

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



Property Reference	SECPMW025p_057_As_Built				Issued on Date	22/11/2021
Assessment Reference	001	Prop Type Ref	MFF			
Property						
SAP Rating	83 B	DER	19.15	TER	20.01	
Environmental	86 B	% DER<TER	4.28			
CO ₂ Emissions (t/year)	1.11	DFEE	50.60	TFEE	56.03	
General Requirements Compliance	Pass	% DFEE<TFEE	9.69			
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 70 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) 20.01 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 19.15 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 56.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 50.6 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.25 (max. 0.30)	0.29 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.24 (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: 3.85 (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 East: 9.04 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 3.9 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	70.2400 (1b)	x 2.4000 (2b)	= 168.5760 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 168.5760 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					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					3.8500
Infiltration rate					0.1925 (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) =				0.1492 (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	0.1902	0.1865	0.1828	0.1641	0.1604	0.1417	0.1417	0.1380	0.1492	0.1604	0.1678	0.1753 (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)			9.0400	1.2357	11.1711		(27)
FT-03			70.2400	0.1247	8.7556		(28b)
WT-E-01	35.5700	9.0400	26.5300	0.2000	5.3060		(29a)
WT-I-01	27.7900	2.1200	25.6700	0.2890	7.4184		(29a)
WT-I-11	12.7200		12.7200	0.2719	3.4586		(29a)
Total net area of external elements Aum(A, m ²)					146.3200		(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	38.2297	(33)
Party Wall 1				11.5200	0.0000	0.0000	(32)
Party Ceilings 1				70.2400			(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)							16.3770 (36)
Total fabric heat loss							(33) + (36) = 54.6067 (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	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150 (38)
Heat transfer coeff	82.4217	82.4217	82.4217	82.4217	82.4217	82.4217	82.4217	82.4217	82.4217	82.4217	82.4217	82.4217 (39)
Average = Sum(39)m / 12 =												82.4217 (39)
HLP	1.1734	1.1734	1.1734	1.1734	1.1734	1.1734	1.1734	1.1734	1.1734	1.1734	1.1734	1.1734 (40)
HLP (average)												1.1734 (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												2.2519 (42)
Average daily hot water use (litres/day)												87.6835 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	96.4519	92.9445	89.4372	85.9298	82.4225	78.9152	78.9152	82.4225	85.9298	89.4372	92.9445	96.4519 (44)
Energy conte	143.0353	125.0996	129.0916	112.5452	107.9898	93.1870	86.3514	99.0895	100.2730	116.8585	127.5602	138.5221 (45)
Energy content (annual)												Total = Sum(45)m = 1379.6031 (45)
Distribution loss (46)m = 0.15 x (45)m												

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	21.4553	18.7649	19.3637	16.8818	16.1985	13.9780	12.9527	14.8634	15.0409	17.5288	19.1340	20.7783 (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	14.0877	12.7043	14.0337	13.5449	13.9702	13.4893	13.9201	13.9526	13.5196	14.0074	13.5973	14.0772 (61)
Total heat required for water heating calculated for each month	157.1230	137.8039	143.1252	126.0901	121.9600	106.6763	100.2715	113.0421	113.7926	130.8659	141.1575	152.5993 (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	157.1230	137.8039	143.1252	126.0901	121.9600	106.6763	100.2715	113.0421	113.7926	130.8659	141.1575	152.5993 (64)
								Total per year (kWh/year) = Sum(64)m =				1544.5074 (64)
Heat gains from water heating, kWh/month	51.0812	44.7717	46.4314	40.8075	39.3991	34.3570	32.1919	36.4354	36.7207	42.3573	45.8131	49.5779 (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	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.2771	17.1218	13.9244	10.5416	7.8800	6.6526	7.1884	9.3438	12.5412	15.9239	18.5855	19.8129	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.8566	199.9097	194.7359	183.7214	169.8176	156.7500	148.0201	145.9669	151.1408	162.1552	176.0590	189.1266	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	(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)	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	(71)
Water heating gains (Table 5)	68.6575	66.6246	62.4078	56.6771	52.9558	47.7180	43.2687	48.9723	51.0009	56.9318	63.6293	66.6370	(72)
Total internal gains	345.5702	343.4351	330.8470	310.7192	290.4325	270.8998	258.2562	264.0621	274.4619	294.7900	318.0529	335.3555	(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

East					9.0400	19.6403	0.4500	0.0000			0.7700			61.5204 (76)

Solar gains	61.5204	120.3469	198.1942	289.0544	354.2471	362.6349	345.2432	296.5588	230.5081	142.8017	76.7087	50.5914	(83)	
Total gains	407.0906	463.7820	529.0413	599.7736	644.6796	633.5347	603.4994	560.6209	504.9700	437.5918	394.7616	385.9469	(84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.1807	59.1807	59.1807	59.1807	59.1807	59.1807	59.1807	59.1807	59.1807	59.1807	59.1807	59.1807	
alpha	4.9454	4.9454	4.9454	4.9454	4.9454	4.9454	4.9454	4.9454	4.9454	4.9454	4.9454	4.9454	
util living area	0.9983	0.9964	0.9900	0.9661	0.8949	0.7477	0.5806	0.6412	0.8771	0.9821	0.9966	0.9987	(86)
MIT	19.7085	19.8485	20.1062	20.4437	20.7476	20.9284	20.9837	20.9738	20.8325	20.4309	19.9985	19.6696	(87)
Th 2	19.9413	19.9413	19.9413	19.9413	19.9413	19.9413	19.9413	19.9413	19.9413	19.9413	19.9413	19.9413	(88)
util rest of house	0.9977	0.9951	0.9863	0.9527	0.8528	0.6553	0.4512	0.5105	0.8114	0.9726	0.9952	0.9983	(89)
MIT 2	18.7657	18.9052	19.1611	19.4904	19.7689	19.9079	19.9372	19.9338	19.8458	19.4829	19.0552	18.7269	(90)
Living area fraction	19.0650	19.2047	19.4611	19.7931	20.0796	20.2319	20.2694	20.2640	20.1591	19.7839	19.3547	19.0262	(91)
MIT	18.9150	19.0547	19.3111	19.6431	19.9296	20.0819	20.1194	20.1140	20.0091	19.6339	19.2047	18.8762	(92)
Temperature adjustment												-0.1500	
adjusted MIT													(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	405.8280	460.8525	520.2417	568.5020	549.4069	423.7019	286.0010	298.9443	412.2645	423.9935	392.3179	385.0209	(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	1204.5929	1166.6550	1055.9136	885.4617	678.2993	451.8277	290.0761	306.1121	487.0361	744.5882	997.6899	1209.6364	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	594.2811	474.2993	398.5399	228.2109	95.8960	0.0000	0.0000	0.0000	0.0000	238.5224	435.8679	613.5139	(98)
Space heating												3079.1314	(98)
Space heating per m ²												43.8373	(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													3402.3551 (211)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	594.2811	474.2993	398.5399	228.2109	95.8960	0.0000	0.0000	0.0000	0.0000	238.5224	435.8679	613.5139	(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)	656.6642	524.0876	440.3756	252.1668	105.9624	0.0000	0.0000	0.0000	0.0000	263.5607	481.6220	677.9159	(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	157.1230	137.8039	143.1252	126.0901	121.9600	106.6763	100.2715	113.0421	113.7926	130.8659	141.1575	152.5993	(64)
Efficiency of water heater (217)m	89.8116	89.7593	89.6319	89.3346	88.6803	87.3000	87.3000	87.3000	87.3000	89.3398	89.6957	89.8440	(216)
Fuel for water heating, kWh/month	174.9473	153.5261	159.6812	141.1436	137.5278	122.1950	114.8586	129.4869	130.3466	146.4810	157.3738	169.8491	(219)
Water heating fuel used												1737.4170	(219)
Annual totals kWh/year													
Space heating fuel - main system												3402.3551	(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)													37.8419 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													112.8419 (231)
Electricity for lighting (calculated in Appendix L)													340.4401 (232)
Total delivered energy for all uses													5593.0542 (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	3402.3551	0.2160	734.9087 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1737.4170	0.2160	375.2821 (264)
Space and water heating			1110.1908 (265)
Pumps and fans	112.8419	0.5190	58.5650 (267)
Energy for lighting	340.4401	0.5190	176.6884 (268)
Total CO2, kg/year			1345.4442 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			19.1500 (273)

