

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



Property Reference	SECPMW026g_089_As_Built				Issued on Date	22/11/2021
Assessment Reference	001	Prop Type Ref	MFF			
Property						
SAP Rating	86 B	DER	14.32	TER	15.59	
Environmental	90 B	% DER<TER	8.16			
CO ₂ Emissions (t/year)	0.85	DFEE	31.41	TFEE	34.51	
General Requirements Compliance	Pass	% DFEE<TFEE	8.97			
Assessor Details	Mr. Stephen Smith, Southern Energy Consultants Limited, Tel: 01635261582, info@southernenergyconsultants.co.uk				Assessor ID	d168-0001
Client	Bellway Homes Thames Valley					

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

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DWELLING AS BUILT

Mid-floor flat, total floor area 73 m²

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

1a TER and DER

Fuel for main heating: Mains gas
Fuel factor: 1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 15.59 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.32 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 34.5 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 31.4 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.27 (max. 0.30)	0.33 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.25 (max. 2.00)	1.30 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.57 (measured in this dwelling)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from database
Ideal LOGIC COMBI ESP1 35
Combi boiler
Efficiency: 89.6% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls:

No cylinder

Boiler interlock

Yes

OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%
Minimum 75% OK

8 Mechanical ventilation

Continuous extract system (decentralised)
Specific fan power: 0.1600 0.1600
Maximum 0.7 OK

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK
Based on:
Overshading: Average
Windows facing West: 10.22 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.6 m³/m²h

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.6200 (1b)	x 2.4000 (2b)	= 174.2880 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 174.2880 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.5700
Infiltration rate					0.1785 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1383 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1764	0.1729	0.1695	0.1522	0.1487	0.1314	0.1314	0.1280	0.1383	0.1487	0.1556	0.1625 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			10.2200	1.2357	12.6293		(27)
WT-E-02	28.3400	10.2200	18.1200	0.2000	3.6240		(29a)
WT-T-01	25.6100	2.1200	23.4900	0.3300	7.7517		(29a)
Total net area of external elements Aum(A, m ²)			53.9500				(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =				26.1250		(33)
Party Wall 1			31.6800	0.0000	0.0000		(32)
Party Floor 1			72.6200				(32d)
Party Ceilings 1			72.6200				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.6120 (36)
Total fabric heat loss	(33) + (36) =						32.7370 (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	28.7575	28.7575	28.7575	28.7575	28.7575	28.7575	28.7575	28.7575	28.7575	28.7575	28.7575	28.7575 (38)
Heat transfer coeff	61.4945	61.4945	61.4945	61.4945	61.4945	61.4945	61.4945	61.4945	61.4945	61.4945	61.4945	61.4945 (39)
Average = Sum(39)m / 12 =												61.4945 (39)
HLP	0.8468	0.8468	0.8468	0.8468	0.8468	0.8468	0.8468	0.8468	0.8468	0.8468	0.8468	0.8468 (40)
HLP (average)												0.8468 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3080 (42)
Average daily hot water use (litres/day)												89.0154 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	97.9169	94.3563	90.7957	87.2351	83.6744	80.1138	80.1138	83.6744	87.2351	90.7957	94.3563	97.9169 (44)
Energy content (annual)	145.2079	126.9998	131.0524	114.2547	109.6301	94.6024	87.6630	100.5946	101.7960	118.6335	129.4977	140.6261 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1400.5582 (45)
	21.7812	19.0500	19.6579	17.1382	16.4445	14.1904	13.1495	15.0892	15.2694	17.7950	19.4247	21.0939 (46)

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Water storage loss:															
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)		
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)		
Combi loss	14.0978	12.7129	14.0421	13.5520	13.9767	13.4947	13.9251	13.9586	13.5259	14.0151	13.6061	14.0870	(61)		
Total heat required for water heating calculated for each month															
Solar input	159.3057	139.7127	145.0945	127.8067	123.6068	108.0971	101.5882	114.5532	115.3220	132.6485	143.1038	154.7132	(62)		
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)		
								Solar input (sum of months) = Sum(63)m =					0.0000	(63)	
Output from w/h	159.3057	139.7127	145.0945	127.8067	123.6068	108.0971	101.5882	114.5532	115.3220	132.6485	143.1038	154.7132	(64)		
								Total per year (kWh/year) = Sum(64)m =					1565.5522	(64)	
Heat gains from water heating, kWh/month															
	51.8061	45.4056	47.0855	41.3777	39.9462	34.8290	32.6292	36.9374	37.2287	42.9494	46.4595	50.2799	(65)		

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	115.4008	115.4008	115.4008	115.4008	115.4008	115.4008	115.4008	115.4008	115.4008	115.4008	115.4008	115.4008 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.4252	17.2533	14.0313	10.6226	7.9405	6.7037	7.2436	9.4155	12.6375	16.0462	18.7283	19.9651 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.3331	205.4431	200.1260	188.8067	174.5181	161.0888	152.1172	150.0072	155.3242	166.6436	180.9322	194.3615 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5401	34.5401	34.5401	34.5401	34.5401	34.5401	34.5401	34.5401	34.5401	34.5401	34.5401	34.5401 (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)	-92.3206	-92.3206	-92.3206	-92.3206	-92.3206	-92.3206	-92.3206	-92.3206	-92.3206	-92.3206	-92.3206	-92.3206 (71)
Water heating gains (Table 5)	69.6318	67.5679	63.2869	57.4690	53.6911	48.3736	43.8565	49.6470	51.7065	57.7277	64.5271	67.5806 (72)
Total internal gains	353.0104	350.8845	338.0645	317.5185	296.7699	276.7863	263.8375	269.6899	280.2884	301.0377	324.8078	342.5274 (73)

