

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



Property Reference	SECPMW025m_056_As_Built				Issued on Date	22/11/2021
Assessment Reference	001	Prop Type Ref	MFF			
Property						
SAP Rating	83 B	DER	18.37	TER	19.26	
Environmental	86 B	% DER<TER	4.60			
CO ₂ Emissions (t/year)	1.14	DFEE	47.67	TFEE	53.40	
General Requirements Compliance	Pass	% DFEE<TFEE	10.73			
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 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) 19.26 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 18.37 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)53.4 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)47.7 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	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: 3.20 (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 3.2 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) =				Air changes per hour
Pressure test					0.0000 / (5) = 0.0000 (8)
Measured/design AP50					Yes
Infiltration rate					3.2000
Number of sides sheltered					0.1600 (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) =				0.1240 (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	0.1581	0.1550	0.1519	0.1364	0.1333	0.1178	0.1178	0.1147	0.1240	0.1333	0.1395	0.1457 (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			75.5400	0.1247	9.4162		(28b)
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)
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) =	38.4651		(33)
Party Wall 1				15.1200	0.0000	0.0000	(32)
Party Ceilings 1				75.5400			(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)							15.6852 (36)
Total fabric heat loss							(33) + (36) = 54.1502 (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	84.0641	84.0641	84.0641	84.0641	84.0641	84.0641	84.0641	84.0641	84.0641	84.0641	84.0641	84.0641 (39)
Average = Sum(39)m / 12 =												84.0641 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1128	1.1128	1.1128	1.1128	1.1128	1.1128	1.1128	1.1128	1.1128	1.1128	1.1128	1.1128 (40)
HLP (average)												1.1128 (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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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	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	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	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	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	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	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	51.0910	(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	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	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	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	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	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	-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	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	352.2280	(73)

6. Solar gains														
[Jan]														
Area	9.0400													
Solar flux	19.6403													
Specific data	0.4500													
FF	0.0000													
Access factor	0.7700													
Gains	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	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	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	62.4028	62.4028	62.4028	62.4028	62.4028	62.4028	62.4028	62.4028	62.4028	62.4028	62.4028	62.4028	62.4028	
Feb	5.1602	5.1602	5.1602	5.1602	5.1602	5.1602	5.1602	5.1602	5.1602	5.1602	5.1602	5.1602	5.1602	
Mar	0.9985	0.9969	0.9912	0.9691	0.9001	0.7521	0.5823	0.6428	0.8808	0.9836	0.9971	0.9989	0.9989	(86)
Apr	19.7733	19.9062	20.1512	20.4731	20.7639	20.9354	20.9861	20.9774	20.8456	20.4624	20.0499	19.7359	19.7359	(87)
May	19.9904	19.9904	19.9904	19.9904	19.9904	19.9904	19.9904	19.9904	19.9904	19.9904	19.9904	19.9904	19.9904	(88)
Jun	0.9980	0.9958	0.9880	0.9568	0.8602	0.6629	0.4579	0.5170	0.8178	0.9751	0.9958	0.9985	0.9985	(89)
Jul	18.8697	19.0022	19.2456	19.5603	19.8275	19.9599	19.9867	19.9837	19.9013	19.5542	19.1458	18.8323	18.8323	(90)
Aug	19.1903	19.3229	19.5669	19.8841	20.1597	20.3060	20.3413	20.3362	20.2363	19.8764	19.4666	19.1529	19.1529	(91)
Sep	19.0403	19.1729	19.4169	19.7341	20.0097	20.1560	20.1913	20.1862	20.0863	19.7264	19.3166	19.0029	19.0029	(92)
Oct														(93)
Nov														
Dec														