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

DER			19.1500 ZC1
Total Floor Area		TFA	70.2400
Assumed number of occupants		N	2.2519
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			16.6921 ZC2
CO2 emissions from cooking, equation (L16)			2.4636 ZC3
Total CO2 emissions			38.3058 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			38.3058 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	70.2400 (1b)	x 2.4000 (2b)	= 168.5760 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 168.5760 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					30.0000 / (5) = 0.1780 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4280 (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) =				0.3317 (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	0.4229	0.4146	0.4063	0.3648	0.3565	0.3151	0.3151	0.3068	0.3317	0.3565	0.3731	0.3897 (22b)
	0.5894	0.5859	0.5825	0.5666	0.5636	0.5496	0.5496	0.5471	0.5550	0.5636	0.5696	0.5759 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.1200	1.0000	2.1200			(26)				
TER Opening Type (Uw = 1.40)			9.0400	1.3258	11.9848			(27)				
FT-03			70.2400	0.1300	9.1312			(28b)				
WT-E-01	35.5700	9.0400	26.5300	0.1800	4.7754			(29a)				
WT-I-01	27.7900	2.1200	25.6700	0.1800	4.6206			(29a)				
WT-I-11	12.7200		12.7200	0.1800	2.2896			(29a)				
Total net area of external elements Aum(A, m2)			146.3200					(31)				
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	34.9216		(33)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								15.1725 (36)				
Total fabric heat loss						(33) + (36) =		50.0941 (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	32.7891	32.5960	32.4066	31.5174	31.3510	30.5765	30.5765	30.4331	30.8748	31.3510	31.6876	32.0395 (38)
Heat transfer coeff	82.8833	82.6901	82.5008	81.6115	81.4452	80.6707	80.6707	80.5272	80.9690	81.4452	81.7817	82.1336 (39)
Average = Sum(39)m / 12 =												81.6107 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1800	1.1773	1.1746	1.1619	1.1595	1.1485	1.1485	1.1465	1.1527	1.1595	1.1643	1.1693 (40)
HLP (average)												1.1619 (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												2.2519 (42)
Average daily hot water use (litres/day)												87.6835 (43)
Daily hot water use	96.4519	92.9445	89.4372	85.9298	82.4225	78.9152	78.9152	82.4225	85.9298	89.4372	92.9445	96.4519 (44)
Energy conte	143.0353	125.0996	129.0916	112.5452	107.9898	93.1870	86.3514	99.0895	100.2730	116.8585	127.5602	138.5221 (45)
Energy content (annual)										Total = Sum(45)m =		1379.6031 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.4553	18.7649	19.3637	16.8818	16.1985	13.9780	12.9527	14.8634	15.0409	17.5288	19.1340	20.7783 (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												

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Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Total heat required for water heating calculated for each month	49.1508	42.7799	45.5762	42.3764	42.0016	38.9171	40.2143	42.0016	42.3764	45.5762	45.8357	49.1508 (61)
Solar input	192.1861	167.8796	174.6678	154.9215	149.9914	132.1040	126.5657	141.0911	142.6493	162.4347	173.3958	187.6729 (62)
Output from w/h	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)
Heat gains from water heating, kWh/month	192.1861	167.8796	174.6678	154.9215	149.9914	132.1040	126.5657	141.0911	142.6493	162.4347	173.3958	187.6729 (64)
	59.8470	52.2906	54.3170	48.0154	46.4070	40.7139	38.7654	43.4477	43.9349	50.2495	53.8727	58.3463 (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	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.2771	17.1218	13.9244	10.5416	7.8800	6.6526	7.1884	9.3438	12.5412	15.9239	18.5855	19.8129	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.8566	199.9097	194.7359	183.7214	169.8176	156.7500	148.0201	145.9669	151.1408	162.1552	176.0590	189.1266	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	(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)	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	(71)
Water heating gains (Table 5)	80.4394	77.8134	73.0067	66.6880	62.3750	56.5471	52.1041	58.3974	61.0206	67.5396	74.8232	78.4224	(72)
Total internal gains	357.3522	354.6239	341.4460	320.7301	299.8517	279.7288	267.0916	273.4872	284.4816	305.3978	329.2468	347.1410	(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	
-----					-----	-----		-----	-----	-----		-----	
East					9.0400	19.6403		0.6300	0.7000	0.7700		54.2610 (76)	
-----					-----	-----		-----	-----	-----		-----	
Solar gains	54.2610	106.1460	174.8073	254.9460	312.4459	319.8440	304.5045	261.5649	203.3081	125.9511	67.6571	44.6216 (83)	
Total gains	411.6132	460.7699	516.2533	575.6761	612.2976	599.5728	571.5961	535.0520	487.7897	431.3490	396.9038	391.7626 (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	58.8512	58.9886	59.1240	59.7682	59.8903	60.4653	60.4653	60.5730	60.2425	59.8903	59.6439	59.3883	
alpha	4.9234	4.9326	4.9416	4.9845	4.9927	5.0310	5.0310	5.0382	5.0162	4.9927	4.9763	4.9592	
util living area	0.9982	0.9965	0.9910	0.9705	0.9081	0.7662	0.5983	0.6548	0.8849	0.9828	0.9965	0.9986	(86)
MIT	19.7057	19.8396	20.0886	20.4279	20.7311	20.9239	20.9826	20.9732	20.8302	20.4353	20.0115	19.6828	(87)
Th 2	19.9360	19.9382	19.9404	19.9506	19.9525	19.9614	19.9614	19.9631	19.9580	19.9525	19.9487	19.9446	(88)
util rest of house	0.9976	0.9953	0.9876	0.9586	0.8694	0.6762	0.4685	0.5252	0.8219	0.9738	0.9951	0.9981	(89)
MIT 2	18.2117	18.4087	18.7726	19.2666	19.6793	19.9084	19.9548	19.9515	19.8143	19.2845	18.6677	18.1841	(90)
Living area fraction									fLA = Living area / (4) =			0.3175	(91)
MIT	18.6860	18.8630	19.1905	19.6353	20.0132	20.2308	20.2811	20.2759	20.1368	19.6499	19.0943	18.6599	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6860	18.8630	19.1905	19.6353	20.0132	20.2308	20.2811	20.2759	20.1368	19.6499	19.0943	18.6599	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	410.1771	457.7753	508.1825	549.1944	533.9631	420.7094	291.5628	303.1630	407.1286	418.5012	394.2734	390.6884	(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	1192.3583	1154.6018	1046.9724	876.1252	677.0708	454.2401	296.9582	312.1132	488.7963	737.0689	980.9145	1187.6459	(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	581.9428	468.2674	400.8597	235.3902	106.4721	0.0000	0.0000	0.0000	0.0000	237.0143	422.3816	592.9364	(98)
Space heating												3045.2646	(98)
Space heating per m2										(98) / (4) =		43.3551	(99)

