

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



Property Reference	SECPMW026i_067_As_Built				Issued on Date	22/11/2021
Assessment Reference	001	Prop Type Ref	MFF			
Property						
SAP Rating	84 B	DER	17.31	TER	18.54	
Environmental	88 B	% DER<TER	6.62			
CO ₂ Emissions (t/year)	1.00	DFEE	43.13	TFEE	48.79	
General Requirements Compliance	Pass	% DFEE<TFEE	11.60			
Assessor Details	Mr. Stephen Smith, Southern Energy Consultants Limited, Tel: 01635261582, info@southernenergyconsultants.co.uk				Assessor ID	d168-0001
Client	Bellway Homes Thames Valley					

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

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DWELLING AS BUILT

Mid-floor flat, total floor area 70 m²

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

1a TER and DER

Fuel for main heating: Mains gas
Fuel factor: 1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 18.54 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.31 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 48.8 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 43.1 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.28 (max. 0.30)	0.33 (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	1.25 (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: 3.24 (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
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	70.1500 (1b)	x 2.4000 (2b)	= 168.3600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.1500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 168.3600 (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					3.2400
Infiltration rate					0.1620 (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) =				0.1256 (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	0.1601	0.1569	0.1538	0.1381	0.1350	0.1193	0.1193	0.1161	0.1256	0.1350	0.1412	0.1475 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			10.2200	1.2357	12.6293		(27)
FT-03			70.1500	0.1247	8.7444		(28b)
WT-E-02	23.4000	10.2200	13.1800	0.2000	2.6360		(29a)
WT-I-01	23.4000	2.1200	21.2800	0.3300	7.0224		(29a)
Total net area of external elements Aum(A, m2)			116.9500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.1520		(33)
Party Wall 1			34.8500	0.0000	0.0000		(32)
Party Ceilings 1			70.1500				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.2634 (36)
Total fabric heat loss						(33) + (36) =	46.4155 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	27.7794	27.7794	27.7794	27.7794	27.7794	27.7794	27.7794	27.7794	27.7794	27.7794	27.7794	27.7794 (38)
Heat transfer coeff	74.1949	74.1949	74.1949	74.1949	74.1949	74.1949	74.1949	74.1949	74.1949	74.1949	74.1949	74.1949 (39)
Average = Sum(39)m / 12 =												74.1949 (39)
HLP	1.0577	1.0577	1.0577	1.0577	1.0577	1.0577	1.0577	1.0577	1.0577	1.0577	1.0577	1.0577 (40)
HLP (average)												1.0577 (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												2.2498 (42)
Average daily hot water use (litres/day)												87.6318 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.3950	92.8897	89.3845	85.8792	82.3739	78.8686	78.8686	82.3739	85.8792	89.3845	92.8897	96.3950 (44)
Energy conte	142.9510	125.0259	129.0155	112.4788	107.9261	93.1320	86.3005	99.0311	100.2139	116.7896	127.4850	138.4404 (45)
Energy content (annual)												Total = Sum(45)m = 1378.7898 (45)
Distribution loss (46)m = 0.15 x (45)m	21.4427	18.7539	19.3523	16.8718	16.1889	13.9698	12.9451	14.8547	15.0321	17.5184	19.1227	20.7661 (46)

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	14.0873	12.7040	14.0333	13.5446	13.9699	13.4891	13.9199	13.9523	13.5194	14.0071	13.5970	14.0768	(61)
Total heat required for water heating calculated for each month	157.0383	137.7299	143.0488	126.0235	121.8960	106.6211	100.2204	112.9835	113.7332	130.7967	141.0820	152.5173	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h	157.0383	137.7299	143.0488	126.0235	121.8960	106.6211	100.2204	112.9835	113.7332	130.7967	141.0820	152.5173	(64)
Heat gains from water heating, kWh/month	51.0530	44.7471	46.4060	40.7854	39.3779	34.3387	32.1749	36.4159	36.7009	42.3343	45.7880	49.5506	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	112.4881	112.4881	112.4881	112.4881	112.4881	112.4881	112.4881	112.4881	112.4881	112.4881	112.4881	112.4881	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.7418	16.6463	13.5376	10.2489	7.6612	6.4679	6.9888	9.0843	12.1929	15.4816	18.0694	19.2626	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.6469	199.6979	194.5295	183.5267	169.6377	156.5839	147.8632	145.8123	150.9806	161.9834	175.8724	188.9262	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2488	34.2488	34.2488	34.2488	34.2488	34.2488	34.2488	34.2488	34.2488	34.2488	34.2488	34.2488	(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)	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	(71)
Water heating gains (Table 5)	68.6197	66.5879	62.3736	56.6463	52.9273	47.6926	43.2458	48.9461	50.9735	56.9010	63.5944	66.6003	(72)
Total internal gains	344.7547	342.6785	330.1872	310.1684	289.9725	270.4908	257.8442	263.5891	273.8934	294.1124	317.2827	334.5356	(73)