8. Space heating requirement														
Utilisation	0.9974	0.9946	0.9855	0.9529	0.8611	0.6789	0.4836	0.5429	0.8249	0.9721	0.9947	0.9980	0.9980	(94)
Useful gains	423.4066	478.5092	537.7516	586.3063	567.4383	439.1086	297.9707	311.3137	427.6909	439.5827	408.4634	402.0103	402.0103	(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	4.2000	(96)
Heat loss rate W	1239.1273	1199.8372	1085.8484	910.7610	698.5500	467.0591	301.8987	318.2868	503.2321	767.2037	1026.9744	1244.3882	1244.3882	(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	1.0000	(97a)
Space heating kWh	606.8962	484.7324	407.7840	233.6074	97.5471	0.0000	0.0000	0.0000	0.0000	243.7500	445.3279	626.7292	626.7292	(98)
Space heating														(98)
Space heating per m2														(98) / (4) =

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													3476.6568 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	606.8962	484.7324	407.7840	233.6074	97.5471	0.0000	0.0000	0.0000	0.0000	243.7500	445.3279	626.7292	(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)	670.6035	535.6160	450.5901	258.1298	107.7869	0.0000	0.0000	0.0000	0.0000	269.3370	492.0751	692.5184	(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	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	89.8070	89.7549	89.6279	89.3305	88.6711	87.3000	87.3000	87.3000	87.3000	89.3345	89.6910	87.3000	(216)
Fuel for water heating, kWh/month	180.1947	158.1170	164.4239	145.2917	141.5447	125.7028	118.1091	133.2176	134.1224	150.7907	162.0589	174.9284	(219)
Water heating fuel used												1788.5018	(219)
Annual totals kWh/year													
Space heating fuel - main system												3476.6568	(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													5747.8351 (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	3476.6568	0.2160	750.9579	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1788.5018	0.2160	386.3164	(264)
Space and water heating			1137.2742	(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			1387.7834	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			18.3700	(273)

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

DER			18.3700	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			37.1624	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			37.1624	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)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					30.0000 / (5) = 0.1655 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4155 (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) =				0.3220 (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												
Effective ac	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)
	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)
FT-03			75.5400	0.1300	9.8202		(28b)
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)
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)							14.6895 (36)
Total fabric heat loss						(33) + (36) =	49.7385 (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	84.6942	84.4984	84.3065	83.4052	83.2365	82.4515	82.4515	82.3061	82.7538	83.2365	83.5777	83.9343 (39)
Average = Sum(39)m / 12 =												83.4043 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1212	1.1186	1.1161	1.1041	1.1019	1.0915	1.0915	1.0896	1.0955	1.1019	1.1064	1.1111 (40)
HLP (average)												1.1041 (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)

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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)												
tau	61.9385	62.0820	62.2233	62.8958	63.0232	63.6233	63.7357	63.3908	63.0232	62.7660	62.4993	
alpha	5.1292	5.1388	5.1482	5.1931	5.2015	5.2416	5.2416	5.2490	5.2261	5.2015	5.1844	5.1666
util living area	0.9985	0.9970	0.9921	0.9732	0.9129	0.7707	0.6002	0.6565	0.8884	0.9843	0.9970	0.9988 (86)
MIT	19.7683	19.8955	20.1327	20.4566	20.7471	20.9308	20.9851	20.9766	20.8427	20.4654	20.0605	19.7461 (87)
Th 2	19.9836	19.9857	19.9877	19.9975	19.9993	20.0078	20.0078	20.0094	20.0045	19.9993	19.9956	19.9918 (88)
util rest of house	0.9979	0.9959	0.9891	0.9623	0.8764	0.6838	0.4752	0.5316	0.8280	0.9761	0.9957	0.9984 (89)
MIT 2	18.3368	18.5241	18.8709	19.3433	19.7399	19.9590	20.0020	19.9991	19.8700	19.3626	18.7727	18.3101 (90)
Living area fraction									fLA = Living area / (4) =			0.3548 (91)
MIT	18.8447	19.0107	19.3185	19.7383	20.0972	20.3038	20.3507	20.3459	20.2151	19.7538	19.2296	18.8196 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8447	19.0107	19.3185	19.7383	20.0972	20.3038	20.3507	20.3459	20.2151	19.7538	19.2296	18.8196 (93)