8c. Space cooling requirement

Not applicable

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

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Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												93.4000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												3260.4546	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	581.9428	468.2674	400.8597	235.3902	106.4721	0.0000	0.0000	0.0000	0.0000	237.0143	422.3816	592.9364	(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)	623.0651	501.3570	429.1860	252.0238	113.9959	0.0000	0.0000	0.0000	0.0000	253.7627	452.2287	634.8356	(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	192.1861	167.8796	174.6678	154.9215	149.9914	132.1040	126.5657	141.0911	142.6493	162.4347	173.3958	187.6729	(64)
Efficiency of water heater	87.6627	87.4958	87.0761	86.1015	84.2058	80.3000	80.3000	80.3000	80.3000	86.0013	87.2076	87.7466	(216)
(217)m	87.6627	87.4958	87.0761	86.1015	84.2058	80.3000	80.3000	80.3000	80.3000	86.0013	87.2076	87.7466	(217)
Fuel for water heating, kWh/month	219.2338	191.8717	200.5922	179.9290	178.1249	164.5131	157.6161	175.7050	177.6455	188.8748	198.8310	213.8805	(219)
Water heating fuel used												2246.8175	(219)
Annual totals kWh/year													
Space heating fuel - main system												3260.4546	(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)												340.4401	(232)
Total delivered energy for all uses												5922.7122	(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	3260.4546	0.2160	704.2582 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2246.8175	0.2160	485.3126 (264)
Space and water heating			1189.5708 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	340.4401	0.5190	176.6884 (268)
Total CO2, kg/m2/year			1405.1842 (272)
Emissions per m2 for space and water heating			16.9358 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.5155 (272b)
Emissions per m2 for pumps and fans			0.5542 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.9358 * 1.00) + 2.5155 + 0.5542, rounded to 2 d.p.			20.0100 (273)

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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	70.2400 (1b)	x 2.4000 (2b)	= 168.5760 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 168.5760 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					30.0000 / (5) = 0.1780 (8)
Measured/design AP50					Yes
Infiltration rate					3.8500
Number of sides sheltered					0.3705 (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) =				0.2871 (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	0.3661	0.3589	0.3517	0.3158	0.3086	0.2728	0.2728	0.2656	0.2871	0.3086	0.3230	0.3374 (22b)
	0.5670	0.5644	0.5618	0.5499	0.5476	0.5372	0.5372	0.5353	0.5412	0.5476	0.5522	0.5569 (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)			9.0400	1.2357	11.1711		(27)
FT-03			70.2400	0.1247	8.7556		(28b)
WT-E-01	35.5700	9.0400	26.5300	0.2000	5.3060		(29a)
WT-I-01	27.7900	2.1200	25.6700	0.2890	7.4184		(29a)
WT-I-11	12.7200		12.7200	0.2719	3.4586		(29a)
Total net area of external elements Aum(A, m ²)			146.3200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.2297		(33)
Party Wall 1			11.5200	0.0000	0.0000		(32)
Party Ceilings 1			70.2400				(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)							16.3770 (36)
Total fabric heat loss						(33) + (36) =	54.6067 (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	31.5423	31.3976	31.2557	30.5893	30.4647	29.8843	29.8843	29.7768	30.1079	30.4647	30.7169	30.9806 (38)
Heat transfer coeff	86.1490	86.0042	85.8624	85.1960	85.0714	84.4910	84.4910	84.3835	84.7145	85.0714	85.3236	85.5872 (39)
Average = Sum(39)m / 12 =												85.1954 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2265	1.2244	1.2224	1.2129	1.2112	1.2029	1.2029	1.2014	1.2061	1.2112	1.2147	1.2185 (40)
HLP (average)												1.2129 (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												2.2519 (42)
Average daily hot water use (litres/day)												87.6835 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.4519	92.9445	89.4372	85.9298	82.4225	78.9152	78.9152	82.4225	85.9298	89.4372	92.9445	96.4519 (44)
Energy conte	143.0353	125.0996	129.0916	112.5452	107.9898	93.1870	86.3514	99.0895	100.2730	116.8585	127.5602	138.5221 (45)
Energy content (annual)												Total = Sum(45)m = 1379.6031 (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												