[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		
West					10.2200	19.6403	0.4500		0.0000	0.7700	69.5507 (80)	
Solar gains	69.5507	136.0559	224.0647	326.7850	400.4873	409.9700	390.3082	335.2689	260.5965	161.4418	86.7215	57.1951 (83)
Total gains	422.5611	486.9404	562.1292	644.3035	697.2572	686.7563	654.1457	604.9589	540.8850	462.4795	411.5294	399.7225 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n11,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	82.0082	82.0082	82.0082	82.0082	82.0082	82.0082	82.0082	82.0082	82.0082	82.0082	82.0082	82.0082
alpha	6.4672	6.4672	6.4672	6.4672	6.4672	6.4672	6.4672	6.4672	6.4672	6.4672	6.4672	6.4672
util living area	0.9981	0.9948	0.9807	0.9198	0.7672	0.5663	0.4128	0.4658	0.7424	0.9627	0.9954	0.9987 (86)
MIT	20.1716	20.3078	20.5340	20.7927	20.9494	20.9936	20.9993	20.9985	20.9689	20.7340	20.3907	20.1323 (87)
Th 2	20.2130	20.2130	20.2130	20.2130	20.2130	20.2130	20.2130	20.2130	20.2130	20.2130	20.2130	20.2130 (88)
util rest of house	0.9975	0.9932	0.9746	0.8969	0.7176	0.4997	0.3394	0.3871	0.6734	0.9470	0.9936	0.9983 (89)
MIT 2	19.4504	19.5860	19.8085	20.0517	20.1812	20.2102	20.2128	20.2125	20.1970	20.0033	19.6689	19.4112 (90)
Living area fraction	19.7061	19.8419	20.0658	20.3144	20.4536	20.4880	20.4917	20.4912	20.4707	20.2624	19.9248	19.3546 (91)
MIT												19.6669 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.5561	19.6919	19.9158	20.1644	20.3036	20.3380	20.3417	20.3412	20.3207	20.1124	19.7748	19.5169 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9968	0.9918	0.9717	0.8953	0.7236	0.5104	0.3515	0.4000	0.6834	0.9446	0.9923	0.9977 (94)
Useful gains	421.2218	482.9260	546.2415	576.8456	504.5413	350.5263	229.9179	241.9711	369.6463	436.8545	408.3802	398.8205 (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	938.1695	909.6227	824.9982	692.7009	529.0764	352.8547	230.0913	242.3633	382.5379	584.9600	779.4324	941.9062 (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	384.6091	286.7402	207.3950	83.4158	18.2541	0.0000	0.0000	0.0000	0.0000	110.1905	267.1576	404.0558 (98)
Space heating												1761.8180 (98)
Space heating per m2											(98) / (4) =	24.2608 (99)

Not applicable

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												90.5000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												1946.7603 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	384.6091	286.7402	207.3950	83.4158	18.2541	0.0000	0.0000	0.0000	0.0000	110.1905	267.1576	404.0558 (98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000 (210)
Space heating fuel (main heating system)	424.9824	316.8400	229.1657	92.1721	20.1703	0.0000	0.0000	0.0000	0.0000	121.7575	295.2017	446.4705 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	159.3057	139.7127	145.0945	127.8067	123.6068	108.0971	101.5882	114.5532	115.3220	132.6485	143.1038	154.7132 (64)
Efficiency of water heater												87.3000 (216)
(217)m	89.5387	89.4261	89.1548	88.5363	87.6990	87.3000	87.3000	87.3000	87.3000	88.7235	89.3575	89.5907 (217)
Fuel for water heating, kWh/month												
	177.9182	156.2325	162.7445	144.3551	140.9443	123.8226	116.3667	131.2179	132.0985	149.5077	160.1475	172.6888 (219)
Water heating fuel used												1768.0443 (219)
Annual totals kWh/year												
Space heating fuel - main system												1946.7603 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(MEVDecentralised, Database: total watage = 5.3360, total flow = 29.0000, SFP = 0.1840)												
mechanical ventilation fans (SFP = 0.1840)												39.1242 (230a)
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												114.1242 (231)
Electricity for lighting (calculated in Appendix L)												343.0552 (232)
Total delivered energy for all uses												4171.9839 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1946.7603	0.2160	420.5002 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1768.0443	0.2160	381.8976 (264)
Space and water heating			802.3978 (265)
Pumps and fans	114.1242	0.5190	59.2304 (267)
Energy for lighting	343.0552	0.5190	178.0456 (268)
Total CO2, kg/year			1039.6739 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.3200 (273)