8. Space heating requirement

Utilisation	0.9971	0.9945	0.9865	0.9588	0.8806	0.7119	0.5199	0.5762	0.8429	0.9734	0.9943	0.9977 (94)
Useful gains	428.3122	475.9609	526.1455	567.2594	552.2083	436.5871	303.9833	315.9687	422.9476	434.5612	410.9570	408.2312 (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	1231.8477	1192.3276	1080.6871	903.9697	698.9562	470.2845	309.2540	324.7714	506.0473	761.9340	1013.7611	1227.0851 (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	597.8304	481.3984	412.5790	242.4314	109.1805	0.0000	0.0000	0.0000	0.0000	243.5654	434.0189	609.2273 (98)
Space heating												3130.2313 (98)
Space heating per m2										(98) / (4) =		41.4381 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3351.4254 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	597.8304	481.3984	412.5790	242.4314	109.1805	0.0000	0.0000	0.0000	0.0000	243.5654	434.0189	609.2273	(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)	640.0753	515.4159	441.7334	259.5626	116.8956	0.0000	0.0000	0.0000	0.0000	260.7767	464.6884	652.2776	(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	87.6521	87.4863	87.0685	86.0947	84.1888	80.3000	80.3000	80.3000	80.3000	85.9890	87.1966	80.3000	(216)
Fuel for water heating, kWh/month	226.4378	198.1741	207.1768	185.8337	183.9930	169.8986	162.7758	181.4569	183.4609	195.0856	205.3659	220.9073	(219)
Water heating fuel used												2320.5666	(219)
Annual totals kWh/year													
Space heating fuel - main system												3351.4254	(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												6113.9712	(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	3351.4254	0.2160	723.9079 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2320.5666	0.2160	501.2424 (264)
Space and water heating			1225.1503 (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			1454.5375 (272)
Emissions per m2 for space and water heating			16.2186 (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) = (16.2186 * 1.00) + 2.5213 + 0.5153, rounded to 2 d.p.			19.2600 (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 * 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) = 0.1655 (8)
Measured/design AP50					Yes
Infiltration rate					3.2000
Number of sides sheltered					0.3255 (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) =	0.2522 (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	0.3216	0.3153	0.3090	0.2775	0.2712	0.2396	0.2396	0.2333	0.2522	0.2712	0.2838	0.2964 (22b)
	0.5517	0.5497	0.5477	0.5385	0.5368	0.5287	0.5287	0.5272	0.5318	0.5368	0.5403	0.5439 (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			75.5400	0.1247	9.4162		(28b)
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)
Total net area of external elements Aum, m ²			148.5000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 38.4651		(33)
Party Wall 1			15.1200	0.0000	0.0000		(32)
Party Ceilings 1			75.5400				(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)							15.6852 (36)
Total fabric heat loss						(33) + (36) =	54.1502 (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	33.0079	32.8878	32.7700	32.2169	32.1134	31.6316	31.6316	31.5424	31.8172	32.1134	32.3227	32.5416 (38)
Heat transfer coeff	87.1581	87.0380	86.9202	86.3671	86.2636	85.7818	85.7818	85.6926	85.9674	86.2636	86.4729	86.6918 (39)
Average = Sum(39)m / 12 =												86.3666 (39)
HLP	1.1538	1.1522	1.1507	1.1433	1.1420	1.1356	1.1356	1.1344	1.1380	1.1420	1.1447	1.1476 (40)
HLP (average)												1.1433 (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)

