

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



Property Reference	SECPMW027e_133_As_Built				Issued on Date	22/11/2021
Assessment Reference	001	Prop Type Ref	MFF			
Property						
SAP Rating	86 B	DER	13.46	TER	15.53	
Environmental	90 B	% DER<TER	13.33			
CO ₂ Emissions (t/year)	0.81	DFEE	27.61	TFEE	34.35	
General Requirements Compliance	Pass	% DFEE<TFEE	19.61			
Assessor Details	Mr. Stephen Smith, Southern Energy Consultants Limited, Tel: 01635261582, info@southernenergyconsultants.co.uk				Assessor ID	d168-0001
Client	Bellway Homes Thames Valley					

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

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DWELLING AS BUILT

Mid-floor flat, total floor area 73 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 15.53 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.46 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)34.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)27.6 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.16 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.25 (max. 2.00)	1.30 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.02 (measured in this dwelling)
Maximum 10.0 OK

4 Heating efficiency

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

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls:

No cylinder

Boiler interlock

Yes

OK

7 Low energy lights

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

8 Mechanical ventilation

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

9 Summertime temperature

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

10 Key features

Party wall U-value 0.00 W/m²K
Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 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	73.2300 (1b)	x 2.4000 (2b)	= 175.7520 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.2300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 175.7520 (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					3.0200
Infiltration rate					0.1510 (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) =				0.1170 (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	0.1492	0.1463	0.1434	0.1287	0.1258	0.1112	0.1112	0.1082	0.1170	0.1258	0.1317	0.1375 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			10.2200	1.2357	12.6293		(27)
WT-E-03	32.1100	10.2200	21.8900	0.1600	3.5024		(29a)
WT-I-02	21.8400	2.1200	19.7200	0.1584	3.1240		(29a)
Total net area of external elements Aum(A, m ²)					53.9500		(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.3757		(33)
Party Wall 1				17.7000	0.0000	0.0000	(32)
Party Wall 2				17.7000	0.0000	0.0000	(32)
Party Floor 1				72.3300			(32d)
Party Ceilings 1				73.2300			(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)							7.0980 (36)
Total fabric heat loss							(33) + (36) = 28.4737 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991 (38)
Average = Sum(39)m / 12 =	57.4728	57.4728	57.4728	57.4728	57.4728	57.4728	57.4728	57.4728	57.4728	57.4728	57.4728	57.4728 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7848	0.7848	0.7848	0.7848	0.7848	0.7848	0.7848	0.7848	0.7848	0.7848	0.7848	0.7848 (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												2.3219 (42)
Average daily hot water use (litres/day)												89.3456 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	98.2802	94.7063	91.1325	87.5587	83.9849	80.4110	80.4110	83.9849	87.5587	91.1325	94.7063	98.2802 (44)
Energy conte	145.7467	127.4710	131.5386	114.6785	110.0368	94.9534	87.9883	100.9678	102.1737	119.0736	129.9781	141.1478 (45)
Energy content (annual)												Total = Sum(45)m = 1405.7543 (45)
Distribution loss (46)m = 0.15 x (45)m												

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	21.8620	19.1206	19.7308	17.2018	16.5055	14.2430	13.1982	15.1452	15.3261	17.8610	19.4967	21.1722 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	14.1003	12.7150	14.0443	13.5538	13.9784	13.4960	13.9264	13.9601	13.5275	14.0170	13.6082	14.0895 (61)
Total heat required for water heating calculated for each month	159.8470	140.1860	145.5829	128.2323	124.0151	108.4494	101.9146	114.9279	115.7012	133.0906	143.5864	155.2373 (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	159.8470	140.1860	145.5829	128.2323	124.0151	108.4494	101.9146	114.9279	115.7012	133.0906	143.5864	155.2373 (64)
Heat gains from water heating, kWh/month	51.9858	45.5628	47.2477	41.5191	40.0818	34.9460	32.7377	37.0618	37.3546	43.0962	46.6198	50.4540 (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	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.5929	17.4022	14.1524	10.7143	8.0091	6.7616	7.3061	9.4968	12.7466	16.1847	18.8899	20.1374	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	204.7153	206.8396	201.4864	190.0901	175.7044	162.1838	153.1512	151.0269	156.3801	167.7764	182.1621	195.6827	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	(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)	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	(71)
Water heating gains (Table 5)	69.8734	67.8019	63.5049	57.6654	53.8734	48.5361	44.0023	49.8143	51.8814	57.9250	64.7497	67.8146	(72)
Total internal gains	355.0104	352.8725	339.9726	319.2986	298.4157	278.3103	265.2884	271.1668	281.8369	302.7149	326.6306	344.4635	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a		g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d		Gains W	

West				10.2200	19.6403		0.4500	0.0000		0.7700		69.5507 (80)	

Solar gains	69.5507	136.0559	224.0647	326.7850	400.4873	409.9700	390.3082	335.2689	260.5965	161.4418	86.7215	57.1951 (83)	
Total gains	424.5611	488.9284	564.0373	646.0836	698.9030	688.2803	655.5966	606.4357	542.4334	464.1567	413.3521	401.6586 (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	88.4839	88.4839	88.4839	88.4839	88.4839	88.4839	88.4839	88.4839	88.4839	88.4839	88.4839	88.4839	
alpha	6.8989	6.8989	6.8989	6.8989	6.8989	6.8989	6.8989	6.8989	6.8989	6.8989	6.8989	6.8989	
util living area	0.9980	0.9942	0.9771	0.9031	0.7326	0.5311	0.3854	0.4351	0.7063	0.9548	0.9949	0.9986	(86)
MIT	20.2635	20.3966	20.6122	20.8462	20.9691	20.9969	20.9997	20.9993	20.9816	20.7877	20.4674	20.2245	(87)
Th 2	20.2665	20.2665	20.2665	20.2665	20.2665	20.2665	20.2665	20.2665	20.2665	20.2665	20.2665	20.2665	(88)
util rest of house	0.9974	0.9924	0.9701	0.8782	0.6846	0.4717	0.3213	0.3662	0.6409	0.9372	0.9929	0.9982	(89)
MIT 2	19.5875	19.7198	19.9313	20.1485	20.2475	20.2651	20.2664	20.2663	20.2572	20.1009	19.7908	19.5487	(90)
Living area fraction	19.8252	19.9577	20.1707	20.3938	20.5012	20.5224	20.5243	20.5241	20.5119	20.3424	20.0287	19.7864	(91)
MIT	19.8252	19.9577	20.1707	20.3938	20.5012	20.5224	20.5243	20.5241	20.5119	20.3424	20.0287	19.7864	(92)
Temperature adjustment	19.6752	19.8077	20.0207	20.2438	20.3512	20.3724	20.3743	20.3741	20.3619	20.1924	19.8787	19.6364	(93)
adjusted MIT	19.6752	19.8077	20.0207	20.2438	20.3512	20.3724	20.3743	20.3741	20.3619	20.1924	19.8787	19.6364	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	423.1529	484.4976	545.6168	566.8226	482.5157	330.6365	216.8473	228.2317	352.4551	434.0303	409.8890	400.7283	(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	883.6572	856.7900	777.0735	651.9625	497.2106	331.7583	216.9177	228.4007	359.8905	551.3019	734.4274	887.1708	(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	342.6152	250.1805	172.2038	61.3007	10.9330	0.0000	0.0000	0.0000	0.0000	87.2500	233.6677	361.9132	(98)
Space heating												1520.0641	(98)
Space heating per m2												20.7574	(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													1679.6288	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	342.6152	250.1805	172.2038	61.3007	10.9330	0.0000	0.0000	0.0000	0.0000	87.2500	233.6677	361.9132	(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)	378.5803	276.4425	190.2804	67.7356	12.0807	0.0000	0.0000	0.0000	0.0000	96.4088	258.1963	399.9041	(211)	
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating requirement	159.8470	140.1860	145.5829	128.2323	124.0151	108.4494	101.9146	114.9279	115.7012	133.0906	143.5864	155.2373	(64)	
Efficiency of water heater (217)m	89.4568	89.3242	89.0054	88.3099	87.5508	87.3000	87.3000	87.3000	87.3000	88.5397	89.2548	89.5151	(216)	
Fuel for water heating, kWh/month	178.6862	156.9407	163.5663	145.2071	141.6494	124.2262	116.7407	131.6471	132.5329	150.3175	160.8725	173.4204	(219)	
Water heating fuel used												1775.8068	(219)	
Annual totals kWh/year														
Space heating fuel - main system													1679.6288	(211)
Space heating fuel - secondary													0.0000	(215)
Electricity for pumps and fans:														
(MEV)Decentralised, Database: total watage = 5.3360, total flow = 29.0000, SFP = 0.1840)														
mechanical ventilation fans (SFP = 0.1840)													39.4528	(230a)
central heating pump													30.0000	(230c)
main heating flue fan													45.0000	(230e)
Total electricity for the above, kWh/year													114.4528	(231)
Electricity for lighting (calculated in Appendix L)													346.0160	(232)
Total delivered energy for all uses													3915.9044	(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	1679.6288	0.2160	362.7998	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1775.8068	0.2160	383.5743	(264)
Space and water heating			746.3741	(265)
Pumps and fans	114.4528	0.5190	59.4010	(267)
Energy for lighting	346.0160	0.5190	179.5823	(268)
Total CO2, kg/year			985.3574	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			13.4600	(273)