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

DER		14.3200 ZC1
Total Floor Area	TFA	72.6200
Assumed number of occupants	N	2.3080
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.5920 ZC2
CO2 emissions from cooking, equation (L16)		2.4014 ZC3
Total CO2 emissions		33.3134 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		33.3134 ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.6200 (1b)	x 2.4000 (2b)	= 174.2880 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 174.2880 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1721 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4221 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3271 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
	0.4171	0.4089	0.4008	0.3599	0.3517	0.3108	0.3108	0.3026	0.3271	0.3517	0.3680	0.3844 (22b)
Effective ac	0.5870	0.5836	0.5803	0.5648	0.5618	0.5483	0.5483	0.5458	0.5535	0.5618	0.5677	0.5739 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.40)			10.2200	1.3258	13.5492		(27)
WT-E-02	28.3400	10.2200	18.1200	0.1800	3.2616		(29a)
WT-I-01	25.6100	2.1200	23.4900	0.1800	4.2282		(29a)
Total net area of external elements Aum(A, m ²)			53.9500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	23.1590		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.5327 (36)
Total fabric heat loss						(33) + (36) =	28.6917 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	33.7609	33.5666	33.3762	32.4817	32.3143	31.5353	31.5353
Heat transfer coeff	62.4527	62.2584	62.0679	61.1734	61.0061	60.2270	60.2270
Average = Sum(39)m / 12 =						60.0827	60.5271
						61.0061	61.3446
						61.6986	61.9826 (39)
						61.1726	61.726 (39)
HLP	0.8600	0.8573	0.8547	0.8424	0.8401	0.8293	0.8293
HLP (average)						0.8274	0.8335
Days in month	31	28	31	30	31	30	31
						30	31
						31	30
						31	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3080 (42)
Average daily hot water use (litres/day)												89.0154 (43)
Daily hot water use	97.9169	94.3563	90.7957	87.2351	83.6744	80.1138	80.1138	83.6744	87.2351	90.7957	94.3563	97.9169 (44)
Energy conte	145.2079	126.9998	131.0524	114.2547	109.6301	94.6024	87.6630	100.5946	101.7960	118.6335	129.4977	140.6261 (45)
Energy content (annual)										Total = Sum(45)m =		1400.5582 (45)
Distribution loss (46)m = 0.15 x (45)m	21.7812	19.0500	19.6579	17.1382	16.4445	14.1904	13.1495	15.0892	15.2694	17.7950	19.4247	21.0939 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	49.8974	43.4297	46.2685	43.0200	42.6396	39.5082	40.8251	42.6396	43.0200	46.2685	46.5319	49.8974 (61)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total heat required for water heating calculated for each month												
Solar input	195.1053	170.4295	177.3209	157.2747	152.2696	134.1106	128.4882	143.2342	144.8161	164.9019	176.0296	190.5235 (62)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum (63)m =												0.0000 (63)
Output from w/h												
	195.1053	170.4295	177.3209	157.2747	152.2696	134.1106	128.4882	143.2342	144.8161	164.9019	176.0296	190.5235 (64)
Total per year (kWh/year) = Sum (64)m =												1934.5041 (64)
Heat gains from water heating, kWh/month												
	60.7560	53.0849	55.1420	48.7447	47.1119	41.3323	39.3542	44.1076	44.6022	51.0127	54.6910	59.2325 (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	115.4008	115.4008	115.4008	115.4008	115.4008	115.4008	115.4008	115.4008	115.4008	115.4008	115.4008	115.4008 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	19.4252	17.2533	14.0313	10.6226	7.9405	6.7037	7.2436	9.4155	12.6375	16.0462	18.7283	19.9651 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	203.3331	205.4431	200.1260	188.8067	174.5181	161.0888	152.1172	150.0072	155.3242	166.6436	180.9322	194.3615 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	34.5401	34.5401	34.5401	34.5401	34.5401	34.5401	34.5401	34.5401	34.5401	34.5401	34.5401	34.5401 (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)												
	-92.3206	-92.3206	-92.3206	-92.3206	-92.3206	-92.3206	-92.3206	-92.3206	-92.3206	-92.3206	-92.3206	-92.3206 (71)
Water heating gains (Table 5)												
	81.6613	78.9953	74.1156	67.7009	63.3224	57.4060	52.8955	59.2844	61.9475	68.5655	75.9597	79.6136 (72)
Total internal gains	365.0398	362.3119	348.8932	327.7505	306.4013	285.8188	272.8765	279.3274	290.5295	311.8755	336.2404	354.5604 (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	
West	10.2200				19.6403		0.6300		0.7000		0.7700		61.3437 (80)	
Solar gains	61.3437	120.0013	197.6251	288.2244	353.2298	361.5935	344.2518	295.7072	229.8461	142.3917	76.4884	50.4461	(83)	
Total gains	426.3835	482.3132	546.5183	615.9749	659.6310	647.4123	617.1283	575.0346	520.3756	454.2672	412.7288	405.0065	(84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												
Utilisation factor for gains for living area, nil,m (see Table 9a)												21.0000 (85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	80.7500	81.0020	81.2506	82.4386	82.6648	83.7341	83.7341	83.9352	83.3190	82.6648	82.2086	81.7370
alpha	6.3833	6.4001	6.4167	6.4959	6.5110	6.5823	6.5823	6.5957	6.5546	6.5110	6.4806	6.4491
util living area	0.9980	0.9952	0.9836	0.9319	0.7935	0.5873	0.4285	0.4786	0.7563	0.9649	0.9953	0.9986 (86)
MIT	20.1570	20.2864	20.5046	20.7724	20.9398	20.9928	20.9992	20.9984	20.9670	20.7312	20.3949	20.1352 (87)
Th 2	20.2016	20.2039	20.2062	20.2168	20.2187	20.2280	20.2280	20.2297	20.2244	20.2187	20.2147	20.2105 (88)
util rest of house												
	0.9974	0.9936	0.9783	0.9115	0.7454	0.5200	0.3538	0.3996	0.6883	0.9500	0.9935	0.9981 (89)
MIT 2	19.0661	19.2564	19.5735	19.9543	20.1625	20.2233	20.2277	20.2290	20.1993	19.9071	19.4236	19.0412 (90)
Living area fraction												
												0.3546 (91)
MIT	19.4529	19.6216	19.9036	20.2444	20.4381	20.4962	20.5012	20.5018	20.4715	20.1993	19.7680	19.4291 (92)
Temperature adjustment												
												0.0000
adjusted MIT	19.4529	19.6216	19.9036	20.2444	20.4381	20.4962	20.5012	20.5018	20.4715	20.1993	19.7680	19.4291 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9966	0.9922	0.9758	0.9123	0.7596	0.5437	0.3803	0.4277	0.7110	0.9496	0.9922	0.9975 (94)
Useful gains	424.9357	478.5275	533.2832	561.9667	501.0617	351.9991	234.7074	245.9221	370.0127	431.3727	409.4959	403.9919 (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												
	946.3408	916.5455	831.9369	693.9730	533.0786	355.1097	234.9602	246.4499	385.6473	585.6164	777.1120	939.6140 (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												
	387.9254	294.3481	222.1983	95.0446	23.8206	0.0000	0.0000	0.0000	0.0000	114.7574	264.6836	398.5028 (98)
Space heating per m2												
												1801.2807 (98)
												(98) / (4) = 24.8042 (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)

