	103.6220	100.3247	100.3247	98.2693	98.2693	102.4944	102.4944	105.9629 (38)
Heat transfer coeff	485.4494	481.6383	481.6383	478.0842	478.0842	474.7870	474.7870	472.7315	472.7315	476.9566	476.9566	480.4251 (39)
Average = Sum(39)m / 12 =	477.8558 (39)											

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	2.3797	2.3610	2.3610	2.3435	2.3435	2.3274	2.3274	2.3173	2.3173	2.3380	2.3380	2.3550 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

FULL SAP CALCULATION PRINTOUT

Calculation Type: Existing Dwelling

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

4. Water heating energy requirements (kWh/year)

Assumed occupancy												3.0071 (42)	
Average daily hot water use (litres/day)												111.1781 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	122.2959	117.8488	113.4017	108.9545	104.5074	100.0603	100.0603	104.5074	108.9545	113.4017	117.8488	122.2959	(44)
Energy content (annual)	181.3613	158.6198	163.6814	142.7014	136.9254	118.1562	109.4891	125.6403	127.1409	148.1704	161.7396	175.6387	(45)
Distribution loss (46)m = 0.15 x (45)m	27.2042	23.7930	24.5522	21.4052	20.5388	17.7234	16.4234	18.8460	19.0711	22.2256	24.2609	26.3458	(46)
Water storage loss:												200.0000 (47)	
Store volume												0.0115 (51)	
b) If manufacturer declared loss factor is not known :												0.8434 (52)	
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.5400 (53)	
Volume factor from Table 2a												1.0519 (55)	
Temperature factor from Table 2b													
Enter (49) or (54) in (55)													
Total storage loss	32.6083	29.4527	32.6083	31.5564	32.6083	31.5564	32.6083	32.6083	31.5564	32.6083	31.5564	32.6083	(56)
If cylinder contains dedicated solar storage	32.6083	29.4527	32.6083	31.5564	32.6083	31.5564	32.6083	32.6083	31.5564	32.6083	31.5564	32.6083	(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	237.2320	209.0836	219.5521	196.7698	192.7961	172.2246	165.3598	181.5110	181.2093	204.0411	215.8080	231.5095	(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	237.2320	209.0836	219.5521	196.7698	192.7961	172.2246	165.3598	181.5110	181.2093	204.0411	215.8080	231.5095	(64)
Total per year (kWh/year) = Sum(64)m =												2407.0971 (64)	
Heat gains from water heating, kWh/month	104.9992	93.1122	99.1206	90.7030	90.2243	82.5417	81.1017	86.4720	85.5291	93.9632	97.0332	103.0965	(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	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	180.4274	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.4265	92.7507	75.4299	57.1053	42.6869	36.0381	38.9404	50.6162	67.9370	86.2616	100.6800	107.3288	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	559.4495	565.2548	550.6256	519.4816	480.1680	443.2187	418.5343	412.7289	427.3582	458.5022	497.8158	534.7651	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	56.0499	(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)	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	-120.2850	(71)
Water heating gains (Table 5)	141.1280	138.5598	133.2267	125.9763	121.2692	114.6412	109.0076	116.2258	118.7904	126.2947	134.7683	138.5705	(72)
Total internal gains	924.1963	915.7576	878.4745	821.7556	763.3164	713.0903	685.6747	698.7633	733.2779	790.2507	852.4564	899.8567	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains							
	m2	Table 6a	Specific data	Specific data	factor	W							
		W/m2	or Table 6b	or Table 6c	Table 6d								
Northeast	6.6600	15.0428	0.6300	0.7000	0.7700	30.6179 (75)							
Southeast	4.6200	46.3896	0.6300	0.7000	0.7700	65.4990 (77)							
Southwest	14.8000	46.3896	0.6300	0.7000	0.7700	209.8235 (79)							
Northwest	0.6100	15.0428	0.6300	0.7000	0.7700	2.8043 (81)							
Northeast	14.7000	15.0428	0.6300	0.7000	0.7700	67.5801 (75)							
Horizontal	11.5000	35.0000	0.6300	0.7000	1.0000	159.7523 (82)							
Solar gains	536.0771	874.3181	1374.1135	2019.8028	2377.0395	2644.1002	2435.4598	2107.3837	1656.5236	1036.0038	653.7093	442.6823	(83)
Total gains	1460.2733	1790.0757	2252.5880	2841.5584	3140.3558	3357.1905	3121.1345	2806.1470	2389.8015	1826.2546	1506.1658	1342.5391	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, T _{hl} (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	29.1826	29.4135	29.4135	29.6322	29.6322	29.8379	29.8379	29.9677	29.9677	29.7022	29.7022	29.4878	
alpha	2.9455	2.9609	2.9609	2.9755	2.9755	2.9892	2.9892	2.9978	2.9978	2.9801	2.9801	2.9659	
util living area	0.9941	0.9891	0.9733	0.9283	0.8388	0.6780	0.5459	0.5890	0.8350	0.9611	0.9892	0.9953	(86)
MIT	19.1271	19.2845	19.6355	20.0848	20.4906	20.7608	20.8545	20.8425	20.6035	20.0947	19.5456	19.1113	(87)
Th 2	19.0922	19.1035	19.1035	19.1141	19.1141	19.1240	19.1240	19.1302	19.1302	19.1175	19.1175	19.1072	(88)
util rest of house	0.9917	0.9846	0.9616	0.8951	0.7566	0.5183	0.3156	0.3480	0.7160	0.9354	0.9838	0.9934	(89)
MIT 2	17.4796	17.6442	17.9900	18.4280	18.7872	18.9855	19.0273	19.0318	18.9044	18.4538	17.9156	17.4751	(90)
Living area fraction												0.4348 (91)	
MIT	18.1959	18.3574	18.7055	19.1484	19.5279	19.7574	19.8218	19.8191	19.6432	19.1673	18.6243	18.1865	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.0459	18.2074	18.5555	18.9984	19.3779	19.6074	19.6718	19.6691	19.4932	19.0173	18.4743	18.0365	(93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: Existing Dwelling