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

DER			13.4600	ZC1
Total Floor Area		TFA	73.2300	
Assumed number of occupants		N	2.3219	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			16.5656	ZC2
CO2 emissions from cooking, equation (L16)			2.3860	ZC3
Total CO2 emissions			32.4116	ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000	ZC7
Net CO2 emissions			32.4116	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	73.2300 (1b)	x 2.4000 (2b)	= 175.7520 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.2300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 175.7520 (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 30.0000 / (5) = 0.1707 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4207 (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) =		0.3260 (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												
	0.4157	0.4075	0.3994	0.3586	0.3505	0.3097	0.3097	0.3016	0.3260	0.3505	0.3668	0.3831 (22b)
Effective ac	0.5864	0.5830	0.5798	0.5643	0.5614	0.5480	0.5480	0.5455	0.5532	0.5614	0.5673	0.5734 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.1200	1.0000	2.1200		(26)					
TER Opening Type (Uw = 1.40)			10.2200	1.3258	13.5492		(27)					
WT-E-03	32.1100	10.2200	21.8900	0.1800	3.9402		(29a)					
WT-I-02	21.8400	2.1200	19.7200	0.1800	3.5496		(29a)					
Total net area of external elements Aum(A, m2)			53.9500				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.1590		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.5327 (36)					
Total fabric heat loss						(33) + (36) =	28.6917 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 34.0103	Feb 33.8157	Mar 33.6250	Apr 32.7291	May 32.5615	Jun 31.7812	Jul 31.7812	Aug 31.6367	Sep 32.0817	Oct 32.5615	Nov 32.9005	Dec 33.2550 (38)
Heat transfer coeff	62.7020	62.5074	62.3167	61.4208	61.2532	60.4729	60.4729	60.3284	60.7735	61.2532	61.5923	61.9468 (39)
Average = Sum(39)m / 12 =												61.4200 (39)
HLP	Jan 0.8562	Feb 0.8536	Mar 0.8510	Apr 0.8387	May 0.8364	Jun 0.8258	Jul 0.8258	Aug 0.8238	Sep 0.8299	Oct 0.8364	Nov 0.8411	Dec 0.8459 (40)
HLP (average)												0.8387 (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												2.3219 (42)
Average daily hot water use (litres/day)												89.3456 (43)
Daily hot water use	98.2802	94.7063	91.1325	87.5587	83.9849	80.4110	80.4110	83.9849	87.5587	91.1325	94.7063	98.2802 (44)
Energy conte	145.7467	127.4710	131.5386	114.6785	110.0368	94.9534	87.9883	100.9678	102.1737	119.0736	129.9781	141.1478 (45)
Energy content (annual)										Total = Sum(45)m =		1405.7543 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.8620	19.1206	19.7308	17.2018	16.5055	14.2430	13.1982	15.1452	15.3261	17.8610	19.4967	21.1722 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	50.0825	43.5909	46.4401	43.1796	42.7978	39.6548	40.9766	42.7978	43.1796	46.4401	46.7045	50.0825 (61)

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Total heat required for water heating calculated for each month													
	195.8291	171.0618	177.9787	157.8582	152.8346	134.6081	128.9649	143.7656	145.3533	165.5137	176.6826	191.2303 (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	195.8291	171.0618	177.9787	157.8582	152.8346	134.6081	128.9649	143.7656	145.3533	165.5137	176.6826	191.2303 (64)	
								Total per year (kWh/year) = Sum(64)m =					1941.6811 (64)
Heat gains from water heating, kWh/month													
	60.9814	53.2818	55.3466	48.9255	47.2867	41.4857	39.5002	44.2712	44.7677	51.2020	54.8939	59.4523 (65)	

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.5929	17.4022	14.1524	10.7143	8.0091	6.7616	7.3061	9.4968	12.7466	16.1847	18.8899	20.1374 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	204.7153	206.8396	201.4864	190.0901	175.7044	162.1838	153.1512	151.0269	156.3801	167.7764	182.1621	195.6827 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096 (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)	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768 (71)
Water heating gains (Table 5)	81.9642	79.2884	74.3906	67.9521	63.5574	57.6190	53.0917	59.5044	62.1773	68.8199	76.2415	79.9090 (72)
Total internal gains	367.1012	364.3590	350.8583	329.5854	308.0996	287.3932	274.3779	280.8569	292.1328	313.6098	338.1223	356.5579 (73)

