

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



Property Reference	SECPMW025o_125_As_Built				Issued on Date	03/12/2021
Assessment Reference	001	Prop Type Ref	TFF			
Property						
SAP Rating	84 B	DER	16.92	TER	17.58	
Environmental	88 B	% DER<TER	3.73			
CO ₂ Emissions (t/year)	1.04	DFEE	42.07	TFEE	44.75	
General Requirements Compliance	Pass	% DFEE<TFEE	6.00			
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

Top-floor flat, total floor area 76 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 17.58 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 16.92 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)44.8 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)42.1 kWh/m²/yrOK

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	(no floor)		
Roof	0.15 (max. 0.20)	0.15 (max. 0.35)	OK
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: 3.73 (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 3.7 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	75.5400 (1b)	x 2.4000 (2b)	= 181.2960 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	75.5400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.2960 (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					3.7300
Infiltration rate					0.1865 (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) =				0.1445 (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	0.1843	0.1807	0.1771	0.1590	0.1554	0.1373	0.1373	0.1337	0.1445	0.1554	0.1626	0.1698 (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)
WT-E-01	32.6600	9.0400	23.6200	0.2000	4.7240		(29a)
WT-I-01	40.3000	2.1200	38.1800	0.2890	11.0337		(29a)
Flat Roof	75.5400		75.5400	0.1500	11.3310		(30)
Total net area of external elements Aum(A, m ²)			148.5000				(31)
Fabric heat loss, W/K = Sum (A x U)	(26) ... (30) + (32) =				40.3798		(33)
Party Wall 1			15.1200	0.0000	0.0000		(32)
Party Floor 1			75.5400				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.0352 (36)
Total fabric heat loss	(33) + (36) =						46.4150 (37)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3728 (42)
Average daily hot water use (litres/day)												90.5539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	99.6093	95.9872	92.3650	88.7428	85.1207	81.4985	81.4985	85.1207	88.7428	92.3650	95.9872	99.6093 (44)
Energy conte	147.7177	129.1949	133.3175	116.2295	111.5249	96.2375	89.1782	102.3333	103.5555	120.6840	131.7360	143.0567 (45)
Energy content (annual)	Total = Sum(45)m =											1424.7658 (45)
Distribution loss (46)m = 0.15 x (45)m	22.1577	19.3792	19.9976	17.4344	16.7287	14.4356	13.3767	15.3500	15.5333	18.1026	19.7604	21.4585 (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	14.1097	12.7229	14.0521	13.5603	13.9844	13.5010	13.9310	13.9656	13.5334	14.0241	13.6163	14.0986	(61)
Total heat required for water heating calculated for each month	161.8274	141.9178	147.3696	129.7898	125.5093	109.7386	103.1092	116.2989	117.0889	134.7080	145.3522	157.1553	(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	161.8274	141.9178	147.3696	129.7898	125.5093	109.7386	103.1092	116.2989	117.0889	134.7080	145.3522	157.1553	(64)
Heat gains from water heating, kWh/month	52.6436	46.1380	47.8411	42.0364	40.5781	35.3742	33.1345	37.5172	37.8155	43.6334	47.2063	51.0910	(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	118.6398	118.6398	118.6398	118.6398	118.6398	118.6398	118.6398	118.6398	118.6398	118.6398	118.6398	118.6398	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.7799	18.4565	15.0098	11.3634	8.4943	7.1712	7.7488	10.0721	13.5188	17.1652	20.0344	21.3574	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	209.8678	212.0456	206.5577	194.8746	180.1267	166.2659	157.0059	154.8282	160.3161	171.9992	186.7470	200.6079	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.8640	34.8640	34.8640	34.8640	34.8640	34.8640	34.8640	34.8640	34.8640	34.8640	34.8640	34.8640	(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)	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	(71)
Water heating gains (Table 5)	70.7575	68.6578	64.3026	58.3839	54.5405	49.1309	44.5356	50.4264	52.5216	58.6471	65.5643	68.6707	(72)
Total internal gains	362.9972	360.7518	347.4621	326.2138	304.7535	284.1599	270.8823	276.9186	287.9484	309.4035	333.9376	352.2280	(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	
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East					9.0400	19.6403		0.4500	0.0000		0.7700		61.5204 (76)	
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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	424.5175	481.0988	545.6563	615.2683	659.0006	646.7948	616.1255	573.4775	518.4565	452.2052	410.6463	402.8194	(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	68.7268	68.7268	68.7268	68.7268	68.7268	68.7268	68.7268	68.7268	68.7268	68.7268	68.7268	68.7268		
alpha	5.5818	5.5818	5.5818	5.5818	5.5818	5.5818	5.5818	5.5818	5.5818	5.5818	5.5818	5.5818		
util living area	0.9986	0.9968	0.9901	0.9629	0.8777	0.7095	0.5366	0.5963	0.8546	0.9809	0.9969	0.9989	(86)	
MIT	19.9147	20.0441	20.2773	20.5775	20.8323	20.9622	20.9933	20.9883	20.8934	20.5532	20.1688	19.8775	(87)	
Th 2	20.0746	20.0746	20.0746	20.0746	20.0746	20.0746	20.0746	20.0746	20.0746	20.0746	20.0746	20.0746	(88)	
util rest of house	0.9981	0.9957	0.9866	0.9491	0.8349	0.6249	0.4282	0.4844	0.7888	0.9714	0.9957	0.9986	(89)	
MIT 2	19.0791	19.2081	19.4396	19.7315	19.9610	20.0572	20.0729	20.0712	20.0146	19.7125	19.3329	19.0420	(90)	
Living area fraction									fLA = Living area / (4) =			0.3548	(91)	
MIT	19.3756	19.5047	19.7368	20.0316	20.2701	20.3783	20.3994	20.3966	20.3264	20.0107	19.6294	19.3384	(92)	
Temperature adjustment												-0.1500		
adjusted MIT	19.2256	19.3547	19.5868	19.8816	20.1201	20.2283	20.2494	20.2466	20.1764	19.8607	19.4794	19.1884	(93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9975	0.9945	0.9842	0.9455	0.8372	0.6398	0.4491	0.5059	0.7971	0.9686	0.9946	0.9981	(94)
Useful gains	423.4385	478.4485	537.0239	581.7612	551.7450	413.8347	276.7301	290.1494	413.2775	437.9923	408.4206	402.0491	(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	1139.2510	1103.3095	998.9010	838.2147	642.7000	429.5990	278.5565	293.6059	463.8030	706.8620	944.9077	1144.0493	(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	532.5645	419.9066	343.6365	184.6465	67.6705	0.0000	0.0000	0.0000	0.0000	200.0390	386.2707	552.0482	(98)
Space heating												2686.7825	(98)
Space heating per m2												(98) / (4) =	35.5677 (99)