6. Solar gains

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

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	414.3054	478.7344	554.2519	636.9534	690.4598	680.4608	648.1524	598.8580	534.4899	455.5542	404.0042	391.7307 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	65.6585	65.6585	65.6585	65.6585	65.6585	65.6585	65.6585	65.6585	65.6585	65.6585	65.6585	65.6585		
alpha	5.3772	5.3772	5.3772	5.3772	5.3772	5.3772	5.3772	5.3772	5.3772	5.3772	5.3772	5.3772		
util living area	0.9982	0.9956	0.9861	0.9483	0.8429	0.6640	0.4973	0.5577	0.8245	0.9751	0.9960	0.9986	(86)	
MIT	19.8759	20.0224	20.2793	20.6000	20.8529	20.9686	20.9944	20.9900	20.9029	20.5541	20.1436	19.8354	(87)	
Th 2	20.0356	20.0356	20.0356	20.0356	20.0356	20.0356	20.0356	20.0356	20.0356	20.0356	20.0356	20.0356	(88)	
util rest of house	0.9975	0.9941	0.9812	0.9302	0.7933	0.5776	0.3917	0.4470	0.7517	0.9630	0.9945	0.9982	(89)	
MIT 2	19.0086	19.1545	19.4086	19.7173	19.9393	20.0216	20.0342	20.0328	19.9830	19.6796	19.2758	18.9681	(90)	
Living area fraction	19.3541	19.5003	19.7555	20.0690	20.3033	20.3989	20.4168	20.4142	20.3495	20.0281	19.6215	19.3137	(91)	
MIT	19.3541	19.5003	19.7555	20.0690	20.3033	20.3989	20.4168	20.4142	20.3495	20.0281	19.6215	19.3137	(92)	
Temperature adjustment												-0.1500		
adjusted MIT	19.2041	19.3503	19.6055	19.9190	20.1533	20.2489	20.2668	20.2642	20.1995	19.8781	19.4715	19.1637	(93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9968	0.9927	0.9785	0.9275	0.8000	0.5976	0.4174	0.4739	0.7656	0.9604	0.9932	0.9976	(94)
Useful gains	412.9822	475.2440	542.3205	590.7995	552.3853	406.6701	270.5663	283.8283	409.1990	437.5217	401.2482	390.7936	(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	1105.8108	1072.1374	972.3625	817.5538	627.1924	419.1224	272.0545	286.7012	452.5548	688.3842	917.9053	1110.2279	(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	515.4644	401.1123	319.9513	163.2630	55.6565	0.0000	0.0000	0.0000	0.0000	186.6417	371.9931	535.2591	(98)
Space heating												2549.3414	(98)
Space heating per m2											(98) / (4) =	36.3413	(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													2816.9519 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	515.4644	401.1123	319.9513	163.2630	55.6565	0.0000	0.0000	0.0000	0.0000	186.6417	371.9931	535.2591	(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)	569.5740	443.2180	353.5373	180.4011	61.4989	0.0000	0.0000	0.0000	0.0000	206.2339	411.0421	591.4465	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	157.0383	137.7299	143.0488	126.0235	121.8960	106.6211	100.2204	112.9835	113.7332	130.7967	141.0820	152.5173	(64)
Efficiency of water heater	89.7319	89.6600	89.4866	89.0776	88.2785	87.3000	87.3000	87.3000	87.3000	89.1535	89.5969	87.3000	(216)
(217)m	89.7319	89.6600	89.4866	89.0776	88.2785	87.3000	87.3000	87.3000	87.3000	89.1535	89.5969	89.7703	(217)
Fuel for water heating, kWh/month	175.0082	153.6136	159.8551	141.4761	138.0813	122.1319	114.8000	129.4198	130.2786	146.7096	157.4630	169.8972	(219)
Water heating fuel used												1738.7343	(219)
Annual totals kWh/year													
Space heating fuel - main system												2816.9519	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 5.3360, total flow = 29.0000, SFP = 0.1840)													
mechanical ventilation fans (SFP = 0.1840)													37.7935 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													112.7935 (231)
Electricity for lighting (calculated in Appendix L)													330.9852 (232)
Total delivered energy for all uses													4999.4648 (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	2816.9519	0.2160	608.4616	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1738.7343	0.2160	375.5666	(264)
Space and water heating			984.0282	(265)
Pumps and fans	112.7935	0.5190	58.5398	(267)
Energy for lighting	330.9852	0.5190	171.7813	(268)
Total CO2, kg/year			1214.3493	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			17.3100	(273)