[Jan				Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
West				10.2200	19.6403	0.6300	0.7000	0.7700	61.3437 (80)			
Solar gains	61.3437	120.0013	197.6251	288.2244	353.2298	361.5935	344.2518	295.7072	229.8461	142.3917	76.4884	50.4461 (83)
Total gains	428.4449	484.3603	548.4833	617.8097	661.3294	648.9868	618.6297	576.5641	521.9789	456.0014	414.6107	407.0040 (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	81.1045	81.3570	81.6060	82.7963	83.0229	84.0941	84.0941	84.2956	83.6782	83.0229	82.5658	82.0933
alpha	6.4070	6.4238	6.4404	6.5198	6.5349	6.6063	6.6063	6.6197	6.5785	6.5349	6.5044	6.4729
util living area	0.9981	0.9952	0.9838	0.9326	0.7947	0.5883	0.4292	0.4793	0.7572	0.9652	0.9954	0.9986 (86)
MIT	20.1606	20.2892	20.5063	20.7730	20.9400	20.9929	20.9992	20.9984	20.9672	20.7322	20.3974	20.1389 (87)
Th 2	20.2049	20.2071	20.2094	20.2199	20.2219	20.2310	20.2310	20.2327	20.2275	20.2219	20.2179	20.2137 (88)
util rest of house	0.9975	0.9937	0.9786	0.9124	0.7467	0.5212	0.3547	0.4005	0.6894	0.9505	0.9936	0.9982 (89)
MIT 2	19.0738	19.2630	19.5785	19.9578	20.1657	20.2264	20.2307	20.2321	20.2025	19.9112	19.4297	19.0489 (90)
Living area fraction									fLA = Living area / (4) =			0.3516 (91)
MIT	19.4560	19.6239	19.9047	20.2445	20.4380	20.4959	20.5010	20.5016	20.4714	20.1999	19.7700	19.4322 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4560	19.6239	19.9047	20.2445	20.4380	20.4959	20.5010	20.5016	20.4714	20.1999	19.7700	19.4322 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9967	0.9923	0.9761	0.9131	0.7607	0.5446	0.3809	0.4283	0.7118	0.9500	0.9923	0.9975 (94)
Useful gains	427.0122	480.6145	535.3697	564.1196	503.0913	353.4394	235.6518	246.9172	371.5677	433.2118	411.4058	406.0006 (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	950.3099	920.3510	835.3384	696.7856	535.2299	356.5444	235.9021	247.4405	387.2096	588.0247	780.3718	943.5857 (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	389.3335	295.5029	223.1767	95.5195	23.9111	0.0000	0.0000	0.0000	0.0000	115.1808	265.6555	399.9633 (98)
Space heating												1808.2434 (98)
Space heating per m2												24.6927 (99)
										(98) / (4) =		

Not applicable

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Efficiency of main space heating system 1 (in %)												93.4000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												1936.0207 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	389.3335	295.5029	223.1767	95.5195	23.9111	0.0000	0.0000	0.0000	0.0000	115.1808	265.6555	399.9633 (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)	416.8453	316.3843	238.9472	102.2693	25.6008	0.0000	0.0000	0.0000	0.0000	123.3199	284.4278	428.2262 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	195.8291	171.0618	177.9787	157.8582	152.8346	134.6081	128.9649	143.7656	145.3533	165.5137	176.6826	191.2303 (64)
Efficiency of water heater (217)m	86.7485	86.4149	85.6220	83.8309	81.5324	80.3000	80.3000	80.3000	80.3000	84.1583	86.0756	86.8659 (217)
Fuel for water heating, kWh/month	225.7435	197.9540	207.8657	188.3056	187.4527	167.6316	160.6038	179.0356	181.0129	196.6695	205.2645	220.1444 (219)
Water heating fuel used												2317.6836 (219)
Annual totals kWh/year												
Space heating fuel - main system												1936.0207 (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)												346.0160 (232)
Total delivered energy for all uses												4674.7204 (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	1936.0207	0.2160	418.1805 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2317.6836	0.2160	500.6197 (264)
Space and water heating			918.8001 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	346.0160	0.5190	179.5823 (268)
Total CO2, kg/m2/year			1137.3075 (272)
Emissions per m2 for space and water heating			12.5468 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4523 (272b)
Emissions per m2 for pumps and fans			0.5315 (272c)
Target Carbon Dioxide Emission Rate (TER) = (12.5468 * 1.00) + 2.4523 + 0.5315, rounded to 2 d.p.			15.5300 (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	73.2300 (1b)	x 2.4000 (2b)	= 175.7520 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.2300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 175.7520 (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) = 0.1707 (8)
Measured/design AP50					Yes
Infiltration rate					3.0200
Number of sides sheltered					0.3217 (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) =				0.2493 (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												
	0.3179	0.3116	0.3054	0.2742	0.2680	0.2368	0.2368	0.2306	0.2493	0.2680	0.2805	0.2929 (22b)
Effective ac	0.5505	0.5486	0.5466	0.5376	0.5359	0.5280	0.5280	0.5266	0.5311	0.5359	0.5393	0.5429 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			10.2200	1.2357	12.6293		(27)
WT-E-03	32.1100	10.2200	21.8900	0.1600	3.5024		(29a)
WT-I-02	21.8400	2.1200	19.7200	0.1584	3.1240		(29a)
Total net area of external elements Aum(A, m ²)			53.9500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.3757		(33)
Party Wall 1			17.7000	0.0000	0.0000		(32)
Party Wall 2			17.7000	0.0000	0.0000		(32)
Party Floor 1			72.3300				(32d)
Party Ceilings 1			73.2300				(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)							7.0980 (36)
Total fabric heat loss						(33) + (36) =	28.4737 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	31.9293	31.8155	31.7040	31.1801	31.0821	30.6258	30.6258	30.5413	30.8016	31.0821	31.2804	31.4877 (38)
Heat transfer coeff	60.4030	60.2892	60.1777	59.6538	59.5558	59.0996	59.0996	59.0151	59.2753	59.5558	59.7541	59.9614 (39)
Average = Sum(39)m / 12 =												59.6534 (39)
HLP	0.8248	0.8233	0.8218	0.8146	0.8133	0.8070	0.8070	0.8059	0.8094	0.8133	0.8160	0.8188 (40)
HLP (average)												0.8146 (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												2.3219 (42)
Average daily hot water use (litres/day)												89.3456 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	98.2802	94.7063	91.1325	87.5587	83.9849	80.4110	80.4110	83.9849	87.5587	91.1325	94.7063	98.2802 (44)
Energy conte	145.7467	127.4710	131.5386	114.6785	110.0368	94.9534	87.9883	100.9678	102.1737	119.0736	129.9781	141.1478 (45)
Energy content (annual)												Total = Sum(45)m = 1405.7543 (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												

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 (56)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	30.9712	27.0876	27.9520	24.3692	23.3828	20.1776	18.6975	21.4557	21.7119	25.3031	27.6204	29.9939 (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	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.5929	17.4022	14.1524	10.7143	8.0091	6.7616	7.3061	9.4968	12.7466	16.1847	18.8899	20.1374	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	204.7153	206.8396	201.4864	190.0901	175.7044	162.1838	153.1512	151.0269	156.3801	167.7764	182.1621	195.6827	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	(71)
Water heating gains (Table 5)	41.6279	40.3089	37.5698	33.8461	31.4285	28.0244	25.1311	28.8383	30.1554	34.0096	38.3616	40.3144	(72)
Total internal gains	323.7649	322.3795	311.0375	292.4793	272.9708	254.7986	243.4172	247.1908	257.1109	275.7995	297.2425	313.9633	(73)