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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 (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 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	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	60.1875	60.2706	60.3523	60.7388	60.8117	61.1532	61.1532	61.2169	61.0212	60.8117	60.6644	60.5113	
alpha	5.0125	5.0180	5.0235	5.0493	5.0541	5.0769	5.0769	5.0811	5.0681	5.0541	5.0443	5.0341	
util living area	0.9990	0.9977	0.9933	0.9752	0.9163	0.7784	0.6106	0.6743	0.9016	0.9878	0.9979	0.9992	(86)
MIT	19.6793	19.8168	20.0709	20.4132	20.7236	20.9203	20.9817	20.9703	20.8153	20.4057	19.9773	19.6508	(87)
Th 2	19.9571	19.9584	19.9597	19.9656	19.9667	19.9719	19.9719	19.9728	19.9699	19.9667	19.9645	19.9621	(88)
util rest of house	0.9986	0.9969	0.9907	0.9650	0.8801	0.6900	0.4803	0.5444	0.8444	0.9812	0.9970	0.9990	(89)
MIT 2	18.7492	18.8875	19.1414	19.4825	19.7728	19.9334	19.9670	19.9639	19.8603	19.4799	19.0528	18.7248	(90)
Living area fraction									fLA = Living area / (4) =			0.3548	(91)
MIT	19.0792	19.2172	19.4712	19.8127	20.1102	20.2835	20.3270	20.3210	20.1991	19.8084	19.3808	19.0533	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0792	19.2172	19.4712	19.8127	20.1102	20.2835	20.3270	20.3210	20.1991	19.8084	19.3808	19.0533	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	392.2396	448.5517	510.8401	566.4844	561.1039	448.1381	313.2029	324.6918	424.1288	416.4551	379.5726	371.4977	(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	1288.1281	1246.1396	1127.4567	942.4967	725.4904	487.5412	319.7094	335.9984	524.3278	794.3471	1061.9559	1287.6613	(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	666.5411	535.9791	458.7627	270.7289	122.3036	0.0000	0.0000	0.0000	0.0000	281.1517	491.3160	681.6257	(98)
Space heating												3508.4087	(98)
Space heating per m2										(98) / (4) =		46.4444	(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	806.3490	634.7854	651.2637	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8411	0.9090	0.8799	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	678.2055	577.0420	573.0351	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	100.2301	152.3226	117.6659	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												370.2186	(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	0.0000	25.0575	38.0806	29.4165	0.0000	0.0000	0.0000 (107)
Space cooling											92.5546 (107)
Space cooling per m2											1.2252 (108)
Energy for space heating											46.4444 (99)
Energy for space cooling											1.2252 (108)
Total											47.6696 (109)
Dwelling Fabric Energy Efficiency (DFEE)											47.7 (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)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					30.0000 / (5) = 0.1655 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4155 (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) =	0.3220 (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												
Effective ac	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)
	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)
FT-03			75.5400	0.1300	9.8202		(28b)
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)
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)							14.6895 (36)
Total fabric heat loss						(33) + (36) =	49.7385 (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	84.6942	84.4984	84.3065	83.4052	83.2365	82.4515	82.4515	82.3061	82.7538	83.2365	83.5777	83.9343 (39)
Average = Sum(39)m / 12 =												83.4043 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1212	1.1186	1.1161	1.1041	1.1019	1.0915	1.0915	1.0896	1.0955	1.1019	1.1064	1.1111 (40)
HLP (average)												1.1041 (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												
	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]												Gains
					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d	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	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	61.9385	62.0820	62.2233	62.8958	63.0232	63.6233	63.6233	63.7357	63.3908	63.0232	62.7660	62.4993
alpha	5.1292	5.1388	5.1482	5.1931	5.2015	5.2416	5.2416	5.2490	5.2261	5.2015	5.1844	5.1666
util living area	0.9991	0.9980	0.9944	0.9795	0.9283	0.7974	0.6290	0.6905	0.9112	0.9893	0.9981	0.9993 (86)
MIT	19.7139	19.8431	20.0841	20.4151	20.7178	20.9183	20.9815	20.9705	20.8165	20.4207	20.0093	19.6924 (87)