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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 (56)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	30.3950	26.5837	27.4320	23.9159	22.9478	19.8022	18.3497	21.0565	21.3080	24.8324	27.1065	29.4359 (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	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.2771	17.1218	13.9244	10.5416	7.8800	6.6526	7.1884	9.3438	12.5412	15.9239	18.5855	19.8129	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.8566	199.9097	194.7359	183.7214	169.8176	156.7500	148.0201	145.9669	151.1408	162.1552	176.0590	189.1266	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	(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)	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	(71)
Water heating gains (Table 5)	40.8535	39.5590	36.8709	33.2165	30.8439	27.5031	24.6635	28.3018	29.5945	33.3769	37.6480	39.5644	(72)
Total internal gains	314.7663	313.3696	302.3102	284.2586	265.3205	247.6848	236.6511	240.3915	250.0554	268.2351	289.0716	305.2830	(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
East				9.0400	19.6403	0.4500	0.0000			0.7700			61.5204 (76)
Solar gains	61.5204	120.3469	198.1942	289.0544	354.2471	362.6349	345.2432	296.5588	230.5081	142.8017	76.7087	50.5914	(83)
Total gains	376.2866	433.7165	500.5044	573.3130	619.5676	610.3197	581.8943	536.9504	480.5635	411.0368	365.7802	355.8744	(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	56.6203	56.7155	56.8093	57.2536	57.3375	57.7313	57.7313	57.8049	57.5790	57.3375	57.1680	56.9919	
alpha	4.7747	4.7810	4.7873	4.8169	4.8225	4.8488	4.8488	4.8537	4.8386	4.8225	4.8112	4.7995	
util living area	0.9988	0.9973	0.9923	0.9728	0.9121	0.7753	0.6105	0.6741	0.8988	0.9866	0.9976	0.9991	(86)
MIT	19.5984	19.7440	20.0124	20.3745	20.7011	20.9105	20.9782	20.9653	20.7980	20.3663	19.9149	19.5707	(87)
Th 2	19.8989	19.9005	19.9021	19.9097	19.9111	19.9177	19.9177	19.9189	19.9151	19.9111	19.9082	19.9052	(88)
util rest of house	0.9983	0.9964	0.9894	0.9615	0.8739	0.6834	0.4744	0.5386	0.8388	0.9792	0.9966	0.9988	(89)
MIT 2	18.6221	18.7687	19.0370	19.3984	19.7034	19.8750	19.9120	19.9087	19.7967	19.3959	18.9458	18.5995	(90)
Living area fraction									fLA = Living area / (4) =			0.3175	(91)
MIT	18.9321	19.0783	19.3467	19.7083	20.0201	20.2038	20.2505	20.2441	20.1146	19.7040	19.2534	18.9078	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9321	19.0783	19.3467	19.7083	20.0201	20.2038	20.2505	20.2441	20.1146	19.7040	19.2534	18.9078	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9978	0.9954	0.9874	0.9589	0.8784	0.7101	0.5183	0.5823	0.8520	0.9773	0.9957	0.9983	(94)
Ext temp.	375.4643	431.7165	494.2184	549.7388	544.2234	433.3939	301.5925	312.6436	409.4563	401.7155	364.2026	355.2801	(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	1260.5399	1219.3964	1103.0488	920.8271	707.8040	473.4687	308.4354	324.3820	509.5224	774.4872	1036.9756	1258.8035	(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	658.4962	529.3209	452.9698	267.1836	121.7039	0.0000	0.0000	0.0000	0.0000	277.3422	484.3966	672.2214	(98)
Space heating												3463.6347	(98)
Space heating per m2										(98) / (4) =		49.3114	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	794.2153	625.2333	641.3147	0.0000	0.0000	0.0000	0.0000	(100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8309	0.9000	0.8694	0.0000	0.0000	0.0000	0.0000	(101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	659.8814	562.7254	557.5686	0.0000	0.0000	0.0000	0.0000	(102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	797.7512	762.8934	711.9518	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	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	0.0000	0.0000	0.0000	0.0000	0.0000	99.2663	148.9250	114.8611	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												363.0524	(104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Cooled Fraction	FC = cooled area / (4) =										1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	24.8166	37.2312	28.7153	0.0000	0.0000	0.0000 (107)
Space cooling											90.7631 (107)
Space cooling per m2											1.2922 (108)
Energy for space heating											49.3114 (99)
Energy for space cooling											1.2922 (108)
Total											50.6036 (109)
Dwelling Fabric Energy Efficiency (DFEE)											50.6 (109)

Southern Energy
Consultants
Energy & Sustainability Solutions

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

Assumed occupancy												2.2519	(42)
Average daily hot water use (litres/day)												87.6835	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	96.4519	92.9445	89.4372	85.9298	82.4225	78.9152	78.9152	82.4225	85.9298	89.4372	92.9445	96.4519	(44)
Energy content (annual)	143.0353	125.0996	129.0916	112.5452	107.9898	93.1870	86.3514	99.0895	100.2730	116.8585	127.5602	138.5221	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1379.6031	(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)
If cylinder contains dedicated solar storage													

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 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	30.3950	26.5837	27.4320	23.9159	22.9478	19.8022	18.3497	21.0565	21.3080	24.8324	27.1065	29.4359 (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	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.2771	17.1218	13.9244	10.5416	7.8800	6.6526	7.1884	9.3438	12.5412	15.9239	18.5855	19.8129	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.8566	199.9097	194.7359	183.7214	169.8176	156.7500	148.0201	145.9669	151.1408	162.1552	176.0590	189.1266	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	(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)	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	(71)
Water heating gains (Table 5)	40.8535	39.5590	36.8709	33.2165	30.8439	27.5031	24.6635	28.3018	29.5945	33.3769	37.6480	39.5644	(72)
Total internal gains	314.7663	313.3696	302.3102	284.2586	265.3205	247.6848	236.6511	240.3915	250.0554	268.2351	289.0716	305.2830	(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	
-----					-----	-----		-----	-----	-----		-----	
East					9.0400	19.6403		0.6300	0.7000	0.7700		54.2610 (76)	
-----					-----	-----		-----	-----	-----		-----	
Solar gains	54.2610	106.1460	174.8073	254.9460	312.4459	319.8440	304.5045	261.5649	203.3081	125.9511	67.6571	44.6216 (83)	
Total gains	369.0272	419.5155	477.1175	539.2046	577.7665	567.5288	541.1556	501.9564	453.3636	394.1862	356.7286	349.9046 (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	58.8512	58.9886	59.1240	59.7682	59.8903	60.4653	60.4653	60.5730	60.2425	59.8903	59.6439	59.3883	
alpha	4.9234	4.9326	4.9416	4.9845	4.9927	5.0310	5.0310	5.0382	5.0162	4.9927	4.9763	4.9592	
util living area	0.9989	0.9977	0.9936	0.9771	0.9235	0.7924	0.6266	0.6882	0.9076	0.9881	0.9979	0.9992	(86)
MIT	19.6495	19.7856	20.0387	20.3855	20.7012	20.9109	20.9788	20.9666	20.8033	20.3893	19.9587	19.6273	(87)
Th 2	19.9360	19.9382	19.9404	19.9506	19.9525	19.9614	19.9614	19.9631	19.9580	19.9525	19.9487	19.9446	(88)
util rest of house	0.9985	0.9969	0.9911	0.9675	0.8893	0.7047	0.4932	0.5565	0.8520	0.9817	0.9969	0.9989	(89)
MIT 2	18.7027	18.8402	19.0939	19.4434	19.7412	19.9179	19.9557	19.9529	19.8403	19.4523	19.0216	18.6873	(90)
Living area fraction									fLA = Living area / (4) =			0.3175	(91)
MIT	19.0033	19.1403	19.3938	19.7425	20.0460	20.2332	20.2805	20.2747	20.1460	19.7498	19.3191	18.9858	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0033	19.1403	19.3938	19.7425	20.0460	20.2332	20.2805	20.2747	20.1460	19.7498	19.3191	18.9858	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9981	0.9960	0.9894	0.9651	0.8929	0.7301	0.5362	0.5989	0.8641	0.9800	0.9962	0.9985	(94)
Useful gains	368.3088	417.8502	472.0693	520.4017	515.9146	414.3316	290.1910	300.6142	391.7395	386.2873	355.3630	349.3839	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1218.6559	1177.5358	1063.7500	884.8724	679.7414	454.4308	296.9107	312.0207	489.5423	745.2059	999.3012	1214.4077	(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	632.6582	510.5087	440.2104	262.4189	121.8871	0.0000	0.0000	0.0000	0.0000	267.0355	463.6355	643.5777	(98)
Space heating												3341.9320	(98)
Space heating per m2											(98) / (4) =	47.5788	(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	758.3041	596.9628	612.0069	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8283	0.8997	0.8703	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	628.0897	537.0799	532.6362	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	747.7359	715.2767	671.0498	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	86.1452	132.5784	102.9797	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												321.7033	(104)
Cooled fraction												1.0000	(105)
Intermittency factor (Table 10b)													