6. Solar gains

[Jan]													
	Area m2				Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
West	10.2200				19.6403		0.4500		0.0000		0.7700		69.5507 (80)
Solar gains	69.5507	136.0559	224.0647	326.7850	400.4873	409.9700	390.3082	335.2689	260.5965	161.4418	86.7215	57.1951	(83)
Total gains	393.3156	458.4354	535.1022	619.2643	673.4581	664.7686	633.7254	582.4597	517.7074	437.2413	383.9640	371.1584	(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	84.1915	84.3504	84.5067	85.2488	85.3891	86.0483	86.0483	86.1715	85.7932	85.3891	85.1058	84.8115	
alpha	6.6128	6.6234	6.6338	6.6833	6.6926	6.7366	6.7366	6.7448	6.7195	6.6926	6.6737	6.6541	
util living area	0.9988	0.9963	0.9845	0.9263	0.7717	0.5634	0.4097	0.4646	0.7494	0.9693	0.9969	0.9992	(86)
MIT	20.1604	20.2992	20.5284	20.7976	20.9533	20.9949	20.9995	20.9988	20.9712	20.7328	20.3885	20.1313	(87)
Th 2	20.2319	20.2332	20.2345	20.2407	20.2418	20.2472	20.2472	20.2482	20.2452	20.2418	20.2395	20.2371	(88)
util rest of house	0.9984	0.9951	0.9795	0.9050	0.7234	0.4996	0.3400	0.3895	0.6826	0.9561	0.9957	0.9989	(89)
MIT 2	19.4553	19.5947	19.8221	20.0821	20.2124	20.2450	20.2471	20.2479	20.2303	20.0285	19.6894	19.4307	(90)
Living area fraction									fLA = Living area / (4) =			0.3516	(91)
MIT	19.7032	19.8424	20.0705	20.3337	20.4730	20.5087	20.5117	20.5120	20.4908	20.2761	19.9352	19.6770	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7032	19.8424	20.0705	20.3337	20.4730	20.5087	20.5117	20.5120	20.4908	20.2761	19.9352	19.6770	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	392.5499	455.8543	523.4715	562.1947	497.5151	347.0203	231.0127	242.2814	365.1309	418.3601	382.0606	370.6575	(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	930.4021	900.8681	816.6382	682.0621	522.4803	349.2030	231.1774	242.6675	378.8175	576.2700	766.9569	928.0240	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	400.1620	299.0493	218.1160	86.3045	18.5741	0.0000	0.0000	0.0000	0.0000	117.4849	277.1254	414.6807	(98)
Space heating												1831.4969	(98)
Space heating per m2										(98) / (4) =		25.0102	(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	555.5358	437.3367	448.5144	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9811	0.9935	0.9887	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	545.0609	434.4754	443.4614	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	863.8713	825.8765	767.5582	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	229.5435	291.2024	241.1280	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												761.8739	(104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Cooled Fraction											FC = cooled area / (4) =	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	57.3859	72.8006	60.2820	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												190.4685 (107)
Space cooling per m2												2.6010 (108)
Energy for space heating												25.0102 (99)
Energy for space cooling												2.6010 (108)
Total												27.6112 (109)
Dwelling Fabric Energy Efficiency (DFEE)												27.6 (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	73.2300 (1b)	x 2.4000 (2b)	= 175.7520 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.2300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 175.7520 (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) = 0.1707 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4207 (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) =	0.3260 (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												
	0.4157	0.4075	0.3994	0.3586	0.3505	0.3097	0.3097	0.3016	0.3260	0.3505	0.3668	0.3831 (22b)
Effective ac	0.5864	0.5830	0.5798	0.5643	0.5614	0.5480	0.5480	0.5455	0.5532	0.5614	0.5673	0.5734 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.1200	1.0000	2.1200			(26)				
TER Opening Type (Uw = 1.40)			10.2200	1.3258	13.5492			(27)				
WT-E-03	32.1100	10.2200	21.8900	0.1800	3.9402			(29a)				
WT-I-02	21.8400	2.1200	19.7200	0.1800	3.5496			(29a)				
Total net area of external elements Aum(A, m2)			53.9500					(31)				
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	23.1590			(33)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								5.5327 (36)				
Total fabric heat loss								(33) + (36) = 28.6917 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	34.0103	33.8157	33.6250	32.7291	32.5615	31.7812	31.7812	31.6367	32.0817	32.5615	32.9005	33.2550 (38)
Average = Sum(39)m / 12 =	62.7020	62.5074	62.3167	61.4208	61.2532	60.4729	60.4729	60.3284	60.7735	61.2532	61.5923	61.9468 (39)
												61.4200 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8562	0.8536	0.8510	0.8387	0.8364	0.8258	0.8258	0.8238	0.8299	0.8364	0.8411	0.8459 (40)
Days in month												0.8387 (40)
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3219 (42)
Average daily hot water use (litres/day)												89.3456 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	98.2802	94.7063	91.1325	87.5587	83.9849	80.4110	80.4110	83.9849	87.5587	91.1325	94.7063	98.2802 (44)
Energy conte	145.7467	127.4710	131.5386	114.6785	110.0368	94.9534	87.9883	100.9678	102.1737	119.0736	129.9781	141.1478 (45)
Energy content (annual)	Total = Sum(45)m =											1405.7543 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Heat gains from water heating, kWh/month
30.9712 27.0876 27.9520 24.3692 23.3828 20.1776 18.6975 21.4557 21.7119 25.3031 27.6204 29.9939 (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	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.5929	17.4022	14.1524	10.7143	8.0091	6.7616	7.3061	9.4968	12.7466	16.1847	18.8899	20.1374	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	204.7153	206.8396	201.4864	190.0901	175.7044	162.1838	153.1512	151.0269	156.3801	167.7764	182.1621	195.6827	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	(71)
Water heating gains (Table 5)	41.6279	40.3089	37.5698	33.8461	31.4285	28.0244	25.1311	28.8383	30.1554	34.0096	38.3616	40.3144	(72)
Total internal gains	323.7649	322.3795	311.0375	292.4793	272.9708	254.7986	243.4172	247.1908	257.1109	275.7995	297.2425	313.9633	(73)

6. Solar gains

[Jan]													
					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
West					10.2200	19.6403	0.6300		0.7000		0.7700		61.3437 (80)
Solar gains	61.3437	120.0013	197.6251	288.2244	353.2298	361.5935	344.2518	295.7072	229.8461	142.3917	76.4884	50.4461	(83)
Total gains	385.1086	442.3808	508.6626	580.7037	626.2006	616.3922	587.6690	542.8980	486.9570	418.1911	373.7309	364.4094	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	81.1045	81.3570	81.6060	82.7963	83.0229	84.0941	84.0941	84.2956	83.6782	83.0229	82.5658	82.0933	
alpha	6.4070	6.4238	6.4404	6.5198	6.5349	6.6063	6.6063	6.6197	6.5785	6.5349	6.5044	6.4729	
util living area	0.9990	0.9971	0.9890	0.9481	0.8229	0.6168	0.4514	0.5082	0.7952	0.9771	0.9974	0.9993	(86)
MIT	20.1024	20.2337	20.4568	20.7381	20.9261	20.9907	20.9989	20.9978	20.9563	20.6893	20.3431	20.0814	(87)
Th 2	20.2049	20.2071	20.2094	20.2199	20.2219	20.2310	20.2310	20.2327	20.2275	20.2219	20.2179	20.2137	(88)
util rest of house	0.9986	0.9962	0.9853	0.9313	0.7770	0.5475	0.3733	0.4250	0.7293	0.9666	0.9964	0.9990	(89)
MIT 2	19.3747	19.5075	19.7304	20.0099	20.1737	20.2269	20.2308	20.2321	20.2040	19.9700	19.6260	19.3612	(90)
Living area fraction									fLA = Living area / (4) =			0.3516	(91)
MIT	19.6306	19.7628	19.9858	20.2660	20.4382	20.4954	20.5009	20.5013	20.4685	20.2230	19.8781	19.6144	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6306	19.7628	19.9858	20.2660	20.4382	20.4954	20.5009	20.5013	20.4685	20.2230	19.8781	19.6144	(93)