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Calculation Type: New Build (As Built)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1928.5660 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	387.9254	294.3481	222.1983	95.0446	23.8206	0.0000	0.0000	0.0000	0.0000	114.7574	264.6836	398.5028	(98)
Space heating efficiency (main heating system 1)	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)	415.3377	315.1479	237.8997	101.7608	25.5038	0.0000	0.0000	0.0000	0.0000	122.8665	283.3872	426.6625	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	195.1053	170.4295	177.3209	157.2747	152.2696	134.1106	128.4882	143.2342	144.8161	164.9019	176.0296	190.5235	(64)
Efficiency of water heater (217)m	86.7487	86.4144	85.6203	83.8279	81.5323	80.3000	80.3000	80.3000	80.3000	84.1583	86.0757	86.8660	(217)
Fuel for water heating, kWh/month	224.9086	197.2235	207.1015	187.6161	186.7600	167.0120	160.0102	178.3738	180.3438	195.9425	204.5055	219.3304	(219)
Water heating fuel used												2309.1279	(219)
Annual totals kWh/year													
Space heating fuel - main system												1928.5660	(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)												343.0552	(232)
Total delivered energy for all uses												4655.7491	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1928.5660	0.2160	416.5703 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2309.1279	0.2160	498.7716 (264)
Space and water heating			915.3419 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	343.0552	0.5190	178.0456 (268)
Total CO2, kg/m2/year			1132.3125 (272)
Emissions per m2 for space and water heating			12.6045 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4517 (272b)
Emissions per m2 for pumps and fans			0.5360 (272c)
Target Carbon Dioxide Emission Rate (TER) = (12.6045 * 1.00) + 2.4517 + 0.5360, rounded to 2 d.p.			15.5900 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.6200 (1b)	x 2.4000 (2b)	= 174.2880 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 174.2880 (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				3 * 10 =	30.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					30.0000 / (5) =
Measured/design AP50					Yes
Infiltration rate					3.5700
Number of sides sheltered					0.3506 (18)
					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.2717 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.3465	0.3397	0.3329	0.2989	0.2921	0.2582	0.2582	0.2514	0.2717	0.2921	0.3057	0.3193 (22b)
	0.5600	0.5577	0.5554	0.5447	0.5427	0.5333	0.5333	0.5316	0.5369	0.5427	0.5467	0.5510 (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
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			10.2200	1.2357	12.6293		(27)
WT-E-02	28.3400	10.2200	18.1200	0.2000	3.6240		(29a)
WT-T-01	25.6100	2.1200	23.4900	0.3300	7.7517		(29a)
Total net area of external elements Aum(A, m ²)			53.9500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.1250		(33)
Party Wall 1			31.6800	0.0000	0.0000		(32)
Party Floor 1			72.6200				(32d)
Party Ceilings 1			72.6200				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.6120 (36)
Total fabric heat loss						(33) + (36) =	32.7370 (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	32.2095	32.0755	31.9441	31.3269	31.2115	30.6740	30.6740	30.5744	30.8810	31.2115	31.4451	31.6893 (38)
Heat transfer coeff	64.9465	64.8125	64.6811	64.0640	63.9485	63.4110	63.4110	63.3114	63.6180	63.9485	64.1821	64.4263 (39)
Average = Sum(39)m / 12 =												64.0634 (39)
HLP	0.8943	0.8925	0.8907	0.8822	0.8806	0.8732	0.8732	0.8718	0.8760	0.8806	0.8838	0.8872 (40)
HLP (average)												0.8822 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3080 (42)
Average daily hot water use (litres/day)												89.0154 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	97.9169	94.3563	90.7957	87.2351	83.6744	80.1138	80.1138	83.6744	87.2351	90.7957	94.3563	97.9169 (44)
Energy content (annual)	145.2079	126.9998	131.0524	114.2547	109.6301	94.6024	87.6630	100.5946	101.7960	118.6335	129.4977	140.6261 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1400.5582 (45)
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	30.8567	26.9875	27.8486	24.2791	23.2964	20.1030	18.6284	21.3764	21.6317	25.2096	27.5183	29.8831 (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	115.4008	115.4008	115.4008	115.4008	115.4008	115.4008	115.4008	115.4008	115.4008	115.4008	115.4008	115.4008	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.4252	17.2533	14.0313	10.6226	7.9405	6.7037	7.2436	9.4155	12.6375	16.0462	18.7283	19.9651	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.3331	205.4431	200.1260	188.8067	174.5181	161.0888	152.1172	150.0072	155.3242	166.6436	180.9322	194.3615	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5401	34.5401	34.5401	34.5401	34.5401	34.5401	34.5401	34.5401	34.5401	34.5401	34.5401	34.5401	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3206	-92.3206	-92.3206	-92.3206	-92.3206	-92.3206	-92.3206	-92.3206	-92.3206	-92.3206	-92.3206	-92.3206	(71)
Water heating gains (Table 5)	41.4740	40.1599	37.4310	33.7210	31.3124	27.9209	25.0382	28.7317	30.0440	33.8839	38.2198	40.1654	(72)
Total internal gains	321.8526	320.4765	309.2085	290.7705	271.3912	253.3336	242.0192	245.7746	255.6259	274.1939	295.5005	312.1122	(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	
West					10.2200	19.6403		0.4500	0.0000			0.7700	69.5507 (80)
Solar gains	69.5507	136.0559	224.0647	326.7850	400.4873	409.9700	390.3082	335.2689	260.5965	161.4418	86.7215	57.1951	(83)
Total gains	391.4033	456.5324	533.2732	617.5555	671.8785	663.3036	632.3273	581.0436	516.2225	435.6357	382.2221	369.3073	(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	77.6493	77.8099	77.9680	78.7191	78.8612	79.5297	79.5297	79.6547	79.2709	78.8612	78.5742	78.2764	
alpha	6.1766	6.1873	6.1979	6.2479	6.2574	6.3020	6.3020	6.3103	6.2847	6.2574	6.2383	6.2184	
util living area	0.9988	0.9966	0.9867	0.9392	0.8045	0.6008	0.4398	0.4980	0.7840	0.9744	0.9971	0.9992	(86)
MIT	20.0591	20.2015	20.4412	20.7346	20.9263	20.9900	20.9988	20.9975	20.9534	20.6728	20.3055	20.0311	(87)
Th 2	20.1723	20.1739	20.1754	20.1827	20.1840	20.1903	20.1903	20.1915	20.1879	20.1840	20.1813	20.1784	(88)
util rest of house	0.9984	0.9955	0.9823	0.9199	0.7557	0.5296	0.3597	0.4122	0.7151	0.9627	0.9960	0.9989	(89)
MIT 2	19.3041	19.4473	19.6858	19.9723	20.1367	20.1860	20.1900	20.1908	20.1632	19.9209	19.5576	19.2812	(90)
Living area fraction	19.5718	19.7147	19.9537	20.2426	20.4167	20.4711	20.4768	20.4768	fLA = Living area / (4) =	20.4434	20.1875	19.8228	0.3546 (91)
MIT	19.5718	19.7147	19.9537	20.2426	20.4167	20.4711	20.4768	20.4768	20.4434	20.1875	19.8228	19.5471	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5718	19.7147	19.9537	20.2426	20.4167	20.4711	20.4768	20.4768	20.4434	20.1875	19.8228	19.5471	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	390.6430	454.1138	523.0459	569.0989	517.6534	367.9375	245.4412	257.2504	381.0741	419.4170	380.4302	368.8003	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	991.8524	960.1799	870.1975	726.6543	557.4202	372.2907	245.8317	258.1096	403.5560	613.1062	816.5730	988.7577	(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	447.2998	340.0764	258.2808	113.4399	29.5865	0.0000	0.0000	0.0000	0.0000	144.1048	314.0228	461.2483	(98)
Space heating												2108.0592	(98)
Space heating per m2												29.0286	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	596.0633	469.2413	481.1670	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9676	0.9874	0.9795	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	576.7348	463.3212	471.2827	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	861.6133	823.7085	765.3510	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	205.1125	268.1282	218.7868	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												692.0275	(104)
Cooled fraction												1.0000	(105)