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

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	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	21.5363	33.1446	25.7449	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling per m2													80.4258 (107)
Energy for space heating													1.1450 (108)
Energy for space cooling													47.5788 (99)
Total													1.1450 (108)
Target Fabric Energy Efficiency (TFEE)													48.7238 (109)
													56.0 (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	70.2400 (1b)	x 2.4000 (2b)	= 168.5760 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 168.5760 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					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					3.8500
Infiltration rate					0.1925 (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) =		0.1492 (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	0.1566	0.1492	0.1492	0.1380	0.1380	0.1231	0.1268	0.1194	0.1231	0.1305	0.1305	0.1417 (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)			9.0400	1.2357	11.1711		(27)
FT-03			70.2400	0.1247	8.7556		(28b)
WT-E-01	35.5700	9.0400	26.5300	0.2000	5.3060		(29a)
WT-I-01	27.7900	2.1200	25.6700	0.2890	7.4184		(29a)
WT-I-11	12.7200		12.7200	0.2719	3.4586		(29a)
Total net area of external elements Aum(A, m ²)			146.3200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.2297		(33)
Party Wall 1			11.5200	0.0000	0.0000		(32)
Party Ceilings 1			70.2400				(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss

250.0000 (35)
16.3770 (36)
(33) + (36) = 54.6067 (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	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150 (38)
Heat transfer coeff	82.4217	82.4217	82.4217	82.4217	82.4217	82.4217	82.4217	82.4217	82.4217	82.4217	82.4217	82.4217 (39)
Average = Sum(39)m / 12 =												82.4217 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1734	1.1734	1.1734	1.1734	1.1734	1.1734	1.1734	1.1734	1.1734	1.1734	1.1734	1.1734 (40)
HLP (average)												1.1734 (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)

2.2519 (42)
87.6835 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.4519	92.9445	89.4372	85.9298	82.4225	78.9152	78.9152	82.4225	85.9298	89.4372	92.9445	96.4519 (44)
Energy conte	143.0353	125.0996	129.0916	112.5452	107.9898	93.1870	86.3514	99.0895	100.2730	116.8585	127.5602	138.5221 (45)
Energy content (annual)												Total = Sum(45)m = 1379.6031 (45)
Distribution loss (46)m = 0.15 x (45)m												

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 HEAT DEMAND 09 Jan 2014

	21.4553	18.7649	19.3637	16.8818	16.1985	13.9780	12.9527	14.8634	15.0409	17.5288	19.1340	20.7783 (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	14.0877	12.7043	14.0337	13.5449	13.9702	13.4893	13.9201	13.9526	13.5196	14.0074	13.5973	14.0772 (61)
Total heat required for water heating calculated for each month	157.1230	137.8039	143.1252	126.0901	121.9600	106.6763	100.2715	113.0421	113.7926	130.8659	141.1575	152.5993 (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	157.1230	137.8039	143.1252	126.0901	121.9600	106.6763	100.2715	113.0421	113.7926	130.8659	141.1575	152.5993 (64)
RHI water heating demand												
Heat gains from water heating, kWh/month	51.0812	44.7717	46.4314	40.8075	39.3991	34.3570	32.1919	36.4354	36.7207	42.3573	45.8131	49.5779 (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	135.1162	135.1162	135.1162	135.1162	135.1162	135.1162	135.1162	135.1162	135.1162	135.1162	135.1162	135.1162 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	48.1928	42.8044	34.8109	26.3541	19.7000	16.6316	17.9710	23.3594	31.3529	39.8097	46.4638	49.5323 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.3083	298.3727	290.6505	274.2110	253.4591	233.9553	220.9255	217.8611	225.5832	242.0227	262.7746	282.2785 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7636	50.7636	50.7636	50.7636	50.7636	50.7636	50.7636	50.7636	50.7636	50.7636	50.7636	50.7636 (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)	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775 (71)
Water heating gains (Table 5)	68.6575	66.6246	62.4078	56.6771	52.9558	47.7180	43.2687	48.9723	51.0009	56.9318	63.6293	66.6370 (72)
Total internal gains	510.9609	506.6040	486.6715	456.0445	424.9173	397.1072	380.9674	388.9951	406.7394	437.5666	471.6701	497.2500 (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		
East				9.0400	22.3313	0.4500	0.0000	0.7700		69.9497 (76)		
Solar gains	69.9497	123.0867	199.8710	299.5493	356.9257	390.7204	368.0744	323.8182	251.6920	155.8605	89.3522	56.9651 (83)
Total gains	580.9106	629.6906	686.5425	755.5939	781.8430	787.8276	749.0419	712.8133	658.4313	593.4271	561.0223	554.2151 (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	59.1807	59.1807	59.1807	59.1807	59.1807	59.1807	59.1807	59.1807	59.1807	59.1807	59.1807	59.1807
alpha	4.9454	4.9454	4.9454	4.9454	4.9454	4.9454	4.9454	4.9454	4.9454	4.9454	4.9454	4.9454
util living area	0.9900	0.9840	0.9637	0.9005	0.7540	0.5128	0.3400	0.3683	0.6780	0.9213	0.9802	0.9918 (86)
MIT	20.0209	20.1350	20.3885	20.6878	20.9070	20.9892	20.9989	20.9984	20.9579	20.6964	20.3056	19.9870 (87)
Th 2	19.9413	19.9413	19.9413	19.9413	19.9413	19.9413	19.9413	19.9413	19.9413	19.9413	19.9413	19.9413 (88)
util rest of house	0.9866	0.9787	0.9513	0.8673	0.6821	0.4093	0.2245	0.2474	0.5744	0.8867	0.9723	0.9890 (89)
MIT 2	19.0758	19.1881	19.4347	19.7119	19.8896	19.9381	19.9412	19.9411	19.9245	19.7265	19.3572	19.0425 (90)
Living area fraction									fLA = Living area / (4) =			0.3175 (91)
MIT	19.3758	19.4887	19.7375	20.0217	20.2126	20.2718	20.2770	20.2768	20.2526	20.0344	19.6583	19.3423 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.2258	19.3387	19.5875	19.8717	20.0626	20.1218	20.1270	20.1268	20.1026	19.8844	19.5083	19.1923 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9836	0.9749	0.9462	0.8648	0.6911	0.4274	0.2449	0.2687	0.5913	0.8844	0.9682	0.9864 (94)
Useful gains	571.4096	613.8596	649.6102	653.4039	540.3004	336.6891	183.4215	191.5659	389.3160	524.8235	543.1625	546.6599 (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	1164.2746	1132.3710	1004.5142	821.8883	582.1147	339.7262	183.5537	191.7782	404.0824	682.8158	948.5332	1161.5144 (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	441.0916	348.4396	264.0486	121.3088	31.1099	0.0000	0.0000	0.0000	0.0000	117.5463	291.8669	457.4517 (98)
Space heating												2072.8634 (98)
RHI space heating demand												2073 (98)