8. Space heating requirement

Utilisation	0.9983	0.9955	0.9841	0.9325	0.7906	0.5717	0.4008	0.4544	0.7511	0.9667	0.9958	0.9988	(94)
Useful gains	384.4501	440.4004	500.5553	541.4821	495.0477	352.4128	235.5570	246.6843	365.7765	404.2449	372.1795	363.9677	(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	961.2586	929.0375	840.3928	698.1071	535.2447	356.5144	235.8970	247.4277	387.0360	589.4371	787.0350	954.8752	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	429.1455	328.3642	252.8391	112.7700	29.9066	0.0000	0.0000	0.0000	0.0000	137.7830	298.6960	439.6352	(98)
Space heating												2029.1396	(98)
Space heating per m2												27.7091	(99)
										(98) / (4) =			

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	568.4453	447.4995	458.4959	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9687	0.9884	0.9813	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	550.6420	442.2918	449.9029	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	807.3274	772.0444	721.3172	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	184.8135	245.3359	201.9322	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												632.0817	(104)
Cooled fraction												1.0000	(105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling kWh													

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

	0.0000	0.0000	0.0000	0.0000	0.0000	46.2034	61.3340	50.4831	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												158.0204 (107)
Space cooling per m2												2.1579 (108)
Energy for space heating												27.7091 (99)
Energy for space cooling												2.1579 (108)
Total												29.8670 (109)
Target Fabric Energy Efficiency (TFEE)												34.3 (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	73.2300 (1b)	x 2.4000 (2b)	= 175.7520 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.2300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 175.7520 (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					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					3.0200							
Number of sides sheltered					0.1510 (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) =		0.1170 (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)
Adj infilt rate	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)
	0.1229	0.1170	0.1170	0.1082	0.1082	0.0965	0.0995	0.0936	0.0965	0.1024	0.1024	0.1112 (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 m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Opening Type 1			2.1200	1.0000	2.1200		(26)					
Opening Type 2 (Uw = 1.30)			10.2200	1.2357	12.6293		(27)					
WT-E-03	32.1100	10.2200	21.8900	0.1600	3.5024		(29a)					
WT-I-02	21.8400	2.1200	19.7200	0.1584	3.1240		(29a)					
Total net area of external elements Aum(A, m2)			53.9500				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		21.3757		(33)					
Party Wall 1			17.7000	0.0000	0.0000		(32)					
Party Wall 2			17.7000	0.0000	0.0000		(32)					
Party Floor 1			72.3300				(32d)					
Party Ceilings 1			73.2300				(32b)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.0980 (36)					
Total fabric heat loss						(33) + (36) =	28.4737 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 28.9991	Feb 28.9991	Mar 28.9991	Apr 28.9991	May 28.9991	Jun 28.9991	Jul 28.9991	Aug 28.9991	Sep 28.9991	Oct 28.9991	Nov 28.9991	Dec 28.9991 (38)
Heat transfer coeff	57.4728	57.4728	57.4728	57.4728	57.4728	57.4728	57.4728	57.4728	57.4728	57.4728	57.4728	57.4728 (39)
Average = Sum(39)m / 12 =												57.4728 (39)
HLP	Jan 0.7848	Feb 0.7848	Mar 0.7848	Apr 0.7848	May 0.7848	Jun 0.7848	Jul 0.7848	Aug 0.7848	Sep 0.7848	Oct 0.7848	Nov 0.7848	Dec 0.7848 (40)
HLP (average)												0.7848 (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												2.3219 (42)
Average daily hot water use (litres/day)												89.3456 (43)
Daily hot water use	Jan 98.2802	Feb 94.7063	Mar 91.1325	Apr 87.5587	May 83.9849	Jun 80.4110	Jul 80.4110	Aug 83.9849	Sep 87.5587	Oct 91.1325	Nov 94.7063	Dec 98.2802 (44)
Energy conte	145.7467	127.4710	131.5386	114.6785	110.0368	94.9534	87.9883	100.9678	102.1737	119.0736	129.9781	141.1478 (45)
Energy content (annual)												Total = Sum(45)m = 1405.7543 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

	21.8620	19.1206	19.7308	17.2018	16.5055	14.2430	13.1982	15.1452	15.3261	17.8610	19.4967	21.1722 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	14.1003	12.7150	14.0443	13.5538	13.9784	13.4960	13.9264	13.9601	13.5275	14.0170	13.6082	14.0895 (61)
Total heat required for water heating calculated for each month	159.8470	140.1860	145.5829	128.2323	124.0151	108.4494	101.9146	114.9279	115.7012	133.0906	143.5864	155.2373 (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	159.8470	140.1860	145.5829	128.2323	124.0151	108.4494	101.9146	114.9279	115.7012	133.0906	143.5864	155.2373 (64)
RHI water heating demand												
Heat gains from water heating, kWh/month	51.9858	45.5628	47.2477	41.5191	40.0818	34.9460	32.7377	37.0618	37.3546	43.0962	46.6198	50.4540 (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	139.3152	139.3152	139.3152	139.3152	139.3152	139.3152	139.3152	139.3152	139.3152	139.3152	139.3152	139.3152 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	48.9821	43.5055	35.3811	26.7857	20.0227	16.9040	18.2653	23.7420	31.8664	40.4617	47.2248	50.3435 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	305.5452	308.7158	300.7260	283.7166	262.2454	242.0654	228.5839	225.4133	233.4031	250.4125	271.8838	292.0638 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.2534	51.2534	51.2534	51.2534	51.2534	51.2534	51.2534	51.2534	51.2534	51.2534	51.2534	51.2534 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768 (71)
Water heating gains (Table 5)	69.8734	67.8019	63.5049	57.6654	53.8734	48.5361	44.0023	49.8143	51.8814	57.9250	64.7497	67.8146 (72)
Total internal gains	525.0927	520.7150	500.3038	468.8596	436.8333	408.1973	391.5434	399.6614	417.8428	449.4911	484.5502	510.9137 (73)