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

DER			17.3100	ZC1
Total Floor Area		TFA	70.1500	
Assumed number of occupants		N	2.2498	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			16.6959	ZC2
CO2 emissions from cooking, equation (L16)			2.4661	ZC3
Total CO2 emissions			36.4719	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			36.4719	ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	70.1500 (1b)	x 2.4000 (2b)	= 168.3600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.1500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 168.3600 (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) = 0.1782 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4282 (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) =				0.3318 (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	0.4231	0.4148	0.4065	0.3650	0.3567	0.3153	0.3153	0.3070	0.3318	0.3567	0.3733	0.3899 (22b)
	0.5895	0.5860	0.5826	0.5666	0.5636	0.5497	0.5497	0.5471	0.5551	0.5636	0.5697	0.5760 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.40)			10.2200	1.3258	13.5492		(27)
FT-03			70.1500	0.1300	9.1195		(28b)
WT-E-02	23.4000	10.2200	13.1800	0.1800	2.3724		(29a)
WT-I-01	23.4000	2.1200	21.2800	0.1800	3.8304		(29a)
Total net area of external elements Aum(A, m ²)			116.9500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.9915		(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)							11.8817 (36)
Total fabric heat loss						(33) + (36) =	42.8732 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	32.7524	32.5593	32.3700	31.4810	31.3146	30.5403	30.5403	30.3969	30.8385	31.3146	31.6511	32.0029 (38)
Heat transfer coeff	75.6256	75.4325	75.2433	74.3542	74.1879	73.4135	73.4135	73.2701	73.7118	74.1879	74.5244	74.8762 (39)
Average = Sum(39)m / 12 =												74.3534 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0781	1.0753	1.0726	1.0599	1.0576	1.0465	1.0465	1.0445	1.0508	1.0576	1.0624	1.0674 (40)
HLP (average)												1.0599 (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												2.2498 (42)
Average daily hot water use (litres/day)												87.6318 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.3950	92.8897	89.3845	85.8792	82.3739	78.8686	78.8686	82.3739	85.8792	89.3845	92.8897	96.3950 (44)
Energy conte	142.9510	125.0259	129.0155	112.4788	107.9261	93.1320	86.3005	99.0311	100.2139	116.7896	127.4850	138.4404 (45)
Energy content (annual)										Total = Sum(45)m =		1378.7898 (45)
Distribution loss (46)m = 0.15 x (45)m	21.4427	18.7539	19.3523	16.8718	16.1889	13.9698	12.9451	14.8547	15.0321	17.5184	19.1227	20.7661 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

