

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



Property Reference	SECPMW026p_130_As_Built				Issued on Date	07/07/2021
Assessment Reference	001	Prop Type Ref	MFF			
Property						
SAP Rating	86 B	DER	13.57	TER	15.77	
Environmental	90 B	% DER<TER	13.92			
CO ₂ Emissions (t/year)	0.80	DFEE	27.80	TFEE	34.53	
General Requirements Compliance	Pass	% DFEE<TFEE	19.48			
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 71 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) 15.77 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.57 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)34.5 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)27.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.27 (max. 0.70)	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:	3.09 (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	OK
Minimum: 88.0%	

Secondary heating system:	None
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5 Cylinder insulation

Hot water storage	No cylinder
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6 Controls

Space heating controls:	Programmer, room thermostat and TRVs	OK
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Hot water controls:	No cylinder
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Boiler interlock	Yes	OK
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7 Low energy lights

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

8 Mechanical ventilation

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

9 Summertime temperature

Overheating risk (Thames Valley):	Not significant	OK
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Based on:

Overshading:	Average
Windows facing South:	10.22 m ² , No overhang
Air change rate:	6.00 ach
Blinds/curtains:	None

10 Key features

Door U-value	1.00 W/m ² K
Air permeability	3.1 m ³ /m ² h

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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	70.8000 (1b)	x 2.4000 (2b)	= 169.9200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.9200 (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					3.0900
Infiltration rate					0.1545 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1313 (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	0.1674	0.1642	0.1609	0.1445	0.1412	0.1248	0.1248	0.1215	0.1313	0.1412	0.1477	0.1543 (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 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-03	43.1000	10.2200	32.8800	0.1600	5.2608		(29a)
WT-I-02	22.8000	2.1200	20.6800	0.1584	3.2761		(29a)
WT-I-11	17.0900		17.0900	0.2719	4.6468		(29a)
Total net area of external elements Aum(A, m2)			82.9900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.9330		(33)
Party Floor 1			70.8000				(32d)
Party Ceilings 1			70.8000				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.9824 (36)
Total fabric heat loss						(33) + (36) =	34.9154 (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	28.0368	28.0368	28.0368	28.0368	28.0368	28.0368	28.0368	28.0368	28.0368	28.0368	28.0368	28.0368 (38)
Average = Sum(39)m / 12 =	62.9522	62.9522	62.9522	62.9522	62.9522	62.9522	62.9522	62.9522	62.9522	62.9522	62.9522	62.9522 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8892	0.8892	0.8892	0.8892	0.8892	0.8892	0.8892	0.8892	0.8892	0.8892	0.8892	0.8892 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												
Average daily hot water use (litres/day)												2.2654 (42)
												88.0030 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	96.8033	93.2832	89.7631	86.2429	82.7228	79.2027	79.2027	82.7228	86.2429	89.7631	93.2832	96.8033 (44)
Energy content (annual)	143.5565	125.5554	129.5620	112.9552	108.3833	93.5265	86.6661	99.4506	100.6383	117.2843	128.0249	139.0268 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1384.6298 (45)
	21.5335	18.8333	19.4343	16.9433	16.2575	14.0290	12.9999	14.9176	15.0957	17.5926	19.2037	20.8540 (46)

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	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	14.0901	12.7064	14.0357	13.5466	13.9717	13.4906	13.9213	13.9540	13.5211	14.0092	13.5994	14.0796	(61)
Total heat required for water heating calculated for each month	157.6466	138.2618	143.5976	126.5018	122.3550	107.0171	100.5874	113.4046	114.1594	131.2935	141.6244	153.1064	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h	157.6466	138.2618	143.5976	126.5018	122.3550	107.0171	100.5874	113.4046	114.1594	131.2935	141.6244	153.1064	(64)
Heat gains from water heating, kWh/month	51.2551	44.9238	46.5883	40.9443	39.5304	34.4702	32.2968	36.5558	36.8425	42.4993	45.9681	49.7463	(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	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.9223	16.8066	13.6680	10.3476	7.7349	6.5302	7.0561	9.1717	12.3103	15.6308	18.2434	19.4482	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.1570	201.2236	196.0158	184.9289	170.9337	157.7803	148.9929	146.9263	152.1341	163.2210	177.2161	190.3696	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	(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)	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	(71)
Water heating gains (Table 5)	68.8912	66.8509	62.6186	56.8670	53.1322	47.8753	43.4097	49.1342	51.1702	57.1227	63.8447	66.8633	(72)
Total internal gains	346.9513	344.8619	332.2833	312.1244	291.7817	272.1665	259.4395	265.2130	275.5954	295.9553	319.2850	336.6619	(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					
South			10.2200	46.7521	0.4500	0.0000	0.7700	165.5598 (78)				
Solar gains	165.5598	271.1443	345.3898	390.3654	406.7849	391.4751	382.4950	371.4557	360.8004	292.4546	196.2448	143.0589 (83)
Total gains	512.5111	616.0062	677.6730	702.4898	698.5666	663.6417	641.9345	636.6687	636.3958	588.4099	515.5299	479.7209 (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	78.1016	78.1016	78.1016	78.1016	78.1016	78.1016	78.1016	78.1016	78.1016	78.1016	78.1016	78.1016		
alpha	6.2068	6.2068	6.2068	6.2068	6.2068	6.2068	6.2068	6.2068	6.2068	6.2068	6.2068	6.2068		
util living area	0.9940	0.9817	0.9541	0.8936	0.7751	0.5960	0.4302	0.4530	0.6609	0.9027	0.9843	0.9959	(86)	
MIT	20.2454	20.4306	20.6292	20.8134	20.9387	20.9898	20.9988	20.9983	20.9808	20.8280	20.4880	20.1925	(87)	
Th 2	20.1767	20.1767	20.1767	20.1767	20.1767	20.1767	20.1767	20.1767	20.1767	20.1767	20.1767	20.1767	(88)	
util rest of house	0.9922	0.9764	0.9414	0.8657	0.7243	0.5242	0.3504	0.3729	0.5907	0.8715	0.9788	0.9947	(89)	
MIT 2	19.4930	19.6750	19.8661	20.0350	20.1382	20.1723	20.1764	20.1763	20.1675	20.0513	19.7330	19.4406	(90)	
Living area fraction	19.7640	19.9472	20.1410	20.3154	20.4265	20.4667	20.4726	20.4724	20.4604	20.3310	20.0049	19.7114	(92)	
MIT	19.6140	19.7972	19.9910	20.1654	20.2765	20.3167	20.3226	20.3224	20.3104	20.1810	19.8549	19.5614	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9906	0.9734	0.9380	0.8653	0.7308	0.5366	0.3646	0.3872	0.6025	0.8717	0.9761	0.9935	(94)
Useful gains	507.7051	599.6505	635.6884	607.8571	510.5439	356.1425	234.0610	246.4975	383.4055	512.8942	503.2307	476.5842	(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	964.0495	937.8112	849.2857	709.1801	539.9126	359.8789	234.3472	246.9209	390.9596	603.1459	802.9523	967.0339	(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	339.5202	227.2440	158.9164	72.9526	21.8504	0.0000	0.0000	0.0000	0.0000	67.1473	215.7996	364.8946	(98)
Space heating												1468.3250	(98)
Space heating per m2												20.7391	(99)