6. Solar gains

[Jan]													
	Area m2				Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
West	10.2200				22.3313		0.4500		0.0000		0.7700		79.0803 (80)
Solar gains	79.0803	139.1533	225.9604	338.6498	403.5155	441.7215	416.1196	366.0865	284.5456	176.2051	101.0154	64.4008 (83)	
Total gains	604.1730	659.8683	726.2642	807.5094	840.3488	849.9189	807.6629	765.7479	702.3884	625.6962	585.5656	575.3145 (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	88.4839	88.4839	88.4839	88.4839	88.4839	88.4839	88.4839	88.4839	88.4839	88.4839	88.4839	88.4839
alpha	6.8989	6.8989	6.8989	6.8989	6.8989	6.8989	6.8989	6.8989	6.8989	6.8989	6.8989	6.8989
util living area	0.9797	0.9628	0.9031	0.7514	0.5432	0.3380	0.2206	0.2402	0.4731	0.8011	0.9529	0.9844 (86)
MIT	20.5578	20.6568	20.8272	20.9571	20.9955	20.9999	21.0000	21.0000	20.9986	20.9464	20.7401	20.5226 (87)
Th 2	20.2665	20.2665	20.2665	20.2665	20.2665	20.2665	20.2665	20.2665	20.2665	20.2665	20.2665	20.2665 (88)
util rest of house	0.9741	0.9531	0.8811	0.7117	0.4950	0.2885	0.1684	0.1851	0.4140	0.7557	0.9388	0.9799 (89)
MIT 2	19.8775	19.9725	20.1297	20.2375	20.2642	20.2665	20.2665	20.2665	20.2660	20.2319	20.0532	19.8435 (90)
Living area fraction									fLA = Living area / (4) =			0.3516 (91)
MIT	20.1167	20.2131	20.3750	20.4906	20.5213	20.5243	20.5244	20.5244	20.5236	20.4831	20.2947	20.0823 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.9667	20.0631	20.2250	20.3406	20.3713	20.3743	20.3744	20.3744	20.3736	20.3331	20.1447	19.9323 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9713	0.9500	0.8798	0.7159	0.5019	0.2958	0.1761	0.1932	0.4227	0.7601	0.9361	0.9774 (94)
Useful gains	586.8534	626.8779	638.9430	578.0695	421.7794	251.3660	142.2112	147.9577	296.8838	475.6025	548.1394	562.3207 (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	854.4310	831.2371	737.0890	600.0489	423.6510	251.4057	142.2119	147.9591	297.3400	501.9159	697.9914	852.4524 (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	199.0777	137.3294	73.0206	15.8252	1.3925	0.0000	0.0000	0.0000	0.0000	19.5772	107.8934	215.8580 (98)
Space heating												769.9740 (98)
RHI space heating demand												770 (98)

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	73.2300 (1b)	x 2.4000 (2b)	= 175.7520 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.2300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 175.7520 (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					3.0200
Infiltration rate					0.1510 (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) =				0.1170 (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	0.1492	0.1463	0.1434	0.1287	0.1258	0.1112	0.1112	0.1082	0.1170	0.1258	0.1317	0.1375 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			10.2200	1.2357	12.6293		(27)
WT-E-03	32.1100	10.2200	21.8900	0.1600	3.5024		(29a)
WT-I-02	21.8400	2.1200	19.7200	0.1584	3.1240		(29a)
Total net area of external elements Aum(A, m ²)					53.9500		(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.3757		(33)
Party Wall 1				17.7000	0.0000	0.0000	(32)
Party Wall 2				17.7000	0.0000	0.0000	(32)
Party Floor 1				72.3300			(32d)
Party Ceilings 1				73.2300			(32b)

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

250.0000 (35)
7.0980 (36)
(33) + (36) = 28.4737 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991 (38)
Heat transfer coeff	57.4728	57.4728	57.4728	57.4728	57.4728	57.4728	57.4728	57.4728	57.4728	57.4728	57.4728	57.4728 (39)
Average = Sum(39)m / 12 =												57.4728 (39)
HLP	0.7848	0.7848	0.7848	0.7848	0.7848	0.7848	0.7848	0.7848	0.7848	0.7848	0.7848	0.7848 (40)
HLP (average)												0.7848 (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												2.3219 (42)
Average daily hot water use (litres/day)												89.3456 (43)
Daily hot water use	98.2802	94.7063	91.1325	87.5587	83.9849	80.4110	80.4110	83.9849	87.5587	91.1325	94.7063	98.2802 (44)
Energy conte	145.7467	127.4710	131.5386	114.6785	110.0368	94.9534	87.9883	100.9678	102.1737	119.0736	129.9781	141.1478 (45)
Energy content (annual)												Total = Sum(45)m = 1405.7543 (45)
Distribution loss (46)m = 0.15 x (45)m												

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CALCULATION OF ENERGY RATINGS 09 Jan 2014

	21.8620	19.1206	19.7308	17.2018	16.5055	14.2430	13.1982	15.1452	15.3261	17.8610	19.4967	21.1722 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	14.1003	12.7150	14.0443	13.5538	13.9784	13.4960	13.9264	13.9601	13.5275	14.0170	13.6082	14.0895 (61)
Total heat required for water heating calculated for each month	159.8470	140.1860	145.5829	128.2323	124.0151	108.4494	101.9146	114.9279	115.7012	133.0906	143.5864	155.2373 (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	159.8470	140.1860	145.5829	128.2323	124.0151	108.4494	101.9146	114.9279	115.7012	133.0906	143.5864	155.2373 (64)
Heat gains from water heating, kWh/month	51.9858	45.5628	47.2477	41.5191	40.0818	34.9460	32.7377	37.0618	37.3546	43.0962	46.6198	50.4540 (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	139.3152	139.3152	139.3152	139.3152	139.3152	139.3152	139.3152	139.3152	139.3152	139.3152	139.3152	139.3152	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	48.9821	43.5055	35.3811	26.7857	20.0227	16.9040	18.2653	23.7420	31.8664	40.4617	47.2248	50.3435	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	305.5452	308.7158	300.7260	283.7166	262.2454	242.0654	228.5839	225.4133	233.4031	250.4125	271.8838	292.0638	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.2534	51.2534	51.2534	51.2534	51.2534	51.2534	51.2534	51.2534	51.2534	51.2534	51.2534	51.2534	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	(71)
Water heating gains (Table 5)	69.8734	67.8019	63.5049	57.6654	53.8734	48.5361	44.0023	49.8143	51.8814	57.9250	64.7497	67.8146	(72)
Total internal gains	525.0927	520.7150	500.3038	468.8596	436.8333	408.1973	391.5434	399.6614	417.8428	449.4911	484.5502	510.9137	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
West				10.2200	19.6403		0.4500		0.0000		0.7700		69.5507 (80)
Solar gains	69.5507	136.0559	224.0647	326.7850	400.4873	409.9700	390.3082	335.2689	260.5965	161.4418	86.7215	57.1951	(83)
Total gains	594.6434	656.7709	724.3685	795.6446	837.3206	818.1673	781.8515	734.9303	678.4393	610.9329	571.2717	568.1088	(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	88.4839	88.4839	88.4839	88.4839	88.4839	88.4839	88.4839	88.4839	88.4839	88.4839	88.4839	88.4839	
alpha	6.8989	6.8989	6.8989	6.8989	6.8989	6.8989	6.8989	6.8989	6.8989	6.8989	6.8989	6.8989	
util living area	0.9857	0.9708	0.9257	0.8076	0.6276	0.4486	0.3233	0.3595	0.5785	0.8636	0.9697	0.9892	(86)
MIT	20.4866	20.6047	20.7763	20.9274	20.9876	20.9989	20.9999	20.9998	20.9943	20.9037	20.6635	20.4456	(87)
Th 2	20.2665	20.2665	20.2665	20.2665	20.2665	20.2665	20.2665	20.2665	20.2665	20.2665	20.2665	20.2665	(88)
util rest of house	0.9818	0.9632	0.9085	0.7733	0.5817	0.3976	0.2695	0.3023	0.5195	0.8283	0.9605	0.9862	(89)
MIT 2	19.8079	19.9223	20.0836	20.2143	20.2592	20.2660	20.2665	20.2664	20.2639	20.1985	19.9807	19.7676	(90)
Living area fraction	0.9818	0.9632	0.9085	0.7733	0.5817	0.3976	0.2695	0.3023	0.5195	0.8283	0.9605	0.9862	(91)
MIT	20.0465	20.1623	20.3272	20.4650	20.5154	20.5237	20.5244	20.5243	20.5207	20.4464	20.2208	20.0060	(92)
Temperature adjustment	19.8965	20.0123	20.1772	20.3150	20.3654	20.3737	20.3744	20.3743	20.3707	20.2964	20.0708	19.8560	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9794	0.9602	0.9061	0.7757	0.5880	0.4051	0.2774	0.3107	0.5280	0.8299	0.9576	0.9841	(94)
Ext temp.	582.3665	630.6067	656.3635	617.1660	492.3285	331.4418	216.9012	228.3655	358.2312	506.9939	547.0266	559.0960	(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	896.3763	868.5436	786.0660	656.0543	498.0233	331.8322	216.9238	228.4151	360.3956	557.2819	745.4681	899.7956	(97)
Space heating kWh	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 per m2	233.6233	159.8936	96.4986	27.9996	4.2369	0.0000	0.0000	0.0000	0.0000	37.4143	142.8779	253.4805	(98)
												956.0249	(98)
												13.0551	(99)