$$fC = \text{cooled area} / (4) =$$

Regs Region: England

Elmhurst Energy Systems
SAP2012 Calculator (Design
System) version 4.14r19

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	51.2781	67.0320	54.6967	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											173.0069 (107)
Space cooling per m2											2.3824 (108)
Energy for space heating											29.0286 (99)
Energy for space cooling											2.3824 (108)
Total											31.4110 (109)
Dwelling Fabric Energy Efficiency (DFEE)											31.4 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.6200 (1b)	x 2.4000 (2b)	= 174.2880 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 174.2880 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					30.0000 / (5) = 0.1721 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4221 (18)
					3 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3271 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
	0.4171	0.4089	0.4008	0.3599	0.3517	0.3108	0.3108	0.3026	0.3271	0.3517	0.3680	0.3844 (22b)
Effective ac	0.5870	0.5836	0.5803	0.5648	0.5618	0.5483	0.5483	0.5458	0.5535	0.5618	0.5677	0.5739 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.40)			10.2200	1.3258	13.5492		(27)
WT-E-02	28.3400	10.2200	18.1200	0.1800	3.2616		(29a)
WT-I-01	25.6100	2.1200	23.4900	0.1800	4.2282		(29a)
Total net area of external elements Aum(A, m ²)			53.9500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	23.1590		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.5327 (36)
Total fabric heat loss						(33) + (36) =	28.6917 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	33.7609	33.5666	33.3762	32.4817	32.3143	31.5353	31.5353
Heat transfer coeff	62.4527	62.2584	62.0679	61.1734	61.0061	60.2270	60.2270
Average = Sum(39)m / 12 =						60.0827	60.5271
						61.0061	61.3446
						61.6986	61.726 (39)
HLP	0.8600	0.8573	0.8547	0.8424	0.8401	0.8293	0.8293
HLP (average)						0.8274	0.8335
Days in month	31	28	31	30	31	30	31
						30	31
						31	30
						31	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3080 (42)
Average daily hot water use (litres/day)												89.0154 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	97.9169	94.3563	90.7957	87.2351	83.6744	80.1138	80.1138	83.6744	87.2351	90.7957	94.3563	97.9169 (44)
Energy conte	145.2079	126.9998	131.0524	114.2547	109.6301	94.6024	87.6630	100.5946	101.7960	118.6335	129.4977	140.6261 (45)
Energy content (annual)	Total = Sum(45)m =											1400.5582 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Heat gains from water heating, kWh/month
30.8567 26.9875 27.8486 24.2791 23.2964 20.1030 18.6284 21.3764 21.6317 25.2096 27.5183 29.8831 (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	115.4008	115.4008	115.4008	115.4008	115.4008	115.4008	115.4008	115.4008	115.4008	115.4008	115.4008	115.4008	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.4252	17.2533	14.0313	10.6226	7.9405	6.7037	7.2436	9.4155	12.6375	16.0462	18.7283	19.9651	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.3331	205.4431	200.1260	188.8067	174.5181	161.0888	152.1172	150.0072	155.3242	166.6436	180.9322	194.3615	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5401	34.5401	34.5401	34.5401	34.5401	34.5401	34.5401	34.5401	34.5401	34.5401	34.5401	34.5401	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3206	-92.3206	-92.3206	-92.3206	-92.3206	-92.3206	-92.3206	-92.3206	-92.3206	-92.3206	-92.3206	-92.3206	(71)
Water heating gains (Table 5)	41.4740	40.1599	37.4310	33.7210	31.3124	27.9209	25.0382	28.7317	30.0440	33.8839	38.2198	40.1654	(72)
Total internal gains	321.8526	320.4765	309.2085	290.7705	271.3912	253.3336	242.0192	245.7746	255.6259	274.1939	295.5005	312.1122	(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
West	10.2200				19.6403		0.6300		0.7000		0.7700		61.3437 (80)
Solar gains	61.3437	120.0013	197.6251	288.2244	353.2298	361.5935	344.2518	295.7072	229.8461	142.3917	76.4884	50.4461 (83)	
Total gains	383.1963	440.4778	506.8336	578.9949	624.6210	614.9271	586.2710	541.4818	485.4721	416.5856	371.9889	362.5583 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	80.7500	81.0020	81.2506	82.4386	82.6648	83.7341	83.7341	83.9352	83.3190	82.6648	82.2086	81.7370	
alpha	6.3833	6.4001	6.4167	6.4959	6.5110	6.5823	6.5823	6.5957	6.5546	6.5110	6.4806	6.4491	
util living area	0.9989	0.9971	0.9889	0.9475	0.8218	0.6157	0.4507	0.5074	0.7943	0.9768	0.9974	0.9993	(86)
MIT	20.0986	20.2307	20.4549	20.7375	20.9259	20.9906	20.9989	20.9978	20.9560	20.6881	20.3404	20.0776	(87)
Th 2	20.2016	20.2039	20.2062	20.2168	20.2187	20.2280	20.2280	20.2297	20.2244	20.2187	20.2147	20.2105	(88)
util rest of house	0.9986	0.9961	0.9851	0.9305	0.7756	0.5463	0.3723	0.4241	0.7281	0.9663	0.9964	0.9990	(89)
MIT 2	19.3682	19.5017	19.7259	20.0065	20.1705	20.2238	20.2277	20.2290	20.2008	19.9662	19.6206	19.3546	(90)
Living area fraction									fLA = Living area / (4) =			0.3546	(91)
MIT	19.6272	19.7602	19.9844	20.2657	20.4383	20.4957	20.5012	20.5016	20.4686	20.2222	19.8758	19.6110	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6272	19.7602	19.9844	20.2657	20.4383	20.4957	20.5012	20.5016	20.4686	20.2222	19.8758	19.6110	(93)