8c. Space cooling requirement

Not applicable

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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													1622.4586 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	339.5202	227.2440	158.9164	72.9526	21.8504	0.0000	0.0000	0.0000	0.0000	67.1473	215.7996	364.8946	(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)	375.1605	251.0983	175.5982	80.6106	24.1440	0.0000	0.0000	0.0000	0.0000	74.1959	238.4526	403.1984	(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	157.6466	138.2618	143.5976	126.5018	122.3550	107.0171	100.5874	113.4046	114.1594	131.2935	141.6244	153.1064	(64)
Efficiency of water heater	89.4602	89.2623	88.9523	88.4438	87.7702	87.3000	87.3000	87.3000	87.3000	88.3572	89.2044	87.3000	(216)
Fuel for water heating, kWh/month	176.2198	154.8938	161.4322	143.0307	139.4037	122.5854	115.2203	129.9021	130.7668	148.5941	158.7639	171.0112	(219)
Water heating fuel used												1751.8241	(219)
Annual totals kWh/year													
Space heating fuel - main system												1622.4586	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 6.2560, total flow = 34.0000, SFP = 0.1840)													
mechanical ventilation fans (SFP = 0.1840)													38.1436 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													113.1436 (231)
Electricity for lighting (calculated in Appendix L)													334.1731 (232)
Total delivered energy for all uses													3821.5995 (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	1622.4586	0.2160	350.4511	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1751.8241	0.2160	378.3940	(264)
Space and water heating			728.8451	(265)
Pumps and fans	113.1436	0.5190	58.7215	(267)
Energy for lighting	334.1731	0.5190	173.4359	(268)
Total CO2, kg/year			961.0025	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			13.5700	(273)

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

DER			13.5700	ZC1
Total Floor Area		TFA	70.8000	
Assumed number of occupants		N	2.2654	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			16.6690	ZC2
CO2 emissions from cooking, equation (L16)			2.4487	ZC3
Total CO2 emissions			32.6877	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			32.6877	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	70.8000 (1b)	x 2.4000 (2b)	= 169.9200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.9200 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1766 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4266 (18)
Number of sides sheltered					2 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3626 (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	0.4623	0.4532	0.4441	0.3988	0.3898	0.3444	0.3444	0.3354	0.3626	0.3898	0.4079	0.4260 (22b)
Effective ac	0.6069	0.6027	0.5986	0.5795	0.5760	0.5593	0.5593	0.5562	0.5657	0.5760	0.5832	0.5907 (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-03	43.1000	10.2200	32.8800	0.1800	5.9184		(29a)
WT-I-02	22.8000	2.1200	20.6800	0.1800	3.7224		(29a)
WT-I-11	17.0900		17.0900	0.1800	3.0762		(29a)
Total net area of external elements Aum, m ²			82.9900				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 28.3862		(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)							5.5611 (36)
Total fabric heat loss							(33) + (36) = 33.9473 (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	34.0283	33.7956	33.5676	32.4964	32.2960	31.3631	31.3631	31.1903	31.7224	32.2960	32.7014	33.1253 (38)
Heat transfer coeff	67.9756	67.7430	67.5149	66.4438	66.2434	65.3104	65.3104	65.1377	65.6698	66.2434	66.6488	67.0726 (39)
Average = Sum(39)m / 12 =												66.4428 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9601	0.9568	0.9536	0.9385	0.9356	0.9225	0.9225	0.9200	0.9275	0.9356	0.9414	0.9474 (40)
HLP (average)												0.9385 (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												2.2654 (42)
Average daily hot water use (litres/day)												88.0030 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.8033	93.2832	89.7631	86.2429	82.7228	79.2027	79.2027	82.7228	86.2429	89.7631	93.2832	96.8033 (44)
Energy conte	143.5565	125.5554	129.5620	112.9552	108.3833	93.5265	86.6661	99.4506	100.6383	117.2843	128.0249	139.0268 (45)
Energy content (annual)												Total = Sum(45)m = 1384.6298 (45)
Distribution loss (46)m = 0.15 x (45)m	21.5335	18.8333	19.4343	16.9433	16.2575	14.0290	12.9999	14.9176	15.0957	17.5926	19.2037	20.8540 (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)