8c. Space cooling requirement

Not applicable

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												90.5000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												2968.8205 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	532.5645	419.9066	343.6365	184.6465	67.6705	0.0000	0.0000	0.0000	0.0000	200.0390	386.2707	552.0482 (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)	588.4691	463.9852	379.7089	204.0292	74.7740	0.0000	0.0000	0.0000	0.0000	221.0376	426.8185	609.9980 (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	161.8274	141.9178	147.3696	129.7898	125.5093	109.7386	103.1092	116.2989	117.0889	134.7080	145.3522	157.1553 (64)
Efficiency of water heater												87.3000 (216)
(217)m	89.7335	89.6697	89.5152	89.1511	88.3949	87.3000	87.3000	87.3000	87.3000	89.1845	89.6020	89.7708 (217)
Fuel for water heating, kWh/month	180.3424	158.2672	164.6309	145.5840	141.9871	125.7028	118.1091	133.2176	134.1224	151.0443	162.2199	175.0628 (219)
Water heating fuel used												1790.2903 (219)
Annual totals kWh/year												
Space heating fuel - main system												2968.8205 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(MEVDecentralised, Database: total watage = 5.3360, total flow = 29.0000, SFP = 0.1840)												
mechanical ventilation fans (SFP = 0.1840)												40.6973 (230a)
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												115.6973 (231)
Electricity for lighting (calculated in Appendix L)												366.9792 (232)
Total delivered energy for all uses												5241.7873 (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	2968.8205	0.2160	641.2652 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1790.2903	0.2160	386.7027 (264)
Space and water heating			1027.9679 (265)
Pumps and fans	115.6973	0.5190	60.0469 (267)
Energy for lighting	366.9792	0.5190	190.4622 (268)
Total CO2, kg/year			1278.4771 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			16.9200 (273)

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

DER		16.9200 ZC1
Total Floor Area	TFA	75.5400
Assumed number of occupants	N	2.3728
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.4632 ZC2
CO2 emissions from cooking, equation (L16)		2.3292 ZC3
Total CO2 emissions		35.7124 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		35.7124 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	75.5400 (1b)	x 2.4000 (2b)	= 181.2960 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	75.5400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.2960 (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)
					Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1655 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4155 (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) =		0.3220 (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												
	0.4105	0.4025	0.3944	0.3542	0.3461	0.3059	0.3059	0.2978	0.3220	0.3461	0.3622	0.3783 (22b)
Effective ac	0.5843	0.5810	0.5778	0.5627	0.5599	0.5468	0.5468	0.5444	0.5518	0.5599	0.5656	0.5716 (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)			9.0400	1.3258	11.9848		(27)
WT-E-01	32.6600	9.0400	23.6200	0.1800	4.2516		(29a)
WT-I-01	40.3000	2.1200	38.1800	0.1800	6.8724		(29a)
Flat Roof	75.5400		75.5400	0.1300	9.8202		(30)
Total net area of external elements Aum, m ²			148.5000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.0490		(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)							5.0395 (36)
Total fabric heat loss						(33) + (36) =	40.0885 (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	34.9556	34.7599	34.5680	33.6666	33.4980	32.7129	32.7129	32.5675	33.0153	33.4980	33.8391	34.1958 (38)
Heat transfer coeff	75.0442	74.8484	74.6565	73.7552	73.5865	72.8015	72.8015	72.6561	73.1038	73.5865	73.9277	74.2843 (39)
Average = Sum(39)m / 12 =												73.7543 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9934	0.9908	0.9883	0.9764	0.9741	0.9637	0.9637	0.9618	0.9678	0.9741	0.9787	0.9834 (40)
HLP (average)												0.9764 (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												2.3728 (42)
Average daily hot water use (litres/day)												90.5539 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	99.6093	95.9872	92.3650	88.7428	85.1207	81.4985	81.4985	85.1207	88.7428	92.3650	95.9872	99.6093 (44)
Energy conte	147.7177	129.1949	133.3175	116.2295	111.5249	96.2375	89.1782	102.3333	103.5555	120.6840	131.7360	143.0567 (45)
Energy content (annual)										Total = Sum(45)m =		1424.7658 (45)
Distribution loss (46)m = 0.15 x (45)m	22.1577	19.3792	19.9976	17.4344	16.7287	14.4356	13.3767	15.3500	15.5333	18.1026	19.7604	21.4585 (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)