Th 2	19.9836	19.9857	19.9877	19.9975	19.9993	20.0078	20.0078	20.0094	20.0045	19.9993	19.9956	19.9918 (88)
util rest of house	0.9988	0.9973	0.9923	0.9708	0.8962	0.7130	0.5005	0.5635	0.8583	0.9835	0.9974	0.9991 (89)
MIT 2	18.8049	18.9356	19.1773	19.5114	19.7978	19.9674	20.0027	20.0002	19.8935	19.5215	19.1098	18.7900 (90)
Living area fraction										fLA = Living area / (4) =		0.3548 (91)
MIT	19.1274	19.2576	19.4990	19.8321	20.1242	20.3047	20.3500	20.3444	20.2210	19.8405	19.4289	19.1101 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1274	19.2576	19.4990	19.8321	20.1242	20.3047	20.3500	20.3444	20.2210	19.8405	19.4289	19.1101 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9984	0.9967	0.9909	0.9691	0.9009	0.7407	0.5468	0.6092	0.8720	0.9823	0.9968	0.9988 (94)
Useful gains	385.0641	434.6369	488.5707	536.9335	532.9128	429.7887	302.5580	313.3106	406.6153	400.9383	370.7022	365.5866 (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	1255.7912	1213.1923	1095.8992	911.7893	701.1985	470.3648	309.1909	324.6521	506.5363	769.1501	1030.4217	1251.4732 (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	647.8209	523.1892	451.8524	269.8962	125.2046	0.0000	0.0000	0.0000	0.0000	273.9496	474.9980	659.0996 (98)
Space heating												3426.0106 (98)
Space heating per m2										(98) / (4) =		45.3536 (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	775.0437	610.1408	625.5262	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8356	0.9065	0.8783	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	647.6204	553.0881	549.4087	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	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)
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	86.2404	134.7174	104.8128	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												325.7706 (104)
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	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	21.5601	33.6794	26.2032	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												81.4427 (107)
Space cooling per m2												1.0781 (108)
Energy for space heating												45.3536 (99)
Energy for space cooling												1.0781 (108)
Total												46.4317 (109)
Target Fabric Energy Efficiency (TFEE)												53.4 (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) =					Air changes per hour
Pressure test					0.0000 / (5) = 0.0000 (8)
Measured/design AP50					Yes
Infiltration rate					3.2000
Number of sides sheltered					0.1600 (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) =	0.1240 (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	0.1302	0.1240	0.1240	0.1147	0.1147	0.1023	0.1054	0.0992	0.1023	0.1085	0.1085	0.1178 (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			75.5400	0.1247	9.4162		(28b)
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)
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) =	38.4651	(33)
Party Wall 1			15.1200	0.0000	0.0000		(32)
Party Ceilings 1			75.5400				(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)							15.6852 (36)
Total fabric heat loss						(33) + (36) =	54.1502 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(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	84.0641	84.0641	84.0641	84.0641	84.0641	84.0641	84.0641	84.0641	84.0641	84.0641	84.0641	84.0641 (39)
Average = Sum(39)m / 12 =												84.0641 (39)
HLP	1.1128	1.1128	1.1128	1.1128	1.1128	1.1128	1.1128	1.1128	1.1128	1.1128	1.1128	1.1128 (40)
HLP (average)												1.1128 (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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 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	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	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	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	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	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	157.1553	(64)
RHI water heating demand	52.6436	46.1380	47.8411	42.0364	40.5781	35.3742	33.1345	37.5172	37.8155	43.6334	47.2063	51.0910	51.0910	(65)
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	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	Specific data or Table 6b	g	Specific data or Table 6c	FF	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	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)