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Combi loss	49.3299	42.9358	45.7423	42.5308	42.1546	39.0589	40.3608	42.1546	42.5308	45.7423	46.0027	49.3299 (61)
Total heat required for water heating calculated for each month	192.8864	168.4912	175.3042	155.4860	150.5379	132.5854	127.0269	141.6052	143.1691	163.0265	174.0276	188.3567 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	192.8864	168.4912	175.3042	155.4860	150.5379	132.5854	127.0269	141.6052	143.1691	163.0265	174.0276	188.3567 (64)
Heat gains from water heating, kWh/month	60.0650	52.4811	54.5149	48.1903	46.5761	40.8623	38.9067	43.6060	44.0949	50.4326	54.0690	58.5589 (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	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.9223	16.8066	13.6680	10.3476	7.7349	6.5302	7.0561	9.1717	12.3103	15.6308	18.2434	19.4482 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.1570	201.2236	196.0158	184.9289	170.9337	157.7803	148.9929	146.9263	152.1341	163.2210	177.2161	190.3696 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269 (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)	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156 (71)
Water heating gains (Table 5)	80.7325	78.0969	73.2727	66.9310	62.6023	56.7532	52.2939	58.6102	61.2430	67.7857	75.0958	78.7082 (72)
Total internal gains	358.7926	356.1079	342.9374	322.1883	301.2518	281.0444	268.3237	274.6891	285.6682	306.6183	330.5362	348.5068 (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
South					10.2200	46.7521	0.6300	0.7000			0.7700			146.0238 (78)
Solar gains	146.0238	239.1493	304.6338	344.3023	358.7843	345.2811	337.3606	327.6239	318.2259	257.9449	173.0879			126.1780 (83)
Total gains	504.8164	595.2572	647.5711	666.4906	660.0361	626.3255	605.6844	602.3129	603.8942	564.5632	503.6241			474.6848 (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	72.3299	72.5783	72.8234	73.9974	74.2213	75.2815	75.2815	75.4812	74.8695	74.2213	73.7698	73.3036
alpha	5.8220	5.8386	5.8549	5.9332	5.9481	6.0188	6.0188	6.0321	5.9913	5.9481	5.9180	5.8869
util living area	0.9950	0.9865	0.9680	0.9227	0.8250	0.6467	0.4716	0.4937	0.7116	0.9263	0.9874	0.9964 (86)
MIT	20.1304	20.3079	20.5156	20.7393	20.9012	20.9821	20.9976	20.9969	20.9677	20.7709	20.4083	20.0995 (87)
Th 2	20.1167	20.1195	20.1222	20.1349	20.1373	20.1484	20.1484	20.1505	20.1442	20.1373	20.1325	20.1274 (88)
util rest of house	0.9935	0.9825	0.9583	0.8995	0.7764	0.5693	0.3819	0.4046	0.6380	0.8995	0.9829	0.9953 (89)
MIT 2	18.9623	19.2210	19.5194	19.8379	20.0433	20.1367	20.1476	20.1492	20.1206	19.8867	19.3780	18.9254 (90)
Living area fraction	19.3830	19.6125	19.8782	20.1626	20.3523	20.4412	20.4537	20.4545	20.4257	20.2052	19.7491	19.3483 (92)
MIT	19.3830	19.6125	19.8782	20.1626	20.3523	20.4412	20.4537	20.4545	20.4257	20.2052	19.7491	19.3483 (93)
Temperature adjustment												0.0000
adjusted MIT	19.3830	19.6125	19.8782	20.1626	20.3523	20.4412	20.4537	20.4545	20.4257	20.2052	19.7491	19.3483 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9917	0.9795	0.9551	0.9003	0.7894	0.5967	0.4143	0.4368	0.6633	0.9019	0.9804	0.9939 (94)
Ext temp.	500.6411	583.0730	618.4728	600.0722	521.0128	373.7061	250.9420	263.0734	400.5391	509.1990	493.7305	471.8032 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Month fracti	1025.2768	996.6654	903.2298	748.3276	573.1587	381.4903	251.6886	264.1030	415.4075	636.2783	843.0455	1016.0352 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating per m2	390.3290	277.9341	211.8592	106.7439	38.7965	0.0000	0.0000	0.0000	0.0000	94.5470	251.5068	404.9086 (98)
												1776.6251 (98)
												25.0936 (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)
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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1902.1682 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	390.3290	277.9341	211.8592	106.7439	38.7965	0.0000	0.0000	0.0000	0.0000	94.5470	251.5068	404.9086	(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)	417.9111	297.5740	226.8300	114.2868	41.5380	0.0000	0.0000	0.0000	0.0000	101.2281	269.2793	433.5210	(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	192.8864	168.4912	175.3042	155.4860	150.5379	132.5854	127.0269	141.6052	143.1691	163.0265	174.0276	188.3567	(64)
Efficiency of water heater	86.7897	86.3031	85.5290	84.1260	82.1814	80.3000	80.3000	80.3000	80.3000	83.7340	85.9774	86.9286	(217)
Fuel for water heating, kWh/month	222.2458	195.2321	204.9646	184.8252	183.1775	165.1125	158.1904	176.3452	178.2928	194.6957	202.4108	216.6797	(219)
Water heating fuel used												2282.1723	(219)
Annual totals kWh/year													
Space heating fuel - main system												1902.1682	(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)													334.1731 (232)
Total delivered energy for all uses													4593.5136 (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	1902.1682	0.2160	410.8683 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2282.1723	0.2160	492.9492 (264)
Space and water heating			903.8175 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	334.1731	0.5190	173.4359 (268)
Total CO2, kg/m2/year			1116.1784 (272)
Emissions per m2 for space and water heating			12.7658 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4497 (272b)
Emissions per m2 for pumps and fans			0.5498 (272c)
Target Carbon Dioxide Emission Rate (TER) = (12.7658 * 1.00) + 2.4497 + 0.5498, rounded to 2 d.p.			15.7700 (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	70.8000 (1b)	x 2.4000 (2b)	= 169.9200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.9200 (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					3.0900
Number of sides sheltered					0.3311 (18)
					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.2814 (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	0.3588	0.3517	0.3447	0.3095	0.3025	0.2673	0.2673	0.2603	0.2814	0.3025	0.3166	0.3306 (22b)
Effective ac	0.5644	0.5619	0.5594	0.5479	0.5458	0.5357	0.5357	0.5339	0.5396	0.5458	0.5501	0.5547 (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-03	43.1000	10.2200	32.8800	0.1600	5.2608		(29a)
WT-I-02	22.8000	2.1200	20.6800	0.1584	3.2761		(29a)
WT-I-11	17.0900		17.0900	0.2719	4.6468		(29a)
Total net area of external elements Aum, m ²			82.9900				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	27.9330	(33)
Party Floor 1			70.8000				(32d)
Party Ceilings 1			70.8000				(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)							6.9824 (36)
Total fabric heat loss						(33) + (36) =	34.9154 (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	31.6458	31.5056	31.3683	30.7231	30.6023	30.0404	30.0404	29.9363	30.2569	30.6023	30.8466	31.1019 (38)
Heat transfer coeff	66.5612	66.4211	66.2837	65.6385	65.5178	64.9558	64.9558	64.8518	65.1723	65.5178	65.7620	66.0173 (39)
Average = Sum(39)m / 12 =												65.6379 (39)
HLP	0.9401	0.9382	0.9362	0.9271	0.9254	0.9175	0.9175	0.9160	0.9205	0.9254	0.9288	0.9324 (40)
HLP (average)												0.9271 (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												2.2654 (42)
Average daily hot water use (litres/day)												88.0030 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	96.8033	93.2832	89.7631	86.2429	82.7228	79.2027	79.2027	82.7228	86.2429	89.7631	93.2832	96.8033 (44)
Energy content (annual)	143.5565	125.5554	129.5620	112.9552	108.3833	93.5265	86.6661	99.4506	100.6383	117.2843	128.0249	139.0268 (45)
Distribution loss (46)m = 0.15 x (45)m												1384.6298 (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	30.5058	26.6805	27.5319	24.0030	23.0314	19.8744	18.4165	21.1332	21.3856	24.9229	27.2053	29.5432 (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	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.9223	16.8066	13.6680	10.3476	7.7349	6.5302	7.0561	9.1717	12.3103	15.6308	18.2434	19.4482	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.1570	201.2236	196.0158	184.9289	170.9337	157.7803	148.9929	146.9263	152.1341	163.2210	177.2161	190.3696	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	(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)	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	(71)
Water heating gains (Table 5)	41.0024	39.7032	37.0053	33.3375	30.9562	27.6033	24.7534	28.4049	29.7023	33.4985	37.7851	39.7086	(72)
Total internal gains	316.0624	314.7142	303.6699	285.5948	266.6058	248.8946	237.7832	241.4838	251.1275	269.3311	290.2255	306.5072	(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