8. Space heating requirement

Utilisation	0.9983	0.9954	0.9838	0.9318	0.7894	0.5708	0.4002	0.4537	0.7503	0.9663	0.9958	0.9988	(94)
Useful gains	382.5297	438.4724	498.6355	539.4801	493.0789	350.9759	234.6123	245.6884	364.2483	402.5509	370.4211	362.1108	(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	957.2225	925.1723	836.9479	695.2776	533.0916	355.0795	234.9551	246.4369	385.4730	587.0107	783.7278	950.8347	(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	427.5715	327.0624	251.7045	112.1741	29.7695	0.0000	0.0000	0.0000	0.0000	137.2381	297.5808	438.0106	(98)
Space heating												2021.1114	(98)
Space heating per m2												27.8313	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	566.1339	445.6798	456.6288	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9686	0.9883	0.9811	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	548.3502	440.4591	448.0188	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	805.0694	769.8764	719.1100	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	184.8378	245.0864	201.6919	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												631.6162	(104)
Cooled fraction												1.0000	(105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling kWh													

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

	0.0000	0.0000	0.0000	0.0000	0.0000	46.2095	61.2716	50.4230	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling													157.9040 (107)
Space cooling per m2													2.1744 (108)
Energy for space heating													27.8313 (99)
Energy for space cooling													2.1744 (108)
Total													30.0057 (109)
Target Fabric Energy Efficiency (TFEE)													34.5 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.6200 (1b)	x 2.4000 (2b)	= 174.2880 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 174.2880 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.5700
Infiltration rate					0.1785 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1383 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.1453	0.1383	0.1383	0.1280	0.1280	0.1141	0.1176	0.1107	0.1141	0.1210	0.1210	0.1314 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			10.2200	1.2357	12.6293		(27)
WT-E-02	28.3400	10.2200	18.1200	0.2000	3.6240		(29a)
WT-I-01	25.6100	2.1200	23.4900	0.3300	7.7517		(29a)
Total net area of external elements Aum(A, m2)			53.9500				(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =				26.1250		(33)
Party Wall 1			31.6800	0.0000	0.0000		(32)
Party Floor 1			72.6200				(32d)
Party Ceilings 1			72.6200				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.6120 (36)
Total fabric heat loss	(33) + (36) =						32.7370 (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	28.7575	28.7575	28.7575	28.7575	28.7575	28.7575	28.7575	28.7575	28.7575	28.7575	28.7575	28.7575 (38)
Heat transfer coeff	61.4945	61.4945	61.4945	61.4945	61.4945	61.4945	61.4945	61.4945	61.4945	61.4945	61.4945	61.4945 (39)
Average = Sum(39)m / 12 =												61.4945 (39)
HLP	0.8468	0.8468	0.8468	0.8468	0.8468	0.8468	0.8468	0.8468	0.8468	0.8468	0.8468	0.8468 (40)
HLP (average)												0.8468 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3080 (42)
Average daily hot water use (litres/day)												89.0154 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	97.9169	94.3563	90.7957	87.2351	83.6744	80.1138	80.1138	83.6744	87.2351	90.7957	94.3563	97.9169 (44)
Energy content (annual)	145.2079	126.9998	131.0524	114.2547	109.6301	94.6024	87.6630	100.5946	101.7960	118.6335	129.4977	140.6261 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1400.5582 (45)
	21.7812	19.0500	19.6579	17.1382	16.4445	14.1904	13.1495	15.0892	15.2694	17.7950	19.4247	21.0939 (46)

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Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	14.0978	12.7129	14.0421	13.5520	13.9767	13.4947	13.9251	13.9586	13.5259	14.0151	13.6061	14.0870 (61)
Total heat required for water heating calculated for each month												
	159.3057	139.7127	145.0945	127.8067	123.6068	108.0971	101.5882	114.5532	115.3220	132.6485	143.1038	154.7132 (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												
	159.3057	139.7127	145.0945	127.8067	123.6068	108.0971	101.5882	114.5532	115.3220	132.6485	143.1038	154.7132 (64)
								Total per year (kWh/year) = Sum(64)m =				1565.5522 (64)
RHI water heating demand												1566 (64)
Heat gains from water heating, kWh/month												
	51.8061	45.4056	47.0855	41.3777	39.9462	34.8290	32.6292	36.9374	37.2287	42.9494	46.4595	50.2799 (65)

[illegible]

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.6200 (1b)	x 2.4000 (2b)	= 174.2880 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 174.2880 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.5700
Infiltration rate					0.1785 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1383 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1764	0.1729	0.1695	0.1522	0.1487	0.1314	0.1314	0.1280	0.1383	0.1487	0.1556	0.1625 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			10.2200	1.2357	12.6293		(27)
WT-E-02	28.3400	10.2200	18.1200	0.2000	3.6240		(29a)
WT-T-01	25.6100	2.1200	23.4900	0.3300	7.7517		(29a)
Total net area of external elements Aum(A, m ²)			53.9500				(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =				26.1250		(33)
Party Wall 1			31.6800	0.0000	0.0000		(32)
Party Floor 1			72.6200				(32d)
Party Ceilings 1			72.6200				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.6120 (36)
Total fabric heat loss	(33) + (36) =						32.7370 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	28.7575	28.7575	28.7575	28.7575	28.7575	28.7575	28.7575	28.7575	28.7575	28.7575	28.7575	28.7575 (38)
Heat transfer coeff	61.4945	61.4945	61.4945	61.4945	61.4945	61.4945	61.4945	61.4945	61.4945	61.4945	61.4945	61.4945 (39)
Average = Sum(39)m / 12 =												61.4945 (39)