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	62.4028	62.4028	62.4028	62.4028	62.4028	62.4028	62.4028	62.4028	62.4028	62.4028	62.4028	62.4028	
alpha	5.1602	5.1602	5.1602	5.1602	5.1602	5.1602	5.1602	5.1602	5.1602	5.1602	5.1602	5.1602	
util living area	0.9906	0.9850	0.9654	0.9029	0.7551	0.5115	0.3383	0.3659	0.6757	0.9222	0.9810	0.9923	(86)
MIT	20.0807	20.1888	20.4294	20.7128	20.9178	20.9912	20.9992	20.9988	20.9643	20.7222	20.3514	20.0480	(87)
Th 2	19.9904	19.9904	19.9904	19.9904	19.9904	19.9904	19.9904	19.9904	19.9904	19.9904	19.9904	19.9904	(88)
util rest of house	0.9875	0.9800	0.9536	0.8710	0.6855	0.4125	0.2286	0.2512	0.5758	0.8886	0.9736	0.9897	(89)
MIT 2	19.1750	19.2814	19.5155	19.7782	19.9444	19.9877	19.9903	19.9902	19.9760	19.7929	19.4426	19.1427	(90)
Living area fraction	19.4963	19.6033	19.8397	20.1098	20.2897	20.3437	20.3482	20.3480	20.3266	20.1226	19.7650	19.4639	(91)
MIT	19.4963	19.6033	19.8397	20.1098	20.2897	20.3437	20.3482	20.3480	20.3266	20.1226	19.7650	19.4639	(92)
Temperature adjustment	19.3463	19.4533	19.6897	19.9598	20.1397	20.1937	20.1982	20.1980	20.1766	19.9726	19.6150	19.3139	(93)
adjusted MIT	19.3463	19.4533	19.6897	19.9598	20.1397	20.1937	20.1982	20.1980	20.1766	19.9726	19.6150	19.3139	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	598.7639	641.1206	675.9911	677.8728	559.8097	349.7736	193.0808	201.4013	404.4826	547.1162	568.2573	573.2278	(94)
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	1197.6036	1164.5678	1033.1244	845.6641	600.1924	352.5416	193.1974	201.5889	418.3527	703.8316	976.4046	1194.8753	(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	445.5367	351.7565	265.7072	120.8097	30.0448	0.0000	0.0000	0.0000	0.0000	116.5963	293.8661	462.5057	(98)
Space heating													
RHI space heating demand													