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	0.9898	0.9817	0.9571	0.8925	0.7706	0.5653	0.3896	0.4261	0.7452	0.9335	0.9812	0.9918	(94)
Useful gains	1445.3076	1757.2414	2155.8629	2536.1812	2419.9761	1897.9229	1216.0309	1195.8273	1780.9079	1704.8322	1477.8109	1331.5647	(95)
Ext temp.	5.0000	5.4000	7.1000	9.4000	12.4000	15.1000	17.0000	17.0000	14.5000	11.3000	7.8000	5.0000	(96)
Heat loss rate W	6333.1423	6168.5553	5517.4006	4588.8351	3336.0056	2140.0459	1268.5219	1261.7647	2360.4419	3680.8008	5091.1922	6263.0775	(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	3636.5490	2964.4029	2500.9841	1477.9108	681.5260	0.0000	0.0000	0.0000	0.0000	1470.1206	2601.6345	3669.0455	(98)
Space heating												19002.1735	(98)
Space heating per m2												(98) / (4) =	93.1479 (99)

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 %)													92.9000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													20454.4386 (211)
Space heating requirement	3636.5490	2964.4029	2500.9841	1477.9108	681.5260	0.0000	0.0000	0.0000	0.0000	1470.1206	2601.6345	3669.0455	(98)
Space heating efficiency (main heating system 1)	92.9000	92.9000	92.9000	92.9000	92.9000	0.0000	0.0000	0.0000	0.0000	92.9000	92.9000	92.9000	(210)
Space heating fuel (main heating system)	3914.4769	3190.9612	2692.1250	1590.8620	733.6125	0.0000	0.0000	0.0000	0.0000	1582.4765	2800.4677	3949.4569	(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	237.2320	209.0836	219.5521	196.7698	192.7961	172.2246	165.3598	181.5110	181.2093	204.0411	215.8080	231.5095	(64)
Efficiency of water heater (217)m	89.7629	89.7075	89.5312	89.0963	87.9010	79.8000	79.8000	79.8000	79.8000	89.0448	89.5800	89.7855	(216)
Fuel for water heating, kWh/month	264.2873	233.0726	245.2241	220.8507	219.3332	215.8203	207.2178	227.4574	227.0793	229.1443	240.9111	257.8474	(219)
Water heating fuel used													2788.2455 (219)
Annual totals kWh/year													
Space heating fuel - main system													20454.4386 (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)													737.6816 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 2.50 * 1232 * 0.80) =										-1970.7580			-1970.7580 (233)
Total delivered energy for all uses													22084.6078 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	20454.4386	3.6300	742.4961	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	2788.2455	3.6300	101.2133	(247)
Pumps and fans for heating	75.0000	19.4400	14.5800	(249)
Energy for lighting	737.6816	19.4400	143.4053	(250)
Additional standing charges			95.0000	(251)
Energy saving/generation technologies				
PV Unit	-1970.7580	19.4400	-383.1153	(252)
Total energy cost			713.5794	(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	20454.4386	0.2160	4418.1587	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2788.2455	0.2160	602.2610	(264)
Space and water heating			5020.4198	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	737.6816	0.5190	382.8568	(268)
Energy saving/generation technologies				
PV Unit	-1970.7580	0.5190	-1022.8234	(269)
Total kg/year			4419.3781	(272)

FULL SAP CALCULATION PRINTOUT

Calculation Type: Existing Dwelling

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

 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	20454.4386	1.2200	24954.4151 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2788.2455	1.2200	3401.6595 (264)
Space and water heating			28356.0746 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	737.6816	3.0700	2264.6826 (268)
Energy saving/generation technologies			
PV Unit	-1970.7580	3.0700	-6050.2270 (269)
Primary energy kWh/year			24800.7802 (272)
Primary energy kWh/m2/year			121.5725 (273)