Regs Region: England

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

FULL SAP CALCULATION PRINTOUT

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Combi loss	50.7598	44.1804	47.0682	43.7636	43.3766	40.1911	41.5308	43.3766	43.7636	47.0682	47.3361	50.7598 (61)
Total heat required for water heating calculated for each month	198.4775	173.3753	180.3857	159.9930	154.9015	136.4286	130.7090	145.7099	147.3191	167.7521	179.0721	193.8165 (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	198.4775	173.3753	180.3857	159.9930	154.9015	136.4286	130.7090	145.7099	147.3191	167.7521	179.0721	193.8165 (64)
Heat gains from water heating, kWh/month	61.8061	54.0024	56.0951	49.5872	47.9262	42.0467	40.0344	44.8700	45.3731	51.8945	55.6362	60.2563 (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	118.6398	118.6398	118.6398	118.6398	118.6398	118.6398	118.6398	118.6398	118.6398	118.6398	118.6398	118.6398	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.7799	18.4565	15.0098	11.3634	8.4943	7.1712	7.7488	10.0721	13.5188	17.1652	20.0344	21.3574	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	209.8678	212.0456	206.5577	194.8746	180.1267	166.2659	157.0059	154.8282	160.3161	171.9992	186.7470	200.6079	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.8640	34.8640	34.8640	34.8640	34.8640	34.8640	34.8640	34.8640	34.8640	34.8640	34.8640	34.8640	(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)	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	(71)
Water heating gains (Table 5)	83.0727	80.3607	75.3967	68.8711	64.4169	58.3983	53.8097	60.3091	63.0182	69.7506	77.2726	80.9897	(72)
Total internal gains	375.3124	372.4548	358.5562	336.7010	314.6299	293.4273	280.1564	286.8014	298.4450	320.5070	345.6459	364.5470	(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	429.5734	478.6007	533.3635	591.6471	627.0758	613.2713	584.6609	548.3662	501.7532	446.4581	413.3030	409.1685 (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	69.9033	70.0861	70.2663	71.1250	71.2880	72.0567	72.0567	72.2009	71.7587	71.2880	70.9590	70.6183	
alpha	5.6602	5.6724	5.6844	5.7417	5.7525	5.8038	5.8038	5.8134	5.7839	5.7525	5.7306	5.7079	
util living area	0.9985	0.9968	0.9908	0.9661	0.8864	0.7159	0.5402	0.5956	0.8548	0.9807	0.9968	0.9988	(86)
MIT	19.9451	20.0679	20.2903	20.5880	20.8350	20.9654	20.9942	20.9902	20.9029	20.5794	20.2100	19.9239	(87)
Th 2	20.0888	20.0910	20.0931	20.1031	20.1049	20.1137	20.1137	20.1153	20.1103	20.1049	20.1012	20.0972	(88)
util rest of house	0.9980	0.9957	0.9876	0.9534	0.8460	0.6341	0.4355	0.4882	0.7906	0.9713	0.9955	0.9985	(89)
MIT 2	18.6715	18.8524	19.1774	19.6100	19.9394	20.0900	20.1114	20.1110	20.0299	19.6049	19.0679	18.6467	(90)
Living area fraction									fLA = Living area / (4) =			0.3548	(91)
MIT	19.1233	19.2836	19.5722	19.9570	20.2571	20.4006	20.4246	20.4230	20.3396	19.9507	19.4731	19.0998	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1233	19.2836	19.5722	19.9570	20.2571	20.4006	20.4246	20.4230	20.3396	19.9507	19.4731	19.0998	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9972	0.9944	0.9851	0.9509	0.8537	0.6619	0.4728	0.5265	0.8091	0.9692	0.9942	0.9978	(94)
Ext temp.	428.3630	475.9127	525.4248	562.5771	535.3176	405.9141	276.4568	288.7226	405.9589	432.6965	410.9036	408.2871	(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	1112.4033	1076.5913	975.9255	815.5092	629.6889	422.2908	278.4375	292.2920	456.1399	688.0818	914.7131	1106.8252	(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 m ²	508.9260	403.6560	335.1725	182.1111	70.2123	0.0000	0.0000	0.0000	0.0000	190.0067	362.7428	519.7124	(98)
												2572.5397	(98)
												34.0553	(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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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



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													2754.3251 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	508.9260	403.6560	335.1725	182.1111	70.2123	0.0000	0.0000	0.0000	0.0000	190.0067	362.7428	519.7124	(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)	544.8886	432.1799	358.8571	194.9797	75.1737	0.0000	0.0000	0.0000	0.0000	203.4332	388.3756	556.4372	(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	198.4775	173.3753	180.3857	159.9930	154.9015	136.4286	130.7090	145.7099	147.3191	167.7521	179.0721	193.8165	(64)
Efficiency of water heater	87.3185	87.1081	86.5894	85.3778	83.1992	80.3000	80.3000	80.3000	80.3000	85.3654	86.7920	87.4135	(216)
Fuel for water heating, kWh/month	227.3029	199.0347	208.3231	187.3942	186.1814	169.8986	162.7758	181.4569	183.4609	196.5107	206.3232	221.7238	(219)
Water heating fuel used												2330.3862	(219)
Annual totals kWh/year													
Space heating fuel - main system												2754.3251	(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)												366.9792	(232)
Total delivered energy for all uses												5526.6906	(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	2754.3251	0.2160	594.9342 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2330.3862	0.2160	503.3634 (264)
Space and water heating			1098.2977 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	366.9792	0.5190	190.4622 (268)
Total CO2, kg/m2/year			1327.6849 (272)
Emissions per m2 for space and water heating			14.5393 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.5213 (272b)
Emissions per m2 for pumps and fans			0.5153 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.5393 * 1.00) + 2.5213 + 0.5153, rounded to 2 d.p.			17.5800 (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	75.5400 (1b)	x 2.4000 (2b)	= 181.2960 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	75.5400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.2960 (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					3.7300
Number of sides sheltered					0.3520 (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) =				0.2728 (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	0.3478	0.3410	0.3342	0.3001	0.2932	0.2591	0.2591	0.2523	0.2728	0.2932	0.3069	0.3205 (22b)
	0.5605	0.5581	0.5558	0.5450	0.5430	0.5336	0.5336	0.5318	0.5372	0.5430	0.5471	0.5514 (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)
WT-E-01	32.6600	9.0400	23.6200	0.2000	4.7240		(29a)
WT-I-01	40.3000	2.1200	38.1800	0.2890	11.0337		(29a)
Flat Roof	75.5400		75.5400	0.1500	11.3310		(30)
Total net area of external elements Aum, m ²			148.5000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	40.3798	(33)
Party Wall 1			15.1200	0.0000	0.0000		(32)
Party Floor 1			75.5400				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.0352 (36)
Total fabric heat loss						(33) + (36) =	46.4150 (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	33.5323	33.3918	33.2540	32.6071	32.4861	31.9227	31.9227	31.8184	32.1397	32.4861	32.7310	32.9869 (38)
Heat transfer coeff	79.9472	79.8067	79.6690	79.0221	78.9011	78.3377	78.3377	78.2333	78.5547	78.9011	79.1459	79.4019 (39)
Average = Sum(39)m / 12 =												79.0215 (39)
HLP	1.0583	1.0565	1.0547	1.0461	1.0445	1.0370	1.0370	1.0357	1.0399	1.0445	1.0477	1.0511 (40)
HLP (average)												1.0461 (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												2.3728 (42)
Average daily hot water use (litres/day)												90.5539 (43)
Daily hot water use	99.6093	95.9872	92.3650	88.7428	85.1207	81.4985	81.4985	85.1207	88.7428	92.3650	95.9872	99.6093 (44)
Energy conte	147.7177	129.1949	133.3175	116.2295	111.5249	96.2375	89.1782	102.3333	103.5555	120.6840	131.7360	143.0567 (45)
Energy content (annual)										Total = Sum(45)m =		1424.7658 (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)