South					10.2200	46.7521	0.4500	0.0000			0.7700			165.5598 (78)

Solar gains	165.5598	271.1443	345.3898	390.3654	406.7849	391.4751	382.4950	371.4557	360.8004	292.4546	196.2448	143.0589	(83)	
Total gains	481.6222	585.8585	649.0597	675.9602	673.3907	640.3697	620.2783	612.9394	611.9279	561.7857	486.4704	449.5662	(84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	73.8669	74.0227	74.1761	74.9052	75.0433	75.6925	75.6925	75.8139	75.4411	75.0433	74.7646	74.4755	
alpha	5.9245	5.9348	5.9451	5.9937	6.0029	6.0462	6.0462	6.0543	6.0294	6.0029	5.9843	5.9650	
util living area	0.9960	0.9871	0.9663	0.9162	0.8110	0.6316	0.4585	0.4835	0.7005	0.9257	0.9891	0.9973	(86)
MIT	20.1285	20.3224	20.5391	20.7582	20.9126	20.9844	20.9980	20.9973	20.9709	20.7768	20.4016	20.0874	(87)
Th 2	20.1335	20.1352	20.1368	20.1445	20.1460	20.1527	20.1527	20.1539	20.1501	20.1460	20.1431	20.1400	(88)
util rest of house	0.9947	0.9832	0.9563	0.8918	0.7614	0.5555	0.3714	0.3963	0.6274	0.8989	0.9852	0.9964	(89)
MIT 2	19.3407	19.5337	19.7459	19.9575	20.0898	20.1458	20.1522	20.1532	20.1357	19.9794	19.6199	19.3052	(90)
Living area fraction	19.6245	19.8178	20.0316	20.2459	20.3861	20.4478	20.4568	20.4572	fLA = Living area / (4) =	20.4365	20.2666	19.9015	0.3602 (91)
MIT	19.6245	19.8178	20.0316	20.2459	20.3861	20.4478	20.4568	20.4572	20.4365	20.2666	19.9015	19.5869	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6245	19.8178	20.0316	20.2459	20.3861	20.4478	20.4568	20.4572	20.4365	20.2666	19.9015	19.5869	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	478.6242	574.9867	619.7379	605.0004	522.7274	373.1100	249.9005	262.2162	399.5844	507.3836	478.5871	447.6219	(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	1020.0143	990.8557	896.9241	744.7277	569.0964	379.8513	250.5233	263.1160	412.9663	633.3332	841.8509	1015.8034	(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	402.7942	279.4640	206.2265	100.6036	34.4986	0.0000	0.0000	0.0000	0.0000	93.7065	261.5500	422.7271	(98)
Space heating												1801.5704	(98)
Space heating per m2												25.4459	(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	610.5847	480.6731	492.8733	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9541	0.9820	0.9790	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	582.5353	472.0245	482.5108	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	833.1555	808.0087	800.9617	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	180.4465	249.9722	236.9275	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												667.3462	(104)
Cooled fraction												1.0000	(105)

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

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	45.1116	62.4931	59.2319	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling												166.8366 (107)
Space cooling per m2												2.3564 (108)
Energy for space heating												25.4459 (99)
Energy for space cooling												2.3564 (108)
Total												27.8024 (109)
Dwelling Fabric Energy Efficiency (DFEE)												27.8 (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	70.8000 (1b)	x 2.4000 (2b)	= 169.9200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.9200 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1766 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4266 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3626 (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	0.4623	0.4532	0.4441	0.3988	0.3898	0.3444	0.3444	0.3354	0.3626	0.3898	0.4079	0.4260 (22b)
Effective ac	0.6069	0.6027	0.5986	0.5795	0.5760	0.5593	0.5593	0.5562	0.5657	0.5760	0.5832	0.5907 (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-03	43.1000	10.2200	32.8800	0.1800	5.9184		(29a)
WT-I-02	22.8000	2.1200	20.6800	0.1800	3.7224		(29a)
WT-I-11	17.0900		17.0900	0.1800	3.0762		(29a)
Total net area of external elements Aum, m ²			82.9900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.3862		(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)							5.5611 (36)
Total fabric heat loss						(33) + (36) =	33.9473 (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	34.0283	33.7956	33.5676	32.4964	32.2960	31.3631	31.3631	31.1903	31.7224	32.2960	32.7014	33.1253 (38)
Heat transfer coeff	67.9756	67.7430	67.5149	66.4438	66.2434	65.3104	65.3104	65.1377	65.6698	66.2434	66.6488	67.0726 (39)
Average = Sum(39)m / 12 =												66.4428 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9601	0.9568	0.9536	0.9385	0.9356	0.9225	0.9225	0.9200	0.9275	0.9356	0.9414	0.9474 (40)
HLP (average)												0.9385 (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												2.2654 (42)
Average daily hot water use (litres/day)												88.0030 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.8033	93.2832	89.7631	86.2429	82.7228	79.2027	79.2027	82.7228	86.2429	89.7631	93.2832	96.8033 (44)
Energy conte	143.5565	125.5554	129.5620	112.9552	108.3833	93.5265	86.6661	99.4506	100.6383	117.2843	128.0249	139.0268 (45)
Energy content (annual)												Total = Sum(45)m = 1384.6298 (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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	30.5058	26.6805	27.5319	24.0030	23.0314	19.8744	18.4165	21.1332	21.3856	24.9229	27.2053	29.5432 (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	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	113.2695	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.9223	16.8066	13.6680	10.3476	7.7349	6.5302	7.0561	9.1717	12.3103	15.6308	18.2434	19.4482	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.1570	201.2236	196.0158	184.9289	170.9337	157.7803	148.9929	146.9263	152.1341	163.2210	177.2161	190.3696	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	34.3269	(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)	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	(71)
Water heating gains (Table 5)	41.0024	39.7032	37.0053	33.3375	30.9562	27.6033	24.7534	28.4049	29.7023	33.4985	37.7851	39.7086	(72)
Total internal gains	316.0624	314.7142	303.6699	285.5948	266.6058	248.8946	237.7832	241.4838	251.1275	269.3311	290.2255	306.5072	(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