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	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					3.2000
Infiltration rate					0.1600 (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) =				0.1240 (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	0.1581	0.1550	0.1519	0.1364	0.1333	0.1178	0.1178	0.1147	0.1240	0.1333	0.1395	0.1457 (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			75.5400	0.1247	9.4162		(28b)
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)
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) =	38.4651		(33)
Party Wall 1				15.1200	0.0000	0.0000	(32)
Party Ceilings 1				75.5400			(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)							15.6852 (36)
Total fabric heat loss							(33) + (36) = 54.1502 (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	84.0641	84.0641	84.0641	84.0641	84.0641	84.0641	84.0641	84.0641	84.0641	84.0641	84.0641	84.0641 (39)
Average = Sum(39)m / 12 =												84.0641 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1128	1.1128	1.1128	1.1128	1.1128	1.1128	1.1128	1.1128	1.1128	1.1128	1.1128	1.1128 (40)
HLP (average)												1.1128 (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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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	62.4028	62.4028	62.4028	62.4028	62.4028	62.4028	62.4028	62.4028	62.4028	62.4028	62.4028	62.4028	
alpha	5.1602	5.1602	5.1602	5.1602	5.1602	5.1602	5.1602	5.1602	5.1602	5.1602	5.1602	5.1602	
util living area	0.9929	0.9878	0.9733	0.9299	0.8274	0.6548	0.4893	0.5368	0.7805	0.9492	0.9869	0.9943	(86)
MIT	19.9878	20.1141	20.3397	20.6216	20.8509	20.9658	20.9936	20.9899	20.9170	20.6223	20.2454	19.9468	(87)
Th 2	19.9904	19.9904	19.9904	19.9904	19.9904	19.9904	19.9904	19.9904	19.9904	19.9904	19.9904	19.9904	(88)
util rest of house	0.9906	0.9839	0.9646	0.9067	0.7744	0.5657	0.3806	0.4248	0.7004	0.9273	0.9820	0.9924	(89)
MIT 2	19.0827	19.2075	19.4285	19.6959	19.8943	19.9754	19.9888	19.9876	19.9476	19.7023	19.3385	19.0420	(90)
Living area fraction	19.4038	19.5292	19.7518	20.0243	20.2337	20.3268	20.3453	20.3432	20.2915	20.0287	19.6603	19.3630	(91)
MIT	19.4038	19.5292	19.7518	20.0243	20.2337	20.3268	20.3453	20.3432	20.2915	20.0287	19.6603	19.3630	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.2538	19.3792	19.6018	19.8743	20.0837	20.1768	20.1953	20.1932	20.1415	19.8787	19.5103	19.2130	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9884	0.9809	0.9604	0.9036	0.7798	0.5830	0.4031	0.4479	0.7137	0.9243	0.9790	0.9906	(94)
Ext temp.	592.5838	641.1861	682.2531	694.6589	624.5551	454.6652	300.5270	315.9461	469.7061	557.4981	561.1070	568.7188	(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	1257.0800	1217.1779	1101.3909	922.5476	704.7679	468.8061	302.2362	318.8739	507.8745	780.0056	1043.2568	1262.0551	(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	494.3852	387.0665	311.8385	164.0799	59.6784	0.0000	0.0000	0.0000	0.0000	165.5456	347.1478	515.8422	(98)
Space heating per m2												2445.5841	(98)
												(98) / (4) =	32.3747 (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													2702.3028 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	494.3852	387.0665	311.8385	164.0799	59.6784	0.0000	0.0000	0.0000	0.0000	165.5456	347.1478	515.8422	(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)	546.2820	427.6978	344.5729	181.3037	65.9430	0.0000	0.0000	0.0000	0.0000	182.9233	383.5888	569.9913	(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	89.6893	89.6187	89.4478	89.0582	88.3062	87.3000	87.3000	87.3000	87.3000	89.0358	89.5314	87.3000	(216)
(217)m	89.6893	89.6187	89.4478	89.0582	88.3062	87.3000	87.3000	87.3000	87.3000	89.0358	89.5314	89.7319	(217)
Fuel for water heating, kWh/month	180.4312	158.3573	164.7549	145.7359	142.1296	125.7028	118.1091	133.2176	134.1224	151.2965	162.3477	175.1386	(219)
Water heating fuel used												1791.3437	(219)
Annual totals kWh/year													
Space heating fuel - main system												2702.3028	(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												4976.3232	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2702.3028	3.4800	94.0401 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1791.3437	3.4800	62.3388 (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			340.0439 (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] = 1.1848 (257)
SAP value	83.4717
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	2702.3028	0.2160	583.6974 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1791.3437	0.2160	386.9302 (264)
Space and water heating			970.6277 (265)
Pumps and fans	115.6973	0.5190	60.0469 (267)
Energy for lighting	366.9792	0.5190	190.4622 (268)
Total kg/year			1221.1368 (272)
CO2 emissions per m2			16.1700 (273)
EI value			86.4251
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	$3.48 / 0.8863 = 3.926$, stars = 4
Water heating environmental impact	$0.216 / 0.8863 = 0.2437$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	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		secondary		other		total		m3 per hour			
	heating		heating									
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							3.2000					
Infiltration rate							0.1600	(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) =	0.1240	(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	0.1302	0.1240	0.1240	0.1147	0.1147	0.1023	0.1054	0.0992	0.1023	0.1085	0.1085	0.1178 (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			75.5400	0.1247	9.4162		(28b)
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)
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) =	38.4651		(33)
Party Wall 1			15.1200	0.0000	0.0000		(32)
Party Ceilings 1			75.5400				(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)							15.6852 (36)
Total fabric heat loss						(33) + (36) =	54.1502 (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	84.0641	84.0641	84.0641	84.0641	84.0641	84.0641	84.0641	84.0641	84.0641	84.0641	84.0641	84.0641 (39)
Average = Sum(39)m / 12 =												84.0641 (39)
HLP	1.1128	1.1128	1.1128	1.1128	1.1128	1.1128	1.1128	1.1128	1.1128	1.1128	1.1128	1.1128 (40)
HLP (average)												1.1128 (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)