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	31.3900	27.4539	28.3300	24.6988	23.6990	20.4505	18.9504	21.7458	22.0055	25.6453	27.9939	30.3996 (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	118.6398	118.6398	118.6398	118.6398	118.6398	118.6398	118.6398	118.6398	118.6398	118.6398	118.6398	118.6398	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.7799	18.4565	15.0098	11.3634	8.4943	7.1712	7.7488	10.0721	13.5188	17.1652	20.0344	21.3574	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	209.8678	212.0456	206.5577	194.8746	180.1267	166.2659	157.0059	154.8282	160.3161	171.9992	186.7470	200.6079	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.8640	34.8640	34.8640	34.8640	34.8640	34.8640	34.8640	34.8640	34.8640	34.8640	34.8640	34.8640	(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)	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	(71)
Water heating gains (Table 5)	42.1909	40.8540	38.0779	34.3038	31.8536	28.4034	25.4709	29.2283	30.5633	34.4695	38.8804	40.8596	(72)
Total internal gains	331.4306	329.9481	318.2374	299.1338	279.0665	260.4325	248.8176	252.7205	262.9901	282.2259	304.2538	321.4169	(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		
-----	-----												
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	392.9509	450.2950	516.4316	588.1882	633.3136	623.0674	594.0608	549.2793	493.4982	425.0277	380.9624	372.0083 (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	65.6162	65.7317	65.8453	66.3844	66.4862	66.9644	66.9644	67.0537	66.7794	66.4862	66.2805	66.0668	
alpha	5.3744	5.3821	5.3897	5.4256	5.4324	5.4643	5.4643	5.4702	5.4520	5.4324	5.4187	5.4045	
util living area	0.9990	0.9977	0.9927	0.9712	0.8995	0.7411	0.5674	0.6313	0.8817	0.9863	0.9979	0.9993	(86)
MIT	19.8083	19.9431	20.1871	20.5122	20.7920	20.9498	20.9903	20.9833	20.8644	20.4912	20.0879	19.7818	(87)
Th 2	20.0350	20.0365	20.0380	20.0451	20.0464	20.0526	20.0526	20.0537	20.0502	20.0464	20.0437	20.0409	(88)
util rest of house	0.9987	0.9969	0.9901	0.9598	0.8605	0.6555	0.4519	0.5133	0.8212	0.9791	0.9970	0.9990	(89)
MIT 2	18.9406	19.0764	19.3203	19.6445	19.9025	20.0289	20.0500	20.0488	19.9713	19.6291	19.2271	18.9190	(90)
Living area fraction									fLA = Living area / (4) =			0.3548	(91)
MIT	19.2485	19.3839	19.6278	19.9523	20.2181	20.3556	20.3836	20.3803	20.2882	19.9350	19.5325	19.2251	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2485	19.3839	19.6278	19.9523	20.2181	20.3556	20.3836	20.3803	20.2882	19.9350	19.5325	19.2251	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9983	0.9962	0.9886	0.9585	0.8685	0.6847	0.4933	0.5556	0.8386	0.9780	0.9964	0.9987	(94)
Ext temp.	392.2820	448.5707	510.5379	563.7755	550.0264	426.5999	293.0380	305.1894	413.8301	415.6870	379.5943	371.5369	(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	1195.0875	1155.9124	1045.8805	873.3772	672.0835	450.8779	296.4007	311.3945	486.1101	736.5403	983.9824	1193.0222	(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	597.2873	475.3336	398.2949	222.9132	90.8105	0.0000	0.0000	0.0000	0.0000	238.7149	435.1594	611.1850	(98)
Space heating per m2												3069.6989	(98)
										(98) / (4) =		40.6367	(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	736.3741	579.6987	594.5733	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8858	0.9410	0.9183	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	652.2970	545.5160	545.9949	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	817.4140	781.7766	731.1881	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	118.8843	175.7779	137.7838	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												432.4460	(104)
Cooled fraction												1.0000	(105)
												fC = 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	29.7211	43.9445	34.4460	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											108.1115 (107)
Space cooling per m2											1.4312 (108)
Energy for space heating											40.6367 (99)
Energy for space cooling											1.4312 (108)
Total											42.0679 (109)
Dwelling Fabric Energy Efficiency (DFEE)											42.1 (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	75.5400 (1b)	x 2.4000 (2b)	= 181.2960 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	75.5400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.2960 (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)
					Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1655 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4155 (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) = 0.3220 (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												
	0.4105	0.4025	0.3944	0.3542	0.3461	0.3059	0.3059	0.2978	0.3220	0.3461	0.3622	0.3783 (22b)
Effective ac	0.5843	0.5810	0.5778	0.5627	0.5599	0.5468	0.5468	0.5444	0.5518	0.5599	0.5656	0.5716 (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)			9.0400	1.3258	11.9848		(27)
WT-E-01	32.6600	9.0400	23.6200	0.1800	4.2516		(29a)
WT-I-01	40.3000	2.1200	38.1800	0.1800	6.8724		(29a)
Flat Roof	75.5400		75.5400	0.1300	9.8202		(30)
Total net area of external elements Aum, m ²			148.5000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 35.0490		(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)							5.0395 (36)
Total fabric heat loss						(33) + (36) =	40.0885 (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	34.9556	34.7599	34.5680	33.6666	33.4980	32.7129	32.7129	32.5675	33.0153	33.4980	33.8391	34.1958 (38)
Heat transfer coeff	75.0442	74.8484	74.6565	73.7552	73.5865	72.8015	72.8015	72.6561	73.1038	73.5865	73.9277	74.2843 (39)
Average = Sum(39)m / 12 =												73.7543 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9934	0.9908	0.9883	0.9764	0.9741	0.9637	0.9637	0.9618	0.9678	0.9741	0.9787	0.9834 (40)
HLP (average)												0.9764 (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												2.3728 (42)
Average daily hot water use (litres/day)												90.5539 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	99.6093	95.9872	92.3650	88.7428	85.1207	81.4985	81.4985	85.1207	88.7428	92.3650	95.9872	99.6093 (44)
Energy conte	147.7177	129.1949	133.3175	116.2295	111.5249	96.2375	89.1782	102.3333	103.5555	120.6840	131.7360	143.0567 (45)
Energy content (annual)												Total = Sum(45)m = 1424.7658 (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	31.3900	27.4539	28.3300	24.6988	23.6990	20.4505	18.9504	21.7458	22.0055	25.6453	27.9939	30.3996 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	118.6398	118.6398	118.6398	118.6398	118.6398	118.6398	118.6398	118.6398	118.6398	118.6398	118.6398	118.6398 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.7799	18.4565	15.0098	11.3634	8.4943	7.1712	7.7488	10.0721	13.5188	17.1652	20.0344	21.3574 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	209.8678	212.0456	206.5577	194.8746	180.1267	166.2659	157.0059	154.8282	160.3161	171.9992	186.7470	200.6079 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.8640	34.8640	34.8640	34.8640	34.8640	34.8640	34.8640	34.8640	34.8640	34.8640	34.8640	34.8640 (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)	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119 (71)