South					10.2200	46.7521	0.6300	0.7000			0.7700			146.0238 (78)

Solar gains	146.0238	239.1493	304.6338	344.3023	358.7843	345.2811	337.3606	327.6239	318.2259	257.9449	173.0879			126.1780 (83)
Total gains	462.0862	553.8635	608.3037	629.8971	625.3900	594.1756	575.1438	569.1077	569.3535	527.2760	463.3135			432.6852 (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	72.3299	72.5783	72.8234	73.9974	74.2213	75.2815	75.2815	75.4812	74.8695	74.2213	73.7698	73.3036	
alpha	5.8220	5.8386	5.8549	5.9332	5.9481	6.0188	6.0188	6.0321	5.9913	5.9481	5.9180	5.8869	
util living area	0.9968	0.9905	0.9757	0.9376	0.8496	0.6760	0.4958	0.5212	0.7440	0.9433	0.9917	0.9978	(86)
MIT	20.0731	20.2547	20.4698	20.7056	20.8830	20.9774	20.9969	20.9959	20.9592	20.7356	20.3561	20.0426	(87)
Th 2	20.1167	20.1195	20.1222	20.1349	20.1373	20.1484	20.1484	20.1505	20.1442	20.1373	20.1325	20.1274	(88)
util rest of house	0.9958	0.9875	0.9680	0.9176	0.8039	0.5974	0.4019	0.4278	0.6707	0.9211	0.9885	0.9971	(89)
MIT 2	19.2717	19.4540	19.6670	19.9024	20.0598	20.1382	20.1476	20.1493	20.1233	19.9356	19.5663	19.2503	(90)
Living area fraction	19.5603	19.7424	19.9561	20.1917	20.3563	20.4404	20.4535	20.4542	20.4244	20.2238	19.8508	19.5356	(91)
MIT	19.5603	19.7424	19.9561	20.1917	20.3563	20.4404	20.4535	20.4542	20.4244	20.2238	19.8508	19.5356	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5603	19.7424	19.9561	20.1917	20.3563	20.4404	20.4535	20.4542	20.4244	20.2238	19.8508	19.5356	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	459.7647	546.0789	587.7933	578.9271	510.5952	371.5192	250.6940	262.6979	396.2431	487.0436	457.4091	431.1495	(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	1037.3310	1005.4660	908.4904	750.2646	573.4203	381.4416	251.6754	264.0828	415.3209	637.5105	849.8231	1028.6020	(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	429.7093	308.7081	238.5987	123.3630	46.7419	0.0000	0.0000	0.0000	0.0000	111.9474	282.5381	444.5046	(98)
Space heating												1986.1112	(98)
Space heating per m2												28.0524	(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	613.9181	483.2972	495.0463	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9378	0.9744	0.9706	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	575.7380	470.9076	480.5080	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	779.1624	755.2542	749.7298	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	146.4656	211.5538	200.3010	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												558.3205	(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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	36.6164	52.8885	50.0753	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling													139.5801 (107)
Space cooling per m2													1.9715 (108)
Energy for space heating													28.0524 (99)
Energy for space cooling													1.9715 (108)
Total													30.0239 (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	70.8000 (1b)	x 2.4000 (2b)	= 169.9200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.9200 (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) =					Air changes per hour
Pressure test					0.0000 / (5) = 0.0000 (8)
Measured/design AP50					Yes
Infiltration rate					3.0900
Number of sides sheltered					0.1545 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.1313 (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	0.1379	0.1313	0.1313	0.1215	0.1215	0.1083	0.1116	0.1051	0.1083	0.1149	0.1149	0.1248 (22b)
Mechanical extract ventilation - decentralised												0.1248 (22b)
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-03	43.1000	10.2200	32.8800	0.1600	5.2608		(29a)
WT-I-02	22.8000	2.1200	20.6800	0.1584	3.2761		(29a)
WT-I-11	17.0900		17.0900	0.2719	4.6468		(29a)
Total net area of external elements Aum(A, m ²)			82.9900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.9330		(33)
Party Floor 1			70.8000				(32d)
Party Ceilings 1			70.8000				(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)							6.9824 (36)
Total fabric heat loss						(33) + (36) =	34.9154 (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	28.0368	28.0368	28.0368	28.0368	28.0368	28.0368	28.0368	28.0368	28.0368	28.0368	28.0368	28.0368 (38)
Heat transfer coeff	62.9522	62.9522	62.9522	62.9522	62.9522	62.9522	62.9522	62.9522	62.9522	62.9522	62.9522	62.9522 (39)
Average = Sum(39)m / 12 =												62.9522 (39)
HLP	0.8892	0.8892	0.8892	0.8892	0.8892	0.8892	0.8892	0.8892	0.8892	0.8892	0.8892	0.8892 (40)
HLP (average)												0.8892 (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												2.2654 (42)
Average daily hot water use (litres/day)												88.0030 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.8033	93.2832	89.7631	86.2429	82.7228	79.2027	79.2027	82.7228	86.2429	89.7631	93.2832	96.8033 (44)
Energy conte	143.5565	125.5554	129.5620	112.9552	108.3833	93.5265	86.6661	99.4506	100.6383	117.2843	128.0249	139.0268 (45)
Energy content (annual)										Total = Sum(45)m =		1384.6298 (45)
Distribution loss (46)m = 0.15 x (45)m	21.5335	18.8333	19.4343	16.9433	16.2575	14.0290	12.9999	14.9176	15.0957	17.5926	19.2037	20.8540 (46)