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	70.2400 (1b)	x 2.4000 (2b)	= 168.5760 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 168.5760 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					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					3.8500
Number of sides sheltered					0.1925 (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) =	0.1492 (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	0.1902	0.1865	0.1828	0.1641	0.1604	0.1417	0.1417	0.1380	0.1492	0.1604	0.1678	0.1753 (22b)
Mechanical extract ventilation - decentralised												0.1753 (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)			9.0400	1.2357	11.1711		(27)
FT-03			70.2400	0.1247	8.7556		(28b)
WT-E-01	35.5700	9.0400	26.5300	0.2000	5.3060		(29a)
WT-I-01	27.7900	2.1200	25.6700	0.2890	7.4184		(29a)
WT-I-11	12.7200		12.7200	0.2719	3.4586		(29a)
Total net area of external elements Aum(A, m ²)			146.3200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.2297		(33)
Party Wall 1			11.5200	0.0000	0.0000		(32)
Party Ceilings 1			70.2400				(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss

250.0000 (35)
16.3770 (36)
(33) + (36) = 54.6067 (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	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150 (38)
Heat transfer coeff	82.4217	82.4217	82.4217	82.4217	82.4217	82.4217	82.4217	82.4217	82.4217	82.4217	82.4217	82.4217 (39)
Average = Sum(39)m / 12 =												82.4217 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1734	1.1734	1.1734	1.1734	1.1734	1.1734	1.1734	1.1734	1.1734	1.1734	1.1734	1.1734 (40)
HLP (average)												1.1734 (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												2.2519 (42)
Average daily hot water use (litres/day)												87.6835 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.4519	92.9445	89.4372	85.9298	82.4225	78.9152	78.9152	82.4225	85.9298	89.4372	92.9445	96.4519 (44)
Energy conte	143.0353	125.0996	129.0916	112.5452	107.9898	93.1870	86.3514	99.0895	100.2730	116.8585	127.5602	138.5221 (45)
Energy content (annual)												Total = Sum(45)m = 1379.6031 (45)
Distribution loss (46)m = 0.15 x (45)m												

Regs Region: England

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

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	21.4553	18.7649	19.3637	16.8818	16.1985	13.9780	12.9527	14.8634	15.0409	17.5288	19.1340	20.7783 (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	14.0877	12.7043	14.0337	13.5449	13.9702	13.4893	13.9201	13.9526	13.5196	14.0074	13.5973	14.0772 (61)
Total heat required for water heating calculated for each month	157.1230	137.8039	143.1252	126.0901	121.9600	106.6763	100.2715	113.0421	113.7926	130.8659	141.1575	152.5993 (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	157.1230	137.8039	143.1252	126.0901	121.9600	106.6763	100.2715	113.0421	113.7926	130.8659	141.1575	152.5993 (64)
Heat gains from water heating, kWh/month	51.0812	44.7717	46.4314	40.8075	39.3991	34.3570	32.1919	36.4354	36.7207	42.3573	45.8131	49.5779 (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	135.1162	135.1162	135.1162	135.1162	135.1162	135.1162	135.1162	135.1162	135.1162	135.1162	135.1162	135.1162	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	48.1928	42.8044	34.8109	26.3541	19.7000	16.6316	17.9710	23.3594	31.3529	39.8097	46.4638	49.5323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.3083	298.3727	290.6505	274.2110	253.4591	233.9553	220.9255	217.8611	225.5832	242.0227	262.7746	282.2785	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7636	50.7636	50.7636	50.7636	50.7636	50.7636	50.7636	50.7636	50.7636	50.7636	50.7636	50.7636	(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)	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	(71)
Water heating gains (Table 5)	68.6575	66.6246	62.4078	56.6771	52.9558	47.7180	43.2687	48.9723	51.0009	56.9318	63.6293	66.6370	(72)
Total internal gains	510.9609	506.6040	486.6715	456.0445	424.9173	397.1072	380.9674	388.9951	406.7394	437.5666	471.6701	497.2500	(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

East					9.0400	19.6403	0.4500	0.0000			0.7700			61.5204 (76)

Solar gains	61.5204	120.3469	198.1942	289.0544	354.2471	362.6349	345.2432	296.5588	230.5081	142.8017	76.7087	50.5914	(83)	
Total gains	572.4813	626.9509	684.8657	745.0990	779.1644	759.7421	726.2107	685.5539	637.2474	580.3684	548.3787	547.8414	(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	59.1807	59.1807	59.1807	59.1807	59.1807	59.1807	59.1807	59.1807	59.1807	59.1807	59.1807	59.1807	
alpha	4.9454	4.9454	4.9454	4.9454	4.9454	4.9454	4.9454	4.9454	4.9454	4.9454	4.9454	4.9454	
util living area	0.9923	0.9869	0.9718	0.9274	0.8249	0.6549	0.4912	0.5394	0.7812	0.9479	0.9862	0.9938	(86)
MIT	19.9238	20.0570	20.2949	20.5922	20.8352	20.9601	20.9921	20.9876	20.9056	20.5912	20.1947	19.8813	(87)
Th 2	19.9413	19.9413	19.9413	19.9413	19.9413	19.9413	19.9413	19.9413	19.9413	19.9413	19.9413	19.9413	(88)
util rest of house	0.9899	0.9827	0.9625	0.9031	0.7701	0.5624	0.3773	0.4222	0.6986	0.9252	0.9810	0.9918	(89)
MIT 2	18.9794	19.1110	19.3439	19.6255	19.8358	19.9241	19.9394	19.9380	19.8930	19.6312	19.2484	18.9374	(90)
Living area fraction	19.2792	19.4114	19.6458	19.9324	20.1531	20.2530	20.2736	20.2712	20.2145	19.9360	19.5488	19.2371	(91)
MIT	19.2792	19.4114	19.6458	19.9324	20.1531	20.2530	20.2736	20.2712	20.2145	19.9360	19.5488	19.2371	(92)
Temperature adjustment	19.1292	19.2614	19.4958	19.7824	20.0031	20.1030	20.1236	20.1212	20.0645	19.7860	19.3988	19.0871	(93)
adjusted MIT													