Water heating gains (Table 5)	42.1909	40.8540	38.0779	34.3038	31.8536	28.4034	25.4709	29.2283	30.5633	34.4695	38.8804	40.8596 (72)
Total internal gains	331.4306	329.9481	318.2374	299.1338	279.0665	260.4325	248.8176	252.7205	262.9901	282.2259	304.2538	321.4169 (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							
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	385.6915	436.0941	493.0447	554.0798	591.5125	580.2765	553.3221	514.2854	466.2982	408.1771	371.9108	366.0385 (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	69.9033	70.0861	70.2663	71.1250	71.2880	72.0567	72.0567	72.2009	71.7587	71.2880	70.9590	70.6183
alpha	5.6602	5.6724	5.6844	5.7417	5.7525	5.8038	5.8038	5.8134	5.7839	5.7525	5.7306	5.7079
util living area	0.9991	0.9980	0.9937	0.9744	0.9064	0.7458	0.5684	0.6303	0.8839	0.9873	0.9981	0.9994 (86)
MIT	19.8893	20.0143	20.2409	20.5474	20.8096	20.9574	20.9925	20.9870	20.8814	20.5346	20.1577	19.8689 (87)
Th 2	20.0888	20.0910	20.0931	20.1031	20.1049	20.1137	20.1137	20.1153	20.1103	20.1049	20.1012	20.0972 (88)
util rest of house	0.9988	0.9973	0.9914	0.9644	0.8702	0.6644	0.4595	0.5189	0.8261	0.9807	0.9973	0.9991 (89)
MIT 2	19.0655	19.1920	19.4193	19.7283	19.9717	20.0932	20.1116	20.1113	20.0406	19.7207	19.3437	19.0520 (90)
Living area fraction												0.3548 (91)
MIT	19.3578	19.4838	19.7108	20.0189	20.2690	20.3998	20.4242	20.4220	20.3389	20.0095	19.6325	19.3418 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3578	19.4838	19.7108	20.0189	20.2690	20.3998	20.4242	20.4220	20.3389	20.0095	19.6325	19.3418 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9985	0.9967	0.9902	0.9632	0.8777	0.6923	0.4985	0.5588	0.8430	0.9798	0.9968	0.9989 (94)
Useful gains	385.1123	434.6528	488.2082	533.7122	519.1770	401.7072	275.8122	287.4013	393.0848	399.9302	370.7172	365.6312 (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	1129.9979	1091.5707	986.2724	820.0740	630.5605	422.2346	278.4045	292.2228	456.0880	692.4111	926.4973	1124.7996 (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	554.1949	441.4488	370.5598	206.1805	82.8693	0.0000	0.0000	0.0000	0.0000	217.6058	400.1616	564.8213 (98)
Space heating												2837.8420 (98)
Space heating per m2											(98) / (4) =	37.5674 (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	684.3337	538.7308	552.1862	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	8.8972	0.9497	0.9301	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	613.9554	511.6406	513.5709	0.0000	0.0000	0.0000	0.0000 (102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	767.3987	734.1600	690.2861	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	110.4791	165.5544	131.4761	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												407.5096 (104)
Intermittency factor (Table 10b)									fC = cooled area / (4) =			1.0000 (105)
	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	27.6198	41.3886	32.8690	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling													101.8774 (107)
Space cooling per m2													1.3487 (108)
Energy for space heating													37.5674 (99)
Energy for space cooling													1.3487 (108)
Total													38.9161 (109)
Target Fabric Energy Efficiency (TFEE)													44.8 (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	75.5400 (1b)	x 2.4000 (2b)	= 181.2960 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	75.5400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.2960 (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					3.7300
Infiltration rate					0.1865 (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) =				0.1445 (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	0.1518	0.1445	0.1445	0.1337	0.1337	0.1192	0.1229	0.1156	0.1192	0.1265	0.1265	0.1373 (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)			9.0400	1.2357	11.1711		(27)
WT-E-01	32.6600	9.0400	23.6200	0.2000	4.7240		(29a)
WT-I-01	40.3000	2.1200	38.1800	0.2890	11.0337		(29a)
Flat Roof	75.5400		75.5400	0.1500	11.3310		(30)
Total net area of external elements Aum(A, m2)			148.5000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26) ... (30) + (32) =	40.3798	(33)
Party Wall 1			15.1200	0.0000	0.0000		(32)
Party Floor 1			75.5400				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.0352 (36)
Total fabric heat loss							(33) + (36) = 46.4150 (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	29.9138	29.9138	29.9138	29.9138	29.9138	29.9138	29.9138	29.9138	29.9138	29.9138	29.9138	29.9138 (38)
Heat transfer coeff	76.3288	76.3288	76.3288	76.3288	76.3288	76.3288	76.3288	76.3288	76.3288	76.3288	76.3288	76.3288 (39)
Average = Sum(39)m / 12 =												76.3288 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0104	1.0104	1.0104	1.0104	1.0104	1.0104	1.0104	1.0104	1.0104	1.0104	1.0104	1.0104 (40)
HLP (average)												1.0104 (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												2.3728 (42)
Average daily hot water use (litres/day)												90.5539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	99.6093	95.9872	92.3650	88.7428	85.1207	81.4985	81.4985	85.1207	88.7428	92.3650	95.9872	99.6093 (44)
Energy conte	147.7177	129.1949	133.3175	116.2295	111.5249	96.2375	89.1782	102.3333	103.5555	120.6840	131.7360	143.0567 (45)
Energy content (annual)												Total = Sum(45)m = 1424.7658 (45)
Distribution loss (46)m = 0.15 x (45)m	22.1577	19.3792	19.9976	17.4344	16.7287	14.4356	13.3767	15.3500	15.5333	18.1026	19.7604	21.4585 (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	14.1097	12.7229	14.0521	13.5603	13.9844	13.5010	13.9310	13.9656	13.5334	14.0241	13.6163	14.0986 (61)
Total heat required for water heating calculated for each month												
	161.8274	141.9178	147.3696	129.7898	125.5093	109.7386	103.1092	116.2989	117.0889	134.7080	145.3522	157.1553 (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												
	161.8274	141.9178	147.3696	129.7898	125.5093	109.7386	103.1092	116.2989	117.0889	134.7080	145.3522	157.1553 (64)
Total per year (kWh/year) = Sum(64)m =												1589.8651 (64)
RHI water heating demand												
Heat gains from water heating, kWh/month												
	52.6436	46.1380	47.8411	42.0364	40.5781	35.3742	33.1345	37.5172	37.8155	43.6334	47.2063	51.0910 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	142.3678	142.3678	142.3678	142.3678	142.3678	142.3678	142.3678	142.3678	142.3678	142.3678	142.3678	142.3678 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	51.9497	46.1413	37.5246	28.4085	21.2357	17.9281	19.3719	25.1804	33.7970	42.9131	50.0859	53.3936 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	313.2356	316.4860	308.2951	290.8576	268.8459	248.1580	234.3372	231.0868	239.2777	256.7152	278.7269	299.4148 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.6096	51.6096	51.6096	51.6096	51.6096	51.6096	51.6096	51.6096	51.6096	51.6096	51.6096	51.6096 (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)	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119 (71)
Water heating gains (Table 5)	70.7575	68.6578	64.3026	58.3839	54.5405	49.1309	44.5356	50.4264	52.5216	58.6471	65.5643	68.6707 (72)
Total internal gains	538.0083	533.3505	512.1877	479.7155	446.6876	417.2825	400.3103	408.7591	427.6618	460.3409	496.4426	523.5446 (73)