Southern Energy Consultants
Energy & Sustainability Solutions

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	14.0901	12.7064	14.0357	13.5466	13.9717	13.4906	13.9213	13.9540	13.5211	14.0092	13.5994	14.0796 (61)
Total heat required for water heating calculated for each month	157.6466	138.2618	143.5976	126.5018	122.3550	107.0171	100.5874	113.4046	114.1594	131.2935	141.6244	153.1064 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	157.6466	138.2618	143.5976	126.5018	122.3550	107.0171	100.5874	113.4046	114.1594	131.2935	141.6244	153.1064 (64)
RHI water heating demand	Total per year (kWh/year) = Sum(64)m = 1549.5555 (64)											
Heat gains from water heating, kWh/month	51.2551	44.9238	46.5883	40.9443	39.5304	34.4702	32.2968	36.5558	36.8425	42.4993	45.9681	49.7463 (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	70.8000 (1b)	x 2.4000 (2b)	= 169.9200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.9200 (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) =					Air changes per hour
Pressure test					0.0000 / (5) = 0.0000 (8)
Measured/design AP50					Yes
Infiltration rate					3.0900
Number of sides sheltered					0.1545 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.1313 (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	0.1674	0.1642	0.1609	0.1445	0.1412	0.1248	0.1248	0.1215	0.1313	0.1412	0.1477	0.1543 (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-03	43.1000	10.2200	32.8800	0.1600	5.2608		(29a)
WT-I-02	22.8000	2.1200	20.6800	0.1584	3.2761		(29a)
WT-I-11	17.0900		17.0900	0.2719	4.6468		(29a)
Total net area of external elements Aum(A, m ²)			82.9900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.9330		(33)
Party Floor 1			70.8000				(32d)
Party Ceilings 1			70.8000				(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)							6.9824 (36)
Total fabric heat loss						(33) + (36) =	34.9154 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	28.0368	28.0368	28.0368	28.0368	28.0368	28.0368	28.0368	28.0368	28.0368	28.0368	28.0368	28.0368 (38)
Heat transfer coeff	62.9522	62.9522	62.9522	62.9522	62.9522	62.9522	62.9522	62.9522	62.9522	62.9522	62.9522	62.9522 (39)
Average = Sum(39)m / 12 =												62.9522 (39)
HLP	0.8892	0.8892	0.8892	0.8892	0.8892	0.8892	0.8892	0.8892	0.8892	0.8892	0.8892	0.8892 (40)
HLP (average)												0.8892 (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												2.2654 (42)
Average daily hot water use (litres/day)												88.0030 (43)
Daily hot water use	96.8033	93.2832	89.7631	86.2429	82.7228	79.2027	79.2027	82.7228	86.2429	89.7631	93.2832	96.8033 (44)
Energy conte	143.5565	125.5554	129.5620	112.9552	108.3833	93.5265	86.6661	99.4506	100.6383	117.2843	128.0249	139.0268 (45)
Energy content (annual)										Total = Sum(45)m =		1384.6298 (45)
Distribution loss (46)m = 0.15 x (45)m	21.5335	18.8333	19.4343	16.9433	16.2575	14.0290	12.9999	14.9176	15.0957	17.5926	19.2037	20.8540 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	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	14.0901	12.7064	14.0357	13.5466	13.9717	13.4906	13.9213	13.9540	13.5211	14.0092	13.5994	14.0796	(61)
Total heat required for water heating calculated for each month	157.6466	138.2618	143.5976	126.5018	122.3550	107.0171	100.5874	113.4046	114.1594	131.2935	141.6244	153.1064	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h	157.6466	138.2618	143.5976	126.5018	122.3550	107.0171	100.5874	113.4046	114.1594	131.2935	141.6244	153.1064	(64)
Heat gains from water heating, kWh/month	51.2551	44.9238	46.5883	40.9443	39.5304	34.4702	32.2968	36.5558	36.8425	42.4993	45.9681	49.7463	(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	135.9234	135.9234	135.9234	135.9234	135.9234	135.9234	135.9234	135.9234	135.9234	135.9234	135.9234	135.9234	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	47.3057	42.0165	34.1701	25.8690	19.3373	16.3254	17.6402	22.9294	30.7757	39.0769	45.6085	48.6204	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	297.2492	300.3337	292.5608	276.0133	255.1250	235.4929	222.3775	219.2930	227.0659	243.6134	264.5017	284.1338	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.8577	50.8577	50.8577	50.8577	50.8577	50.8577	50.8577	50.8577	50.8577	50.8577	50.8577	50.8577	(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)	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	(71)
Water heating gains (Table 5)	68.8912	66.8509	62.6186	56.8670	53.1322	47.8753	43.4097	49.1342	51.1702	57.1227	63.8447	66.8633	(72)
Total internal gains	512.6116	508.3665	488.5151	457.9148	426.7601	398.8591	382.5928	390.5220	408.1773	438.9785	473.1204	498.7830	(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

South					10.2200	46.7521	0.4500	0.0000			0.7700			165.5598 (78)

Solar gains	165.5598	271.1443	345.3898	390.3654	406.7849	391.4751	382.4950	371.4557	360.8004	292.4546	196.2448	143.0589	(83)	
Total gains	678.1714	779.5109	833.9048	848.2802	833.5450	790.3342	765.0879	761.9777	768.9777	731.4331	669.3652	641.8419	(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	78.1016	78.1016	78.1016	78.1016	78.1016	78.1016	78.1016	78.1016	78.1016	78.1016	78.1016	78.1016	
alpha	6.2068	6.2068	6.2068	6.2068	6.2068	6.2068	6.2068	6.2068	6.2068	6.2068	6.2068	6.2068	
util living area	0.9756	0.9467	0.8970	0.8109	0.6771	0.5059	0.3616	0.3795	0.5577	0.8093	0.9479	0.9818	(86)
MIT	20.4573	20.6162	20.7705	20.8971	20.9706	20.9958	20.9996	20.9994	20.9923	20.9126	20.6650	20.4047	(87)
Th 2	20.1767	20.1767	20.1767	20.1767	20.1767	20.1767	20.1767	20.1767	20.1767	20.1767	20.1767	20.1767	(88)
util rest of house	0.9692	0.9340	0.8746	0.7743	0.6251	0.4426	0.2942	0.3119	0.4942	0.7662	0.9332	0.9768	(89)
MIT 2	19.7001	19.8514	19.9934	20.1029	20.1592	20.1750	20.1766	20.1766	20.1732	20.1176	19.9002	19.6492	(90)
Living area fraction									fLA = Living area / (4) =			0.3602	(91)
MIT	19.9728	20.1269	20.2733	20.3889	20.4515	20.4706	20.4730	20.4729	20.4682	20.4039	20.1757	19.9213	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.8228	19.9769	20.1233	20.2389	20.3015	20.3206	20.3230	20.3229	20.3182	20.2539	20.0257	19.7713	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9658	0.9305	0.8730	0.7773	0.6332	0.4538	0.3062	0.3239	0.5052	0.7705	0.9301	0.9738	(94)
Useful gains	655.0076	725.3595	728.0127	659.3460	527.8308	358.6272	234.2667	246.8031	388.5186	563.5681	622.5720	625.0505	(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	977.1977	949.1219	857.6158	713.8115	541.4817	360.1237	234.3719	246.9563	391.4496	607.7358	813.6992	980.2478	(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	239.7094	150.3683	96.4247	39.2151	10.1563	0.0000	0.0000	0.0000	0.0000	32.8608	137.6116	264.2668	(98)
Space heating												970.6130	(98)
Space heating per m2											(98) / (4) =	13.7092	(99)