HLP	0.8468	0.8468	0.8468	0.8468	0.8468	0.8468	0.8468	0.8468	0.8468	0.8468	0.8468	0.8468 (40)
HLP (average)												0.8468 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3080 (42)
Average daily hot water use (litres/day)												89.0154 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	97.9169	94.3563	90.7957	87.2351	83.6744	80.1138	80.1138	83.6744	87.2351	90.7957	94.3563	97.9169 (44)
Energy conte	145.2079	126.9998	131.0524	114.2547	109.6301	94.6024	87.6630	100.5946	101.7960	118.6335	129.4977	140.6261 (45)
Energy content (annual)	Total = Sum(45)m =											1400.5582 (45)
Distribution loss (46)m = 0.15 x (45)m	21.7812	19.0500	19.6579	17.1382	16.4445	14.1904	13.1495	15.0892	15.2694	17.7950	19.4247	21.0939 (46)

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Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	14.0978	12.7129	14.0421	13.5520	13.9767	13.4947	13.9251	13.9586	13.5259	14.0151	13.6061	14.0870 (61)
Total heat required for water heating calculated for each month												
Solar input	159.3057	139.7127	145.0945	127.8067	123.6068	108.0971	101.5882	114.5532	115.3220	132.6485	143.1038	154.7132 (62)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
								Solar input	(sum of months) =	Sum(63)m =		0.0000 (63)
Output from w/h	159.3057	139.7127	145.0945	127.8067	123.6068	108.0971	101.5882	114.5532	115.3220	132.6485	143.1038	154.7132 (64)
								Total per year (kWh/year) =	Sum(64)m =			1565.5522 (64)
Heat gains from water heating, kWh/month												
	51.8061	45.4056	47.0855	41.3777	39.9462	34.8290	32.6292	36.9374	37.2287	42.9494	46.4595	50.2799 (65)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1298.4925 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	275.9152	195.4774	127.2873	42.9604	7.9261	0.0000	0.0000	0.0000	0.0000	53.9985	175.3444	296.2264	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	304.8786	215.9971	140.6490	47.4701	8.7581	0.0000	0.0000	0.0000	0.0000	59.6669	193.7507	327.3220	(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	159.3057	139.7127	145.0945	127.8067	123.6068	108.0971	101.5882	114.5532	115.3220	132.6485	143.1038	154.7132	(64)
Efficiency of water heater (217)m	89.3018	89.1381	88.7668	88.0835	87.4864	87.3000	87.3000	87.3000	87.3000	88.2023	89.0334	87.3000	(216)
Fuel for water heating, kWh/month	178.3902	156.7373	163.4559	145.0971	141.2868	123.8226	116.3667	131.2179	132.0985	150.3913	160.7304	173.1037	(219)
Water heating fuel used												1772.6984	(219)
Annual totals kWh/year													
Space heating fuel - main system												1298.4925	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 5.3360, total flow = 29.0000, SFP = 0.1840)													
mechanical ventilation fans (SFP = 0.1840)													39.1242 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													114.1242 (231)
Electricity for lighting (calculated in Appendix L)													343.0552 (232)
Total delivered energy for all uses													3528.3702 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1298.4925	3.4800	45.1875 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1772.6984	3.4800	61.6899 (247)
Mechanical ventilation fans	39.1242	13.1900	5.1605 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	343.0552	13.1900	45.2490 (250)
Additional standing charges			120.0000 (251)
Total energy cost			287.1794 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.4200 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] = 1.0255 (257)
SAP value	85.6947
SAP rating (Section 12)	86 (258)
SAP band	B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1298.4925	0.2160	280.4744 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1772.6984	0.2160	382.9028 (264)
Space and water heating			663.3772 (265)
Pumps and fans	114.1242	0.5190	59.2304 (267)
Energy for lighting	343.0552	0.5190	178.0456 (268)
Total kg/year			900.6533 (272)
CO2 emissions per m2			12.4000 (273)
EI value			89.7392
EI rating			90 (274)
EI band			B

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9050 = 3.845$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9050 = 0.2387$, stars = 4
Water heating energy efficiency	$3.48 / 0.8822 = 3.945$, stars = 4
Water heating environmental impact	$0.216 / 0.8822 = 0.2449$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.6200 (1b)	x 2.4000 (2b)	= 174.2880 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 174.2880 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.5700
Infiltration rate					0.1785 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1383 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.1453	0.1383	0.1383	0.1280	0.1280	0.1141	0.1176	0.1107	0.1141	0.1210	0.1210	0.1314 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			10.2200	1.2357	12.6293		(27)
WT-E-02	28.3400	10.2200	18.1200	0.2000	3.6240		(29a)
WT-T-01	25.6100	2.1200	23.4900	0.3300	7.7517		(29a)
Total net area of external elements Aum(A, m ²)			53.9500				(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =				26.1250		(33)
Party Wall 1			31.6800	0.0000	0.0000		(32)
Party Floor 1			72.6200				(32d)
Party Ceilings 1			72.6200				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.6120 (36)
Total fabric heat loss	(33) + (36) =						32.7370 (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	28.7575	28.7575	28.7575	28.7575	28.7575	28.7575	28.7575	28.7575	28.7575	28.7575	28.7575	28.7575 (38)
Heat transfer coeff	61.4945	61.4945	61.4945	61.4945	61.4945	61.4945	61.4945	61.4945	61.4945	61.4945	61.4945	61.4945 (39)
Average = Sum(39)m / 12 =												61.4945 (39)
HLP	0.8468	0.8468	0.8468	0.8468	0.8468	0.8468	0.8468	0.8468	0.8468	0.8468	0.8468	0.8468 (40)
HLP (average)												0.8468 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3080 (42)
Average daily hot water use (litres/day)												89.0154 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	97.9169	94.3563	90.7957	87.2351	83.6744	80.1138	80.1138	83.6744	87.2351	90.7957	94.3563	97.9169 (44)
Energy content (annual)	145.2079	126.9998	131.0524	114.2547	109.6301	94.6024	87.6630	100.5946	101.7960	118.6335	129.4977	140.6261 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1400.5582 (45)
	21.7812	19.0500	19.6579	17.1382	16.4445	14.1904	13.1495	15.0892	15.2694	17.7950	19.4247	21.0939 (46)