[Jan					Area	Solar flux	g	FF			Access	Gains
					m2	Table 6a	Specific data	Specific data			factor	W
						W/m2	or Table 6b	or Table 6c			Table 6d	
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	607.9580	656.4372	712.0587	779.2648	803.6133	808.0029	768.3847	732.5773	679.3538	616.2014	585.7948	580.5097 (84)

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	68.7268	68.7268	68.7268	68.7268	68.7268	68.7268	68.7268	68.7268	68.7268	68.7268	68.7268	68.7268
alpha	5.5818	5.5818	5.5818	5.5818	5.5818	5.5818	5.5818	5.5818	5.5818	5.5818	5.5818	5.5818
util living area												
	0.9894	0.9825	0.9582	0.8812	0.7127	0.4685	0.3076	0.3329	0.6295	0.9046	0.9777	0.9914 (86)
MIT	20.2191	20.3233	20.5461	20.7951	20.9517	20.9961	20.9997	20.9995	20.9808	20.7958	20.4648	20.1860 (87)
Th 2	20.0746	20.0746	20.0746	20.0746	20.0746	20.0746	20.0746	20.0746	20.0746	20.0746	20.0746	20.0746 (88)
util rest of house												
	0.9860	0.9771	0.9450	0.8466	0.6461	0.3838	0.2160	0.2369	0.5389	0.8679	0.9694	0.9887 (89)
MIT 2	19.3812	19.4834	19.6989	19.9255	20.0481	20.0735	20.0746	20.0746	20.0670	19.9317	19.6233	19.3487 (90)
Living area fraction									fLA = Living area / (4) =			0.3548 (91)
MIT	19.6785	19.7814	19.9995	20.2341	20.3687	20.4008	20.4028	20.4027	20.3912	20.2382	19.9219	19.6457 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.5285	19.6314	19.8495	20.0841	20.2187	20.2508	20.2528	20.2527	20.2412	20.0882	19.7719	19.4957 (93)