8c. Space cooling requirement

Not applicable

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													1072.5006 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	239.7094	150.3683	96.4247	39.2151	10.1563	0.0000	0.0000	0.0000	0.0000	32.8608	137.6116	264.2668	(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)	264.8722	166.1529	106.5467	43.3317	11.2224	0.0000	0.0000	0.0000	0.0000	36.3103	152.0570	292.0075	(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	157.6466	138.2618	143.5976	126.5018	122.3550	107.0171	100.5874	113.4046	114.1594	131.2935	141.6244	153.1064	(64)
Efficiency of water heater (217)m	89.2028	88.9383	88.5580	88.0366	87.5372	87.3000	87.3000	87.3000	87.3000	87.9223	88.8482	87.3000	(216)
Fuel for water heating, kWh/month	176.7283	155.4580	162.1510	143.6923	139.7748	122.5854	115.2203	129.9021	130.7668	149.3289	159.4003	171.4531	(219)
Water heating fuel used												1756.4616	(219)
Annual totals kWh/year													
Space heating fuel - main system												1072.5006	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 6.2560, total flow = 34.0000, SFP = 0.1840)													
mechanical ventilation fans (SFP = 0.1840)												38.1436	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												113.1436	(231)
Electricity for lighting (calculated in Appendix L)												334.1731	(232)
Total delivered energy for all uses												3276.2789	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1072.5006	3.4800	37.3230 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1756.4616	3.4800	61.1249 (247)
Mechanical ventilation fans	38.1436	13.1900	5.0311 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	334.1731	13.1900	44.0774 (250)
Additional standing charges			120.0000 (251)
Total energy cost			277.4490 (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] = 1.0063 (257)
SAP value	85.9622
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	1072.5006	0.2160	231.6601 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1756.4616	0.2160	379.3957 (264)
Space and water heating			611.0558 (265)
Pumps and fans	113.1436	0.5190	58.7215 (267)
Energy for lighting	334.1731	0.5190	173.4359 (268)
Total kg/year			843.2132 (272)
CO2 emissions per m2			11.9100 (273)
EI value			90.2426
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	$3.48 / 0.8813 = 3.949$, stars = 4
Water heating environmental impact	$0.216 / 0.8813 = 0.2451$, 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	70.8000 (1b)	x 2.4000 (2b)	= 169.9200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.9200 (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) =					Air changes per hour
Pressure test					0.0000 / (5) = 0.0000 (8)
Measured/design AP50					Yes
Infiltration rate					3.0900
Number of sides sheltered					0.1545 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.1313 (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	0.1379	0.1313	0.1313	0.1215	0.1215	0.1083	0.1116	0.1051	0.1083	0.1149	0.1149	0.1248 (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-03	43.1000	10.2200	32.8800	0.1600	5.2608		(29a)
WT-I-02	22.8000	2.1200	20.6800	0.1584	3.2761		(29a)
WT-I-11	17.0900		17.0900	0.2719	4.6468		(29a)
Total net area of external elements Aum(A, m ²)			82.9900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.9330		(33)
Party Floor 1			70.8000				(32d)
Party Ceilings 1			70.8000				(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)							6.9824 (36)
Total fabric heat loss						(33) + (36) =	34.9154 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	28.0368	28.0368	28.0368	28.0368	28.0368	28.0368	28.0368	28.0368	28.0368	28.0368	28.0368	28.0368 (38)
Heat transfer coeff	62.9522	62.9522	62.9522	62.9522	62.9522	62.9522	62.9522	62.9522	62.9522	62.9522	62.9522	62.9522 (39)
Average = Sum(39)m / 12 =												62.9522 (39)
HLP	0.8892	0.8892	0.8892	0.8892	0.8892	0.8892	0.8892	0.8892	0.8892	0.8892	0.8892	0.8892 (40)
HLP (average)												0.8892 (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												2.2654 (42)
Average daily hot water use (litres/day)												88.0030 (43)
Daily hot water use	96.8033	93.2832	89.7631	86.2429	82.7228	79.2027	79.2027	82.7228	86.2429	89.7631	93.2832	96.8033 (44)
Energy conte	143.5565	125.5554	129.5620	112.9552	108.3833	93.5265	86.6661	99.4506	100.6383	117.2843	128.0249	139.0268 (45)
Energy content (annual)										Total = Sum(45)m =		1384.6298 (45)
Distribution loss (46)m = 0.15 x (45)m	21.5335	18.8333	19.4343	16.9433	16.2575	14.0290	12.9999	14.9176	15.0957	17.5926	19.2037	20.8540 (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	14.0901	12.7064	14.0357	13.5466	13.9717	13.4906	13.9213	13.9540	13.5211	14.0092	13.5994	14.0796 (61)
Total heat required for water heating calculated for each month	157.6466	138.2618	143.5976	126.5018	122.3550	107.0171	100.5874	113.4046	114.1594	131.2935	141.6244	153.1064 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	157.6466	138.2618	143.5976	126.5018	122.3550	107.0171	100.5874	113.4046	114.1594	131.2935	141.6244	153.1064 (64)
Heat gains from water heating, kWh/month	51.2551	44.9238	46.5883	40.9443	39.5304	34.4702	32.2968	36.5558	36.8425	42.4993	45.9681	49.7463 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	135.9234	135.9234	135.9234	135.9234	135.9234	135.9234	135.9234	135.9234	135.9234	135.9234	135.9234	135.9234 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	47.3057	42.0165	34.1701	25.8690	19.3373	16.3254	17.6402	22.9294	30.7757	39.0769	45.6085	48.6204 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	297.2492	300.3337	292.5608	276.0133	255.1250	235.4929	222.3775	219.2930	227.0659	243.6134	264.5017	284.1338 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.8577	50.8577	50.8577	50.8577	50.8577	50.8577	50.8577	50.8577	50.8577	50.8577	50.8577	50.8577 (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)	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156	-90.6156 (71)
Water heating gains (Table 5)	68.8912	66.8509	62.6186	56.8670	53.1322	47.8753	43.4097	49.1342	51.1702	57.1227	63.8447	66.8633 (72)
Total internal gains	512.6116	508.3665	488.5151	457.9148	426.7601	398.8591	382.5928	390.5220	408.1773	438.9785	473.1204	498.7830 (73)