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	565.2509	613.9270	655.7866	669.6443	602.8181	438.6110	288.5409	303.5097	451.9994	534.5548	535.9972	542.1719	(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	1222.2495	1183.6903	1071.1399	896.9480	684.3574	453.5651	290.4232	306.7109	491.6052	757.1225	1013.6898	1227.0164	(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	488.8070	382.8810	309.0229	163.6587	60.6653	0.0000	0.0000	0.0000	0.0000	165.5903	343.9387	509.5243	(98)
Space heating												2424.0883	(98)
Space heating per m2												34.5115	(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													2678.5506 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	488.8070	382.8810	309.0229	163.6587	60.6653	0.0000	0.0000	0.0000	0.0000	165.5903	343.9387	509.5243	(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)	540.1182	423.0729	341.4618	180.8384	67.0335	0.0000	0.0000	0.0000	0.0000	182.9728	380.0427	563.0103	(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	157.1230	137.8039	143.1252	126.0901	121.9600	106.6763	100.2715	113.0421	113.7926	130.8659	141.1575	152.5993	(64)
Efficiency of water heater (217)m	89.7002	89.6305	89.4620	89.0791	88.3376	87.3000	87.3000	87.3000	87.3000	89.0589	89.5449	89.7419	(216)
Fuel for water heating, kWh/month	175.1646	153.7467	159.9845	141.5485	138.0612	122.1950	114.8586	129.4869	130.3466	146.9430	157.6388	170.0425	(219)
Water heating fuel used													(219)
Annual totals kWh/year													
Space heating fuel - main system													2678.5506 (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)													37.8419 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													112.8419 (231)
Electricity for lighting (calculated in Appendix L)													340.4401 (232)
Total delivered energy for all uses													4871.8495 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2678.5506	3.4800	93.2136 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1740.0169	3.4800	60.5526 (247)
Mechanical ventilation fans	37.8419	13.1900	4.9914 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	340.4401	13.1900	44.9041 (250)
Additional standing charges			120.0000 (251)
Total energy cost			333.5541 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)		1.2157 (257)
SAP value		83.0415
SAP rating (Section 12)		83 (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	2678.5506	0.2160	578.5669 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1740.0169	0.2160	375.8437 (264)
Space and water heating			954.4106 (265)
Pumps and fans	112.8419	0.5190	58.5650 (267)
Energy for lighting	340.4401	0.5190	176.6884 (268)
Total kg/year			1189.6640 (272)
CO2 emissions per m2			16.9400 (273)
EI value			86.1667
EI rating			86 (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	$3.48 / 0.8865 = 3.926$, stars = 4
Water heating environmental impact	$0.216 / 0.8865 = 0.2437$, stars = 4

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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	70.2400 (1b)	x 2.4000 (2b)	= 168.5760 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 168.5760 (5)

2. Ventilation rate

	main heating	+	secondary heating	+	other	=	total	m3 per hour				
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							0 * 10 =	0.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000 (8)				
Pressure test							Yes					
Measured/design AP50								3.8500				
Infiltration rate								0.1925 (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) =	0.1492 (21)				
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	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												
	0.1566	0.1492	0.1492	0.1380	0.1380	0.1231	0.1268	0.1194	0.1231	0.1305	0.1305	0.1417 (22b)
Mechanical extract ventilation - decentralised												
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)			9.0400	1.2357	11.1711		(27)
FT-03			70.2400	0.1247	8.7556		(28b)
WT-E-01	35.5700	9.0400	26.5300	0.2000	5.3060		(29a)
WT-I-01	27.7900	2.1200	25.6700	0.2890	7.4184		(29a)
WT-I-11	12.7200		12.7200	0.2719	3.4586		(29a)
Total net area of external elements Aum(A, m ²)			146.3200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.2297		(33)
Party Wall 1			11.5200	0.0000	0.0000		(32)
Party Ceilings 1			70.2400				(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)							16.3770 (36)
Total fabric heat loss							(33) + (36) = 54.6067 (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	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150 (38)
Heat transfer coeff	82.4217	82.4217	82.4217	82.4217	82.4217	82.4217	82.4217	82.4217	82.4217	82.4217	82.4217	82.4217 (39)
Average = Sum(39)m / 12 =	82.4217	82.4217	82.4217	82.4217	82.4217	82.4217	82.4217	82.4217	82.4217	82.4217	82.4217	82.4217 (39)
HLP	1.1734	1.1734	1.1734	1.1734	1.1734	1.1734	1.1734	1.1734	1.1734	1.1734	1.1734	1.1734 (40)
HLP (average)	1.1734	1.1734	1.1734	1.1734	1.1734	1.1734	1.1734	1.1734	1.1734	1.1734	1.1734	1.1734 (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												2.2519 (42)
Average daily hot water use (litres/day)												87.6835 (43)
Daily hot water use	Jan 96.4519	Feb 92.9445	Mar 89.4372	Apr 85.9298	May 82.4225	Jun 78.9152	Jul 78.9152	Aug 82.4225	Sep 85.9298	Oct 89.4372	Nov 92.9445	Dec 96.4519 (44)
Energy conte	143.0353	125.0996	129.0916	112.5452	107.9898	93.1870	86.3514	99.0895	100.2730	116.8585	127.5602	138.5221 (45)
Energy content (annual)												Total = Sum(45)m = 1379.6031 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

	21.4553	18.7649	19.3637	16.8818	16.1985	13.9780	12.9527	14.8634	15.0409	17.5288	19.1340	20.7783 (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	14.0877	12.7043	14.0337	13.5449	13.9702	13.4893	13.9201	13.9526	13.5196	14.0074	13.5973	14.0772 (61)
Total heat required for water heating calculated for each month	157.1230	137.8039	143.1252	126.0901	121.9600	106.6763	100.2715	113.0421	113.7926	130.8659	141.1575	152.5993 (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	157.1230	137.8039	143.1252	126.0901	121.9600	106.6763	100.2715	113.0421	113.7926	130.8659	141.1575	152.5993 (64)
Heat gains from water heating, kWh/month	51.0812	44.7717	46.4314	40.8075	39.3991	34.3570	32.1919	36.4354	36.7207	42.3573	45.8131	49.5779 (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	135.1162	135.1162	135.1162	135.1162	135.1162	135.1162	135.1162	135.1162	135.1162	135.1162	135.1162	135.1162	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	48.1928	42.8044	34.8109	26.3541	19.7000	16.6316	17.9710	23.3594	31.3529	39.8097	46.4638	49.5323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.3083	298.3727	290.6505	274.2110	253.4591	233.9553	220.9255	217.8611	225.5832	242.0227	262.7746	282.2785	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7636	50.7636	50.7636	50.7636	50.7636	50.7636	50.7636	50.7636	50.7636	50.7636	50.7636	50.7636	(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)	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	(71)
Water heating gains (Table 5)	68.6575	66.6246	62.4078	56.6771	52.9558	47.7180	43.2687	48.9723	51.0009	56.9318	63.6293	66.6370	(72)
Total internal gains	510.9609	506.6040	486.6715	456.0445	424.9173	397.1072	380.9674	388.9951	406.7394	437.5666	471.6701	497.2500	(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