[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	75.5400 (1b)	x 2.4000 (2b)	= 181.2960 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	75.5400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.2960 (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							3.7300					
Infiltration rate							0.1865	(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) =	0.1445 (21)				
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	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												
	0.1843	0.1807	0.1771	0.1590	0.1554	0.1373	0.1373	0.1337	0.1445	0.1554	0.1626	0.1698 (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)
WT-E-01	32.6600	9.0400	23.6200	0.2000	4.7240		(29a)
WT-I-01	40.3000	2.1200	38.1800	0.2890	11.0337		(29a)
Flat Roof	75.5400		75.5400	0.1500	11.3310		(30)
Total net area of external elements Aum(A, m ²)			148.5000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	40.3798		(33)
Party Wall 1			15.1200	0.0000	0.0000		(32)
Party Floor 1			75.5400				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.0352 (36)
Total fabric heat loss						(33) + (36) =	46.4150 (37)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3728 (42)
Average daily hot water use (litres/day)												90.5539 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	99.6093	95.9872	92.3650	88.7428	85.1207	81.4985	81.4985	85.1207	88.7428	92.3650	95.9872	99.6093 (44)
Energy conte	147.7177	129.1949	133.3175	116.2295	111.5249	96.2375	89.1782	102.3333	103.5555	120.6840	131.7360	143.0567 (45)
Energy content (annual)												Total = Sum(45)m = 1424.7658 (45)
Distribution loss (46)m = 0.15 x (45)m	22.1577	19.3792	19.9976	17.4344	16.7287	14.4356	13.3767	15.3500	15.5333	18.1026	19.7604	21.4585 (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	14.1097	12.7229	14.0521	13.5603	13.9844	13.5010	13.9310	13.9656	13.5334	14.0241	13.6163	14.0986	(61)
Total heat required for water heating calculated for each month	161.8274	141.9178	147.3696	129.7898	125.5093	109.7386	103.1092	116.2989	117.0889	134.7080	145.3522	157.1553	(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	161.8274	141.9178	147.3696	129.7898	125.5093	109.7386	103.1092	116.2989	117.0889	134.7080	145.3522	157.1553	(64)
Heat gains from water heating, kWh/month	52.6436	46.1380	47.8411	42.0364	40.5781	35.3742	33.1345	37.5172	37.8155	43.6334	47.2063	51.0910	(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	142.3678	142.3678	142.3678	142.3678	142.3678	142.3678	142.3678	142.3678	142.3678	142.3678	142.3678	142.3678	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	51.9497	46.1413	37.5246	28.4085	21.2357	17.9281	19.3719	25.1804	33.7970	42.9131	50.0859	53.3936	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	313.2356	316.4860	308.2951	290.8576	268.8459	248.1580	234.3372	231.0868	239.2777	256.7152	278.7269	299.4148	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.6096	51.6096	51.6096	51.6096	51.6096	51.6096	51.6096	51.6096	51.6096	51.6096	51.6096	51.6096	(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)	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	-94.9119	(71)
Water heating gains (Table 5)	70.7575	68.6578	64.3026	58.3839	54.5405	49.1309	44.5356	50.4264	52.5216	58.6471	65.5643	68.6707	(72)
Total internal gains	538.0083	533.3505	512.1877	479.7155	446.6876	417.2825	400.3103	408.7591	427.6618	460.3409	496.4426	523.5446	(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	599.5287	653.6975	710.3820	768.7699	800.9347	779.9174	745.5535	705.3179	658.1699	603.1427	573.1513	574.1359 (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	68.7268	68.7268	68.7268	68.7268	68.7268	68.7268	68.7268	68.7268	68.7268	68.7268	68.7268	68.7268	
alpha	5.5818	5.5818	5.5818	5.5818	5.5818	5.5818	5.5818	5.5818	5.5818	5.5818	5.5818	5.5818	
util living area	0.9921	0.9860	0.9681	0.9141	0.7926	0.6083	0.4476	0.4927	0.7403	0.9380	0.9850	0.9937	(86)
MIT	20.1326	20.2545	20.4655	20.7183	20.9042	20.9821	20.9972	20.9954	20.9497	20.7090	20.3667	20.0920	(87)
Th 2	20.0746	20.0746	20.0746	20.0746	20.0746	20.0746	20.0746	20.0746	20.0746	20.0746	20.0746	20.0746	(88)
util rest of house	0.9897	0.9817	0.9583	0.8884	0.7389	0.5280	0.3550	0.3963	0.6627	0.9136	0.9795	0.9918	(89)
MIT 2	19.2955	19.4157	19.6213	19.8579	20.0142	20.0669	20.0740	20.0734	20.0493	19.8550	19.5275	19.2553	(90)
Living area fraction	19.5925	19.7133	19.9208	20.1631	20.3300	20.3916	20.4015	20.4005	20.3688	20.1580	19.8252	19.5521	(91)
MIT	19.5925	19.7133	19.9208	20.1631	20.3300	20.3916	20.4015	20.4005	20.3688	20.1580	19.8252	19.5521	(92)
Temperature adjustment	19.4425	19.5633	19.7708	20.0131	20.1800	20.2416	20.2515	20.2505	20.2188	20.0080	19.6752	19.4021	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	592.0333	639.7783	677.9619	681.5097	597.1056	423.4684	277.9962	292.6047	444.7175	549.7388	559.7138	568.3674	(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	1155.8110	1119.2326	1012.9425	848.2516	647.2651	430.6162	278.7162	293.9030	467.0383	718.1009	959.8514	1160.3620	(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	419.4506	322.1933	249.2255	120.0541	37.3186	0.0000	0.0000	0.0000	0.0000	125.2614	288.0991	440.4439	(98)
Space heating												2002.0467	(98)
Space heating per m2												26.5031	(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												2212.2063	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	419.4506	322.1933	249.2255	120.0541	37.3186	0.0000	0.0000	0.0000	0.0000	125.2614	288.0991	440.4439	(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)	463.4813	356.0147	275.3873	132.6565	41.2361	0.0000	0.0000	0.0000	0.0000	138.4104	318.3415	486.6784	(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	161.8274	141.9178	147.3696	129.7898	125.5093	109.7386	103.1092	116.2989	117.0889	134.7080	145.3522	157.1553	(64)
Efficiency of water heater												87.3000	(216)
(217)m	89.5858	89.4969	89.2839	88.8089	88.0133	87.3000	87.3000	87.3000	87.3000	88.8131	89.4011	89.6360	(217)
Fuel for water heating, kWh/month	180.6396	158.5729	165.0573	146.1450	142.6027	125.7028	118.1091	133.2176	134.1224	151.6758	162.5844	175.3262	(219)
Water heating fuel used												1793.7559	(219)
Annual totals kWh/year													
Space heating fuel - main system												2212.2063	(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)												40.6973	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												115.6973	(231)
Electricity for lighting (calculated in Appendix L)												366.9792	(232)
Total delivered energy for all uses												4488.6387	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2212.2063	3.4800	76.9848 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1793.7559	3.4800	62.4227 (247)
Mechanical ventilation fans	40.6973	13.1900	5.3680 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	366.9792	13.1900	48.4046 (250)
Additional standing charges			120.0000 (251)
Total energy cost			323.0725 (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] = 1.1257 (257)
SAP value	84.2966
SAP rating (Section 12)	84 (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	2212.2063	0.2160	477.8366 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1793.7559	0.2160	387.4513 (264)
Space and water heating			865.2878 (265)
Pumps and fans	115.6973	0.5190	60.0469 (267)
Energy for lighting	366.9792	0.5190	190.4622 (268)
Total kg/year			1115.7970 (272)
CO2 emissions per m2			14.7700 (273)
EI value			87.5961
EI rating			88 (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	$3.48 / 0.8852 = 3.931$, stars = 4
Water heating environmental impact	$0.216 / 0.8852 = 0.2440$, stars = 4