Southern Energy
Consultants
Energy & Sustainability Solutions

Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	14.1097	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)

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, n _{li,m} (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	62.4028	62.4028	62.4028	62.4028	62.4028	62.4028	62.4028	62.4028	62.4028	62.4028	62.4028	62.4028
alpha	5.1602	5.1602	5.1602	5.1602	5.1602	5.1602	5.1602	5.1602	5.1602	5.1602	5.1602	5.1602
util living area												
	0.9906	0.9850	0.9654	0.9029	0.7551	0.5115	0.3383	0.3659	0.6757	0.9222	0.9810	0.9923 (86)
MIT	20.0807	20.1888	20.4294	20.7128	20.9178	20.9912	20.9992	20.9988	20.9643	20.7222	20.3514	20.0480 (87)
Th 2	19.9904	19.9904	19.9904	19.9904	19.9904	19.9904	19.9904	19.9904	19.9904	19.9904	19.9904	19.9904 (88)
util rest of house												
	0.9875	0.9800	0.9536	0.8710	0.6855	0.4125	0.2286	0.2512	0.5758	0.8886	0.9736	0.9897 (89)
MIT 2	19.1750	19.2814	19.5155	19.7782	19.9444	19.9877	19.9903	19.9902	19.9760	19.7929	19.4426	19.1427 (90)
Living area fraction												
MIT	19.4963	19.6033	19.8397	20.1098	20.2897	20.3437	20.3482	20.3480	fLA = Living area / (4) = 20.3266	20.1226	19.7650	0.3548 (91) 19.4639 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.3463	19.4533	19.6897	19.9598	20.1397	20.1937	20.1982	20.1980	20.1766	19.9726	19.6150	19.3139 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9849	0.9767	0.9493	0.8699	0.6966	0.4329	0.2513	0.2749	0.5954	0.8879	0.9701	0.9875 (94)
Useful gains	598.7639	641.1206	675.9911	677.8728	559.8097	349.7736	193.0808	201.4013	404.4826	547.1162	568.2573	573.2278 (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	1197.6036	1164.5678	1033.1244	845.6641	600.1924	352.5416	193.1974	201.5889	418.3527	703.8316	976.4046	1194.8753 (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	445.5367	351.7565	265.7072	120.8097	30.0448	0.0000	0.0000	0.0000	0.0000	116.5963	293.8661	462.5057 (98)
Space heating												2086.8230 (98)
Space heating per m2												27.6254 (99)
										(98) / (4) =		

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													2305.8817 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	445.5367	351.7565	265.7072	120.8097	30.0448	0.0000	0.0000	0.0000	0.0000	116.5963	293.8661	462.5057	(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)	492.3058	388.6812	293.5991	133.4914	33.1986	0.0000	0.0000	0.0000	0.0000	128.8357	324.7139	511.0561	(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	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	89.6247	89.5563	89.3318	88.8139	87.9003	87.3000	87.3000	87.3000	87.3000	88.7561	89.4154	87.3000	(216)
Fuel for water heating, kWh/month	180.5612	158.4676	164.9688	146.1368	142.7860	125.7028	118.1091	133.2176	134.1224	151.7733	162.5585	175.2666	(219)
Water heating fuel used												1793.6707	(219)
Annual totals kWh/year													
Space heating fuel - main system												2305.8817	(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													4582.2290 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2305.8817	3.7400	86.2400 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1793.6707	3.7400	67.0833 (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			339.6110 (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	2305.8817	0.2160	498.0705 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1793.6707	0.2160	387.4329 (264)
Space and water heating			885.5033 (265)
Pumps and fans	115.6973	0.5190	60.0469 (267)
Energy for lighting	366.9792	0.5190	190.4622 (268)
Total kg/year			1136.0125 (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	2305.8817	1.2200	2813.1757 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1793.6707	1.2200	2188.2783 (264)
Space and water heating			5001.4540 (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			6483.2711 (272)
Primary energy kWh/m2/year			85.8257 (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)

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 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	£92	£92	£0
Mains gas	£247	£247	£0
Space heating	£202	£202	£0
Water heating	£67	£67	£0
Lighting	£70	£70	£0
Total cost of fuels	£339	£339	£0
Total cost of uses	£339	£339	£0
Delivered energy	61 kWh/m²	61 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.1 tonnes	1.1 tonnes	0.0 tonnes
CO2 emissions per m²	15 kg/m²	15 kg/m²	0 kg/m²
Primary energy	86 kWh/m²	86 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	54.15 (P7)
Summer heat loss coefficient	413.12 (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	2.11	2.00	1.90	(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	18.36	20.15	19.95	(P7)
Likelihood of high internal temperature	Not significant	Not significant	Not significant	
Assessment of likelihood of high internal temperature:	Not significant			