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Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	14.0978	12.7129	14.0421	13.5520	13.9767	13.4947	13.9251	13.9586	13.5259	14.0151	13.6061	14.0870 (61)
Total heat required for water heating calculated for each month												
Solar input	159.3057	139.7127	145.0945	127.8067	123.6068	108.0971	101.5882	114.5532	115.3220	132.6485	143.1038	154.7132 (62)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
								Solar input (sum of months) = Sum(63)m =				0.0000 (63)
Output from w/h	159.3057	139.7127	145.0945	127.8067	123.6068	108.0971	101.5882	114.5532	115.3220	132.6485	143.1038	154.7132 (64)
								Total per year (kWh/year) = Sum(64)m =				1565.5522 (64)
Heat gains from water heating, kWh/month	51.8061	45.4056	47.0855	41.3777	39.9462	34.8290	32.6292	36.9374	37.2287	42.9494	46.4595	50.2799 (65)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1061.6961 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	238.8014	170.5948	99.5380	25.9018	2.8541	0.0000	0.0000	0.0000	0.0000	30.5177	136.7174	255.9097	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	263.8690	188.5025	109.9867	28.6207	3.1537	0.0000	0.0000	0.0000	0.0000	33.7212	151.0690	282.7732	(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	159.3057	139.7127	145.0945	127.8067	123.6068	108.0971	101.5882	114.5532	115.3220	132.6485	143.1038	154.7132	(64)
Efficiency of water heater (217)m	89.1917	89.0307	88.5743	87.8233	87.3697	87.3000	87.3000	87.3000	87.3000	87.8812	88.8347	87.3000	(216)
Fuel for water heating, kWh/month	178.6104	156.9264	163.8110	145.5271	141.4755	123.8226	116.3667	131.2179	132.0985	150.9408	161.0899	173.3148	(219)
Water heating fuel used												1775.2016	(219)
Annual totals kWh/year													
Space heating fuel - main system												1061.6961	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 5.3360, total flow = 29.0000, SFP = 0.1840)													
mechanical ventilation fans (SFP = 0.1840)													39.1242 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													114.1242 (231)
Electricity for lighting (calculated in Appendix L)													343.0552 (232)
Total delivered energy for all uses													3294.0770 (238)

10a. Fuel costs - using BEDF prices (485)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1061.6961	3.7400	39.7074 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1775.2016	3.7400	66.3925 (247)
Mechanical ventilation fans	39.1242	19.1200	7.4805 (249)
Pumps and fans for heating	75.0000	19.1200	14.3400 (249)
Energy for lighting	343.0552	19.1200	65.5922 (250)
Additional standing charges			94.0000 (251)
Total energy cost			287.5127 (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	1061.6961	0.2160	229.3263 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1775.2016	0.2160	383.4435 (264)
Space and water heating			612.7699 (265)
Pumps and fans	114.1242	0.5190	59.2304 (267)
Energy for lighting	343.0552	0.5190	178.0456 (268)
Total kg/year			850.0460 (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	1061.6961	1.2200	1295.2692 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1775.2016	1.2200	2165.7459 (264)
Space and water heating			3461.0151 (265)
Pumps and fans	114.1242	3.0700	350.3612 (267)
Energy for lighting	343.0552	3.0700	1053.1794 (268)
Primary energy kWh/year			4864.5557 (272)
Primary energy kWh/m2/year			66.9864 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 86
Current environmental impact rating: B 90

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



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

(For testing purposes):

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

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

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

Potential energy efficiency rating: B 86
 Potential environmental impact rating: B 90

Fuel prices for cost data on this page from database revision number 485 TEST (29 Oct 2021)
 Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£87	£87	£0
Mains gas	£200	£200	£0
Space heating	£156	£156	£0
Water heating	£66	£66	£0
Lighting	£66	£66	£0
Total cost of fuels	£287	£287	£0
Total cost of uses	£288	£288	£0
Delivered energy	45 kWh/m²	45 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.9 tonnes	0.9 tonnes	0.0 tonnes
CO2 emissions per m²	12 kg/m²	12 kg/m²	0 kg/m²
Primary energy	67 kWh/m²	67 kWh/m²	0 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



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

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

No improvements selected / applicable

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

Overheating Calculation Input Data

Dwelling type	MidTerrace Flat
Number of storeys	1
Cross ventilation possible	Yes
SAP Region	Thames Valley
Front of dwelling faces	East
Overshading	Average or unknown
Thermal mass parameter	250.0
Night ventilation	Yes
Ventilation rate during hot weather (ach)	6.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient	345.09 (P1)
Transmission heat loss coefficient	32.74 (37)
Summer heat loss coefficient	377.83 (P2)

Overhangs	Ratio	Z_overhangs	Overhang type
Orientation			
West	0.000	1.000	None
Solar shading			
Orientation	Z blinds	Solar access	Z overhangs Z summer
West	1.000	0.90	1.000 0.900 (P8)
[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b
			FF Specific data or Table 6c
West	10.2200	117.5071	0.4500 0.0000
total:			0.9000 486.3735

Solar gains	Jun	Jul	Aug	
Internal gains	516	486	428	(P4)
Total summer gains	403	386	394	
	919	873	822	(P5)
Summer gain/loss ratio	2.43	2.31	2.18	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 250.0)	0.25	0.25	0.25	
Threshold temperature	18.68	20.46	20.23	(P7)
Likelihood of high internal temperature	Not significant	Not significant	Not significant	
Assessment of likelihood of high internal temperature:	Not significant			