FULL SAP CALCULATION PRINTOUT

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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	75.5400 (1b)	x 2.4000 (2b)	= 181.2960 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	75.5400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.2960 (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					3.7300
Infiltration rate					0.1865 (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) =				0.1445 (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	0.1518	0.1445	0.1445	0.1337	0.1337	0.1192	0.1229	0.1156	0.1192	0.1265	0.1265	0.1373 (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)			9.0400	1.2357	11.1711		(27)
WT-E-01	32.6600	9.0400	23.6200	0.2000	4.7240		(29a)
WT-I-01	40.3000	2.1200	38.1800	0.2890	11.0337		(29a)
Flat Roof	75.5400		75.5400	0.1500	11.3310		(30)
Total net area of external elements Aum(A, m2)			148.5000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26) ... (30) + (32) =	40.3798	(33)
Party Wall 1			15.1200	0.0000	0.0000		(32)
Party Floor 1			75.5400				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.0352 (36)
Total fabric heat loss							(33) + (36) = 46.4150 (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	29.9138	29.9138	29.9138	29.9138	29.9138	29.9138	29.9138	29.9138	29.9138	29.9138	29.9138	29.9138 (38)
Heat transfer coeff	76.3288	76.3288	76.3288	76.3288	76.3288	76.3288	76.3288	76.3288	76.3288	76.3288	76.3288	76.3288 (39)
Average = Sum(39)m / 12 =												76.3288 (39)
HLP	1.0104	1.0104	1.0104	1.0104	1.0104	1.0104	1.0104	1.0104	1.0104	1.0104	1.0104	1.0104 (40)
HLP (average)												1.0104 (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												2.3728 (42)
Average daily hot water use (litres/day)												90.5539 (43)
Daily hot water use	99.6093	95.9872	92.3650	88.7428	85.1207	81.4985	81.4985	85.1207	88.7428	92.3650	95.9872	99.6093 (44)
Energy conte	147.7177	129.1949	133.3175	116.2295	111.5249	96.2375	89.1782	102.3333	103.5555	120.6840	131.7360	143.0567 (45)
Energy content (annual)												Total = Sum(45)m = 1424.7658 (45)
Distribution loss (46)m = 0.15 x (45)m	22.1577	19.3792	19.9976	17.4344	16.7287	14.4356	13.3767	15.3500	15.5333	18.1026	19.7604	21.4585 (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	14.1097	12.7229	14.0521	13.5603	13.9844	13.5010	13.9310	13.9656	13.5334	14.0241	13.6163	14.0986 (61)
Total heat required for water heating calculated for each month												
	161.8274	141.9178	147.3696	129.7898	125.5093	109.7386	103.1092	116.2989	117.0889	134.7080	145.3522	157.1553 (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	161.8274	141.9178	147.3696	129.7898	125.5093	109.7386	103.1092	116.2989	117.0889	134.7080	145.3522	157.1553 (64)
	Total per year (kWh/year) = Sum(64)m = 1589.8651 (64)											
Heat gains from water heating, kWh/month												
	52.6436	46.1380	47.8411	42.0364	40.5781	35.3742	33.1345	37.5172	37.8155	43.6334	47.2063	51.0910 (65)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1866.8971 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	374.5553	290.1560	208.4101	84.4484	17.1046	0.0000	0.0000	0.0000	0.0000	83.8698	239.5099	391.4878	(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)	413.8732	320.6144	230.2874	93.3131	18.9001	0.0000	0.0000	0.0000	0.0000	92.6738	264.6518	432.5832	(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	161.8274	141.9178	147.3696	129.7898	125.5093	109.7386	103.1092	116.2989	117.0889	134.7080	145.3522	157.1553	(64)
Efficiency of water heater (217)m	89.5101	89.4234	89.1465	88.5340	87.6718	87.3000	87.3000	87.3000	87.3000	88.5007	89.2643	87.3000	(216)
Fuel for water heating, kWh/month	180.7923	158.7032	165.3118	146.5989	143.1581	125.7028	118.1091	133.2176	134.1224	152.2112	162.8337	175.4755	(219)
Water heating fuel used													(219)
Annual totals kWh/year													
Space heating fuel - main system													1866.8971 (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)													40.6973 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													115.6973 (231)
Electricity for lighting (calculated in Appendix L)													366.9792 (232)
Total delivered energy for all uses													4145.8103 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1866.8971	3.7400	69.8220 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1796.2366	3.7400	67.1792 (247)
Mechanical ventilation fans	40.6973	19.1200	7.7813 (249)
Pumps and fans for heating	75.0000	19.1200	14.3400 (249)
Energy for lighting	366.9792	19.1200	70.1664 (250)
Additional standing charges			94.0000 (251)
Total energy cost			323.2890 (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	1866.8971	0.2160	403.2498 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1796.2366	0.2160	387.9871 (264)
Space and water heating			791.2369 (265)
Pumps and fans	115.6973	0.5190	60.0469 (267)
Energy for lighting	366.9792	0.5190	190.4622 (268)
Total kg/year			1041.7460 (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	1866.8971	1.2200	2277.6145 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1796.2366	1.2200	2191.4087 (264)
Space and water heating			4469.0232 (265)
Pumps and fans	115.6973	3.0700	355.1908 (267)
Energy for lighting	366.9792	3.0700	1126.6263 (268)
Primary energy kWh/year			5950.8402 (272)
Primary energy kWh/m2/year			78.7773 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 84
Current environmental impact rating: B 88

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 84
 Potential environmental impact rating: B 88

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	£92	£92	£0
Mains gas	£231	£231	£0
Space heating	£186	£186	£0
Water heating	£67	£67	£0
Lighting	£70	£70	£0
Total cost of fuels	£323	£323	£0
Total cost of uses	£323	£323	£0
Delivered energy	55 kWh/m²	55 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.0 tonnes	1.0 tonnes	0.0 tonnes
CO2 emissions per m²	14 kg/m²	14 kg/m²	0 kg/m²
Primary energy	79 kWh/m²	79 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	358.97 (P1)
Transmission heat loss coefficient	46.41 (P7)
Summer heat loss coefficient	405.38 (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	414	397	406	
Total summer gains	871	828	784	(P5)
Summer gain/loss ratio	2.15	2.04	1.93	(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	18.40	20.19	19.98	(P7)
Likelihood of high internal temperature	Not significant	Not significant	Not significant	
Assessment of likelihood of high internal temperature:	Not significant			