East					9.0400	22.3313	0.4500	0.0000			0.7700			69.9497 (76)

Solar gains	69.9497	123.0867	199.8710	299.5493	356.9257	390.7204	368.0744	323.8182	251.6920	155.8605	89.3522			56.9651 (83)
Total gains	580.9106	629.6906	686.5425	755.5939	781.8430	787.8276	749.0419	712.8133	658.4313	593.4271	561.0223			554.2151 (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	59.1807	59.1807	59.1807	59.1807	59.1807	59.1807	59.1807	59.1807	59.1807	59.1807	59.1807	59.1807	
alpha	4.9454	4.9454	4.9454	4.9454	4.9454	4.9454	4.9454	4.9454	4.9454	4.9454	4.9454	4.9454	
util living area	0.9900	0.9840	0.9637	0.9005	0.7540	0.5128	0.3400	0.3683	0.6780	0.9213	0.9802	0.9918	(86)
MIT	20.0209	20.1350	20.3885	20.6878	20.9070	20.9892	20.9989	20.9984	20.9579	20.6964	20.3056	19.9870	(87)
Th 2	19.9413	19.9413	19.9413	19.9413	19.9413	19.9413	19.9413	19.9413	19.9413	19.9413	19.9413	19.9413	(88)
util rest of house	0.9866	0.9787	0.9513	0.8673	0.6821	0.4093	0.2245	0.2474	0.5744	0.8867	0.9723	0.9890	(89)
MIT 2	19.0758	19.1881	19.4347	19.7119	19.8896	19.9381	19.9412	19.9411	19.9245	19.7265	19.3572	19.0425	(90)
Living area fraction	19.3758	19.4887	19.7375	20.0217	20.2126	20.2718	20.2770	20.2768	20.2526	20.0344	19.6583	19.3423	(91)
MIT	19.3758	19.4887	19.7375	20.0217	20.2126	20.2718	20.2770	20.2768	20.2526	20.0344	19.6583	19.3423	(92)
Temperature adjustment	19.2258	19.3387	19.5875	19.8717	20.0626	20.1218	20.1270	20.1268	20.1026	19.8844	19.5083	19.1923	(93)
adjusted MIT													

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9836	0.9749	0.9462	0.8648	0.6911	0.4274	0.2449	0.2687	0.5913	0.8844	0.9682	0.9864	(94)
Ext temp.	571.4096	613.8596	649.6102	653.4039	540.3004	336.6891	183.4215	191.5659	389.3160	524.8235	543.1625	546.6599	(95)
Heat loss rate W	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)
Month fracti	1164.2746	1132.3710	1004.5142	821.8883	582.1147	339.7262	183.5537	191.7782	404.0824	682.8158	948.5332	1161.5144	(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	441.0916	348.4396	264.0486	121.3088	31.1099	0.0000	0.0000	0.0000	0.0000	117.5463	291.8669	457.4517	(98)
												2072.8634	(98)
												29.5112	(99)

8c. Space cooling requirement

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												2290.4568	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	441.0916	348.4396	264.0486	121.3088	31.1099	0.0000	0.0000	0.0000	0.0000	117.5463	291.8669	457.4517	(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)	487.3940	385.0162	291.7664	134.0429	34.3755	0.0000	0.0000	0.0000	0.0000	129.8854	322.5048	505.4715	(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	157.1230	137.8039	143.1252	126.0901	121.9600	106.6763	100.2715	113.0421	113.7926	130.8659	141.1575	152.5993	(64)
Efficiency of water heater (217)m	89.6370	89.5695	89.3488	88.8403	87.9319	87.3000	87.3000	87.3000	87.3000	88.7855	89.4314	89.6777	(216)
Fuel for water heating, kWh/month	175.2881	153.8514	160.1871	141.9289	138.6982	122.1950	114.8586	129.4869	130.3466	147.3955	157.8389	170.1641	(219)
Water heating fuel used												1742.2393	(219)
Annual totals kWh/year													
Space heating fuel - main system												2290.4568	(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)												37.8419	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												112.8419	(231)
Electricity for lighting (calculated in Appendix L)												340.4401	(232)
Total delivered energy for all uses												4485.9782	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2290.4568	3.7400	85.6631 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1742.2393	3.7400	65.1597 (247)
Mechanical ventilation fans	37.8419	19.1200	7.2354 (249)
Pumps and fans for heating	75.0000	19.1200	14.3400 (249)
Energy for lighting	340.4401	19.1200	65.0922 (250)
Additional standing charges			94.0000 (251)
Total energy cost			331.4904 (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	2290.4568	0.2160	494.7387 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1742.2393	0.2160	376.3237 (264)
Space and water heating			871.0624 (265)
Pumps and fans	112.8419	0.5190	58.5650 (267)
Energy for lighting	340.4401	0.5190	176.6884 (268)
Total kg/year			1106.3158 (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	2290.4568	1.2200	2794.3573 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1742.2393	1.2200	2125.5319 (264)
Space and water heating			4919.8892 (265)
Pumps and fans	112.8419	3.0700	346.4248 (267)
Energy for lighting	340.4401	3.0700	1045.1512 (268)
Primary energy kWh/year			6311.4652 (272)
Primary energy kWh/m2/year			89.8557 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 83
Current environmental impact rating: B 86

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



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(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 83	
Potential environmental impact rating:			B 86

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	£245	£245	£0
Space heating	£201	£201	£0
Water heating	£65	£65	£0
Lighting	£65	£65	£0
Total cost of fuels	£332	£332	£0
Total cost of uses	£331	£331	£0
Delivered energy	64 kWh/m²	64 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.1 tonnes	1.1 tonnes	0.0 tonnes
CO2 emissions per m²	16 kg/m²	16 kg/m²	0 kg/m²
Primary energy	90 kWh/m²	90 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	West
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	333.78 (P1)
Transmission heat loss coefficient	54.61 (P7)
Summer heat loss coefficient	388.39 (P2)

Overhangs	Ratio	Z_overhangs	Overhang type
Orientation			
East	0.000	1.000	None
Solar shading			
Orientation	Z blinds	Solar access	Z overhangs Z summer
East	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
East	9.0400	117.5071	0.4500 0.0000
total:			0.9000 430.2169

	Jun	Jul	Aug	
Solar gains	457	430	378	(P4)
Internal gains	394	378	386	
Total summer gains	851	808	764	(P5)
Summer gain/loss ratio	2.19	2.08	1.97	(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	18.44	20.23	20.02	(P7)
Likelihood of high internal temperature	Not significant	Not significant	Not significant	
Assessment of likelihood of high internal temperature:	Not significant			