8c. Space cooling requirement

Not applicable

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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													1056.3811 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	233.6233	159.8936	96.4986	27.9996	4.2369	0.0000	0.0000	0.0000	0.0000	37.4143	142.8779	253.4805	(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)	258.1473	176.6780	106.6283	30.9388	4.6817	0.0000	0.0000	0.0000	0.0000	41.3418	157.8762	280.0890	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	159.8470	140.1860	145.5829	128.2323	124.0151	108.4494	101.9146	114.9279	115.7012	133.0906	143.5864	155.2373	(64)
Efficiency of water heater (217)m	89.1721	88.9764	88.5481	87.8567	87.4021	87.3000	87.3000	87.3000	87.3000	87.9827	88.8672	89.2573	(216)
Fuel for water heating, kWh/month	179.2567	157.5541	164.4111	145.9562	141.8904	124.2262	116.7407	131.6471	132.5329	151.2691	161.5740	173.9211	(219)
Water heating fuel used												1780.9795	(219)
Annual totals kWh/year													
Space heating fuel - main system												1056.3811	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 5.3360, total flow = 29.0000, SFP = 0.1840)													
mechanical ventilation fans (SFP = 0.1840)													39.4528 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													114.4528 (231)
Electricity for lighting (calculated in Appendix L)													346.0160 (232)
Total delivered energy for all uses													3297.8294 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1056.3811	3.4800	36.7621 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1780.9795	3.4800	61.9781 (247)
Mechanical ventilation fans	39.4528	13.1900	5.2038 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	346.0160	13.1900	45.6395 (250)
Additional standing charges			120.0000 (251)
Total energy cost			279.4760 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)		0.9928 (257)
SAP value	$[(255) \times (256)] / [(4) + 45.0] =$	86.1503
SAP rating (Section 12)		86 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1056.3811	0.2160	228.1783 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1780.9795	0.2160	384.6916 (264)
Space and water heating			612.8699 (265)
Pumps and fans	114.4528	0.5190	59.4010 (267)
Energy for lighting	346.0160	0.5190	179.5823 (268)
Total kg/year			851.8532 (272)
CO2 emissions per m2			11.6300 (273)
EI value			90.3452
EI rating			90 (274)
EI band			B

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9050 = 3.845$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9050 = 0.2387$, stars = 4
Water heating energy efficiency	$3.48 / 0.8811 = 3.950$, stars = 4
Water heating environmental impact	$0.216 / 0.8811 = 0.2452$, 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	73.2300 (1b)	x 2.4000 (2b)	= 175.7520 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.2300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 175.7520 (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					3.0200
Infiltration rate					0.1510 (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) =				0.1170 (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	0.1229	0.1170	0.1170	0.1082	0.1082	0.0965	0.0995	0.0936	0.0965	0.1024	0.1024	0.1112 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			10.2200	1.2357	12.6293		(27)
WT-E-03	32.1100	10.2200	21.8900	0.1600	3.5024		(29a)
WT-T-02	21.8400	2.1200	19.7200	0.1584	3.1240		(29a)
Total net area of external elements Aum(A, m ²)			53.9500				(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =				21.3757		(33)
Party Wall 1			17.7000	0.0000	0.0000		(32)
Party Wall 2			17.7000	0.0000	0.0000		(32)
Party Floor 1			72.3300				(32d)
Party Ceilings 1			73.2300				(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)							7.0980 (36)
Total fabric heat loss	(33) + (36) =						28.4737 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991 (38)
Average = Sum(39)m / 12 =	57.4728	57.4728	57.4728	57.4728	57.4728	57.4728	57.4728	57.4728	57.4728	57.4728	57.4728	57.4728 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7848	0.7848	0.7848	0.7848	0.7848	0.7848	0.7848	0.7848	0.7848	0.7848	0.7848	0.7848 (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												2.3219 (42)
Average daily hot water use (litres/day)												89.3456 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	98.2802	94.7063	91.1325	87.5587	83.9849	80.4110	80.4110	83.9849	87.5587	91.1325	94.7063	98.2802 (44)
Energy conte	145.7467	127.4710	131.5386	114.6785	110.0368	94.9534	87.9883	100.9678	102.1737	119.0736	129.9781	141.1478 (45)
Energy content (annual)												Total = Sum(45)m = 1405.7543 (45)
Distribution loss (46)m = 0.15 x (45)m												