[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			
South				10.2200	50.9848	0.4500	0.0000	0.7700	180.5490 (78)			
Solar gains	180.5490	265.3663	333.3669	389.6318	398.2891	411.8829	397.3472	392.0371	377.7133	305.2939	219.0656	154.6394 (83)
Total gains	693.1606	773.7329	821.8819	847.5466	825.0491	810.7420	779.9401	782.5592	785.8906	744.2725	692.1860	653.4224 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nll,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	78.1016	78.1016	78.1016	78.1016	78.1016	78.1016	78.1016	78.1016	78.1016	78.1016	78.1016	78.1016
alpha	6.2068	6.2068	6.2068	6.2068	6.2068	6.2068	6.2068	6.2068	6.2068	6.2068	6.2068	6.2068
util living area	0.9662	0.9380	0.8782	0.7663	0.5990	0.3876	0.2502	0.2574	0.4625	0.7465	0.9222	0.9742 (86)
MIT	20.5387	20.6606	20.8129	20.9314	20.9869	20.9992	21.0000	21.0000	20.9977	20.9497	20.7493	20.4926 (87)
Th 2	20.1767	20.1767	20.1767	20.1767	20.1767	20.1767	20.1767	20.1767	20.1767	20.1767	20.1767	20.1767 (88)
util rest of house	0.9572	0.9231	0.8518	0.7239	0.5416	0.3241	0.1838	0.1912	0.3979	0.6953	0.9011	0.9671 (89)
MIT 2	19.7790	19.8935	20.0315	20.1302	20.1699	20.1765	20.1767	20.1767	20.1759	20.1455	19.9778	19.7350 (90)
Living area fraction												0.3602 (91)
MIT	20.0526	20.1698	20.3129	20.4188	20.4641	20.4728	20.4732	20.4732	20.4718	20.4351	20.2557	20.0078 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.9026	20.0198	20.1629	20.2688	20.3141	20.3228	20.3232	20.3232	20.3218	20.2851	20.1057	19.8578 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9537	0.9199	0.8513	0.7289	0.5514	0.3354	0.1956	0.2030	0.4093	0.7024	0.8990	0.9637 (94)
Useful gains	661.0641	711.7488	699.6578	617.7488	454.9086	271.9252	152.5427	158.8362	321.6758	522.7541	622.3086	629.7281 (95)
Ext. temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	931.8567	907.7560	803.4549	652.7362	460.4401	272.1316	152.5476	158.8426	322.4313	546.7479	762.0790	929.0372 (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	201.4697	131.7168	77.2250	25.1909	4.1154	0.0000	0.0000	0.0000	0.0000	17.8514	100.6347	222.6860 (98)
Space heating												780.8899 (98)
Space heating per m2										(98) / (4) =		11.0295 (99)

Not applicable

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	862.8618 (211)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	201.4697	131.7168	77.2250	25.1909	4.1154	0.0000	0.0000	0.0000	0.0000	17.8514	100.6347	222.6860 (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)	222.6184	145.5435	85.3315	27.8353	4.5475	0.0000	0.0000	0.0000	0.0000	19.7253	111.1985	246.0618 (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	157.6466	138.2618	143.5976	126.5018	122.3550	107.0171	100.5874	113.4046	114.1594	131.2935	141.6244	153.1064 (64)
Efficiency of water heater (217)m	89.0668	88.8324	88.3930	87.8156	87.4006	87.3000	87.3000	87.3000	87.3000	87.6710	88.6014	87.3000 (216)
Fuel for water heating, kWh/month	176.9981	155.6434	162.4536	144.0539	139.9934	122.5854	115.2203	129.9021	130.7668	149.7570	159.8444	171.7048 (219)
Water heating fuel used												1758.9232 (219)
Annual totals kWh/year												
Space heating fuel - main system												862.8618 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(MEV)Decentralised, Database: total watage = 6.2560, total flow = 34.0000, SFP = 0.1840)												
mechanical ventilation fans (SFP = 0.1840)												38.1436 (230a)
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												113.1436 (231)
Electricity for lighting (calculated in Appendix L)												334.1731 (232)
Total delivered energy for all uses												3069.1017 (238)

10a. Fuel costs - using BEDF prices (478)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	862.8618	3.8700	33.3928 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1758.9232	3.8700	68.0703 (247)
Mechanical ventilation fans	38.1436	18.9000	7.2091 (249)
Pumps and fans for heating	75.0000	18.9000	14.1750 (249)
Energy for lighting	334.1731	18.9000	63.1587 (250)
Additional standing charges			93.0000 (251)
Total energy cost			279.0059 (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	862.8618	0.2160	186.3782 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1758.9232	0.2160	379.9274 (264)
Space and water heating			566.3056 (265)
Pumps and fans	113.1436	0.5190	58.7215 (267)
Energy for lighting	334.1731	0.5190	173.4359 (268)
Total kg/year			798.4630 (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	862.8618	1.2200	1052.6914 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1758.9232	1.2200	2145.8863 (264)
Space and water heating			3198.5777 (265)
Pumps and fans	113.1436	3.0700	347.3510 (267)
Energy for lighting	334.1731	3.0700	1025.9115 (268)
Primary energy kWh/year			4571.8401 (272)
Primary energy kWh/m2/year			64.5740 (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 478 TEST (27 May 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	£85	£85	£0
Mains gas	£194	£194	£0
Space heating	£148	£148	£0
Water heating	£68	£68	£0
Lighting	£63	£63	£0
Total cost of fuels	£279	£279	£0
Total cost of uses	£279	£279	£0
Delivered energy	43 kWh/m²	43 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.8 tonnes	0.8 tonnes	0.0 tonnes
CO2 emissions per m²	11 kg/m²	11 kg/m²	0 kg/m²
Primary energy	65 kWh/m²	65 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	EndTerrace Flat
Number of storeys	1
Cross ventilation possible	Yes
SAP Region	Thames Valley
Front of dwelling faces	North
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	336.44 (P1)
Transmission heat loss coefficient	34.92 (P7)
Summer heat loss coefficient	371.36 (P2)

Overhangs	Ratio	Z_overhangs	Overhang type	
Orientation				
South	0.000	1.000	None	
Solar shading				
Orientation	Z blinds	Solar access	Z overhangs	Z summer
South	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
South	10.2200	112.2060	0.4500	0.0000
total:				464.4318

Solar gains	Jun	Jul	Aug	
Internal gains	481	464	458	(P4)
Total summer gains	396	380	388	
	877	844	846	(P5)
Summer gain/loss ratio	2.36	2.27	2.28	(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	18.61	20.42	20.33	(P7)
Likelihood of high internal temperature	Not significant	Not significant	Not significant	
Assessment of likelihood of high internal temperature:	Not significant			