Regs Region: England

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

	21.8620	19.1206	19.7308	17.2018	16.5055	14.2430	13.1982	15.1452	15.3261	17.8610	19.4967	21.1722 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	14.1003	12.7150	14.0443	13.5538	13.9784	13.4960	13.9264	13.9601	13.5275	14.0170	13.6082	14.0895 (61)
Total heat required for water heating calculated for each month	159.8470	140.1860	145.5829	128.2323	124.0151	108.4494	101.9146	114.9279	115.7012	133.0906	143.5864	155.2373 (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	159.8470	140.1860	145.5829	128.2323	124.0151	108.4494	101.9146	114.9279	115.7012	133.0906	143.5864	155.2373 (64)
Heat gains from water heating, kWh/month	51.9858	45.5628	47.2477	41.5191	40.0818	34.9460	32.7377	37.0618	37.3546	43.0962	46.6198	50.4540 (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	139.3152	139.3152	139.3152	139.3152	139.3152	139.3152	139.3152	139.3152	139.3152	139.3152	139.3152	139.3152 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	48.9821	43.5055	35.3811	26.7857	20.0227	16.9040	18.2653	23.7420	31.8664	40.4617	47.2248	50.3435 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	305.5452	308.7158	300.7260	283.7166	262.2454	242.0654	228.5839	225.4133	233.4031	250.4125	271.8838	292.0638 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.2534	51.2534	51.2534	51.2534	51.2534	51.2534	51.2534	51.2534	51.2534	51.2534	51.2534	51.2534 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768 (71)
Water heating gains (Table 5)	69.8734	67.8019	63.5049	57.6654	53.8734	48.5361	44.0023	49.8143	51.8814	57.9250	64.7497	67.8146 (72)
Total internal gains	525.0927	520.7150	500.3038	468.8596	436.8333	408.1973	391.5434	399.6614	417.8428	449.4911	484.5502	510.9137 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a		g	FF		Access		Gains
					W/m2		Specific data or Table 6b	Specific data or Table 6c		factor Table 6d		W
West				10.2200	22.3313		0.4500	0.0000		0.7700		79.0803 (80)
Solar gains	79.0803	139.1533	225.9604	338.6498	403.5155	441.7215	416.1196	366.0865	284.5456	176.2051	101.0154	64.4008 (83)
Total gains	604.1730	659.8683	726.2642	807.5094	840.3488	849.9189	807.6629	765.7479	702.3884	625.6962	585.5656	575.3145 (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	88.4839	88.4839	88.4839	88.4839	88.4839	88.4839	88.4839	88.4839	88.4839	88.4839	88.4839	88.4839
alpha	6.8989	6.8989	6.8989	6.8989	6.8989	6.8989	6.8989	6.8989	6.8989	6.8989	6.8989	6.8989
util living area	0.9797	0.9628	0.9031	0.7514	0.5432	0.3380	0.2206	0.2402	0.4731	0.8011	0.9529	0.9844 (86)
MIT	20.5578	20.6568	20.8272	20.9571	20.9955	20.9999	21.0000	21.0000	20.9986	20.9464	20.7401	20.5226 (87)
Th 2	20.2665	20.2665	20.2665	20.2665	20.2665	20.2665	20.2665	20.2665	20.2665	20.2665	20.2665	20.2665 (88)
util rest of house	0.9741	0.9531	0.8811	0.7117	0.4950	0.2885	0.1684	0.1851	0.4140	0.7557	0.9388	0.9799 (89)
MIT 2	19.8775	19.9725	20.1297	20.2375	20.2642	20.2665	20.2665	20.2665	20.2660	20.2319	20.0532	19.8435 (90)
Living area fraction	20.1167	20.2131	20.3750	20.4906	20.5213	20.5243	20.5244	20.5244	20.5236	20.4831	20.2947	20.0823 (92)
Temperature adjustment	19.9667	20.0631	20.2250	20.3406	20.3713	20.3743	20.3744	20.3744	20.3736	20.3331	20.1447	19.9323 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9713	0.9500	0.8798	0.7159	0.5019	0.2958	0.1761	0.1932	0.4227	0.7601	0.9361	0.9774 (94)
Ext temp.	586.8534	626.8779	638.9430	578.0695	421.7794	251.3660	142.2112	147.9577	296.8838	475.6025	548.1394	562.3207 (95)
Heat loss rate W	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Month fracti	854.4310	831.2371	737.0890	600.0489	423.6510	251.4057	142.2119	147.9591	297.3400	501.9159	697.9914	852.4524 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating per m2	199.0777	137.3294	73.0206	15.8252	1.3925	0.0000	0.0000	0.0000	0.0000	19.5772	107.8934	215.8580 (98)
												769.9740 (98)
												10.5145 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)											
Fraction of space heat from main system(s)	1.0000 (202)											
Efficiency of main space heating system 1 (in %)	90.5000 (206)											
Efficiency of secondary/supplementary heating system, %	0.0000 (208)											
Space heating requirement	850.8000 (211)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	199.0777	137.3294	73.0206	15.8252	1.3925	0.0000	0.0000	0.0000	0.0000	19.5772	107.8934	215.8580 (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)	219.9754	151.7451	80.6858	17.4864	1.5387	0.0000	0.0000	0.0000	0.0000	21.6323	119.2193	238.5171 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	159.8470	140.1860	145.5829	128.2323	124.0151	108.4494	101.9146	114.9279	115.7012	133.0906	143.5864	155.2373 (64)
Efficiency of water heater (217)m	89.0464	88.8547	88.3434	87.6404	87.3343	87.3000	87.3000	87.3000	87.3000	87.6976	88.6448	87.3000 (216)
Fuel for water heating, kWh/month	179.5098	157.7698	164.7919	146.3164	142.0005	124.2262	116.7407	131.6471	132.5329	151.7607	161.9795	174.1632 (219)
Water heating fuel used												1783.4388 (219)
Annual totals kWh/year												
Space heating fuel - main system												850.8000 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(MEV)Decentralised, Database: total watage = 5.3360, total flow = 29.0000, SFP = 0.1840)												
mechanical ventilation fans (SFP = 0.1840)												39.4528 (230a)
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												114.4528 (231)
Electricity for lighting (calculated in Appendix L)												346.0160 (232)
Total delivered energy for all uses												3094.7077 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	850.8000	3.7400	31.8199 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1783.4388	3.7400	66.7006 (247)
Mechanical ventilation fans	39.4528	19.1200	7.5434 (249)
Pumps and fans for heating	75.0000	19.1200	14.3400 (249)
Energy for lighting	346.0160	19.1200	66.1583 (250)
Additional standing charges			94.0000 (251)
Total energy cost			280.5622 (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	850.8000	0.2160	183.7728 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1783.4388	0.2160	385.2228 (264)
Space and water heating			568.9956 (265)
Pumps and fans	114.4528	0.5190	59.4010 (267)
Energy for lighting	346.0160	0.5190	179.5823 (268)
Total kg/year			807.9789 (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	850.8000	1.2200	1037.9760 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1783.4388	1.2200	2175.7954 (264)
Space and water heating			3213.7714 (265)
Pumps and fans	114.4528	3.0700	351.3701 (267)
Energy for lighting	346.0160	3.0700	1062.2692 (268)
Primary energy kWh/year			4627.4107 (272)
Primary energy kWh/m2/year			63.1901 (273)

SAP 2012 EPC IMPROVEMENTS

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



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

(For testing purposes):

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

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

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
	Total Savings £0		0.00 kg/m²
Potential energy efficiency rating:		B 86	
Potential environmental impact rating:			B 90

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

Typical heating and lighting costs of this home (per year, Thames Valley):			
	Current	Potential	Saving
Electricity	£88	£88	£0
Mains gas	£193	£193	£0
Space heating	£148	£148	£0
Water heating	£67	£67	£0
Lighting	£66	£66	£0
Total cost of fuels	£281	£281	£0
Total cost of uses	£281	£281	£0
Delivered energy	42 kWh/m²	42 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.8 tonnes	0.8 tonnes	0.0 tonnes
CO2 emissions per m²	11 kg/m²	11 kg/m²	0 kg/m²
Primary energy	63 kWh/m²	63 kWh/m²	0 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



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

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

No improvements selected / applicable

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

Overheating Calculation Input Data

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

Overheating Calculation

Summer ventilation heat loss coefficient	347.99 (P1)
Transmission heat loss coefficient	28.47 (37)
Summer heat loss coefficient	376.46 (P2)

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

	Jun	Jul	Aug	
Solar gains	516	486	428	(P4)
Internal gains	405	389	397	
Total summer gains	921	875	825	(P5)
Summer gain/loss ratio	2.45	2.32	2.19	(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	18.70	20.47	20.24	(P7)
Likelihood of high internal temperature	Not significant	Not significant	Not significant	
Assessment of likelihood of high internal temperature:	Not significant			