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Combi loss	49.1218	42.7547	45.5493	42.3514	41.9768	38.8941	40.1906	41.9768	42.3514	45.5493	45.8086	49.1218 (61)
Total heat required for water heating calculated for each month	192.0729	167.7806	174.5648	154.8302	149.9030	132.0262	126.4911	141.0080	142.5652	162.3389	173.2936	187.5623 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	192.0729	167.7806	174.5648	154.8302	149.9030	132.0262	126.4911	141.0080	142.5652	162.3389	173.2936	187.5623 (64)
Heat gains from water heating, kWh/month	59.8117	52.2598	54.2850	47.9871	46.3796	40.6899	38.7426	43.4221	43.9090	50.2199	53.8409	58.3119 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	112.4881	112.4881	112.4881	112.4881	112.4881	112.4881	112.4881	112.4881	112.4881	112.4881	112.4881	112.4881	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.7418	16.6463	13.5376	10.2489	7.6612	6.4679	6.9888	9.0843	12.1929	15.4816	18.0694	19.2626	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.6469	199.6979	194.5295	183.5267	169.6377	156.5839	147.8632	145.8123	150.9806	161.9834	175.8724	188.9262	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2488	34.2488	34.2488	34.2488	34.2488	34.2488	34.2488	34.2488	34.2488	34.2488	34.2488	34.2488	(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)	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	(71)
Water heating gains (Table 5)	80.3920	77.7675	72.9637	66.6487	62.3382	56.5138	52.0734	58.3630	60.9847	67.4998	74.7790	78.3762	(72)
Total internal gains	356.5271	353.8581	340.7773	320.1707	299.3835	279.3120	266.6717	273.0059	283.9045	304.7113	328.4673	346.3115	(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	417.8708	473.8594	538.4023	608.3951	652.6133	640.9055	610.9235	568.7131	513.7507	447.1030	404.9557	396.7575 (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	64.4163	64.5813	64.7437	65.5179	65.6648	66.3574	66.3574	66.4872	66.0889	65.6648	65.3683	65.0611	
alpha	5.2944	5.3054	5.3162	5.3679	5.3777	5.4238	5.4238	5.4325	5.4059	5.3777	5.3579	5.3374	
util living area	0.9981	0.9959	0.9880	0.9568	0.8657	0.6911	0.5207	0.5781	0.8396	0.9769	0.9960	0.9986	(86)
MIT	19.8525	19.9921	20.2408	20.5677	20.8298	20.9632	20.9933	20.9887	20.8947	20.5441	20.1394	19.8287	(87)
Th 2	20.0188	20.0211	20.0233	20.0337	20.0356	20.0447	20.0447	20.0464	20.0412	20.0356	20.0317	20.0276	(88)
util rest of house	0.9974	0.9944	0.9837	0.9409	0.8196	0.6046	0.4119	0.4656	0.7696	0.9656	0.9944	0.9981	(89)
MIT 2	18.4850	18.6904	19.0529	19.5246	19.8691	20.0203	20.0423	20.0417	19.9562	19.5006	18.9137	18.4566	(90)
Living area fraction									fLA = Living area / (4) =			0.3984	(91)
MIT	19.0299	19.2090	19.5262	19.9402	20.2519	20.3960	20.4212	20.4190	20.3301	19.9164	19.4021	19.0033	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0299	19.2090	19.5262	19.9402	20.2519	20.3960	20.4212	20.4190	20.3301	19.9164	19.4021	19.0033	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	416.4145	470.4691	528.1271	571.3538	542.3599	408.7966	278.2856	290.4398	407.3909	430.9261	402.1024	395.6975	(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	1113.9565	1079.3671	980.1343	820.8862	634.4457	425.5063	280.5276	294.4742	459.2340	691.1608	916.8053	1108.4122	(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	518.9712	409.1795	336.2934	179.6634	68.5119	0.0000	0.0000	0.0000	0.0000	193.6147	370.5861	530.2597	(98)
Space heating												2607.0797	(98)
Space heating per m ²												37.1644	(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													2791.3059 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	518.9712	409.1795	336.2934	179.6634	68.5119	0.0000	0.0000	0.0000	0.0000	193.6147	370.5861	530.2597	(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)	555.6437	438.0936	360.0571	192.3591	73.3532	0.0000	0.0000	0.0000	0.0000	207.2962	396.7731	567.7299	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	192.0729	167.7806	174.5648	154.8302	149.9030	132.0262	126.4911	141.0080	142.5652	162.3389	173.2936	187.5623	(64)
Efficiency of water heater	87.4295	87.2102	86.6748	85.4265	83.2164	80.3000	80.3000	80.3000	80.3000	85.4957	86.9167	87.5235	(216)
Fuel for water heating, kWh/month	219.6889	192.3865	201.4022	181.2439	180.1363	164.4161	157.5232	175.6014	177.5408	189.8797	199.3789	214.2992	(219)
Water heating fuel used													2253.4972 (219)
Annual totals kWh/year													
Space heating fuel - main system													2791.3059 (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)													330.9852 (232)
Total delivered energy for all uses													5450.7883 (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	2791.3059	0.2160	602.9221 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2253.4972	0.2160	486.7554 (264)
Space and water heating			1089.6775 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	330.9852	0.5190	171.7813 (268)
Total CO2, kg/m2/year			1300.3838 (272)
Emissions per m2 for space and water heating			15.5335 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4488 (272b)
Emissions per m2 for pumps and fans			0.5549 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.5335 * 1.00) + 2.4488 + 0.5549, rounded to 2 d.p.			18.5400 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	70.1500 (1b)	x 2.4000 (2b)	= 168.3600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.1500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 168.3600 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				3 * 10 =	30.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					30.0000 / (5) =
Measured/design AP50					Yes
Infiltration rate					3.2400
Number of sides sheltered					0.3402 (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) =				0.2636 (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	0.3361	0.3296	0.3230	0.2900	0.2834	0.2505	0.2505	0.2439	0.2636	0.2834	0.2966	0.3098 (22b)
Effective ac	0.5565	0.5543	0.5522	0.5421	0.5402	0.5314	0.5314	0.5297	0.5348	0.5402	0.5440	0.5480 (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)
FT-03			70.1500	0.1247	8.7444		(28b)
WT-E-02	23.4000	10.2200	13.1800	0.2000	2.6360		(29a)
WT-I-01	23.4000	2.1200	21.2800	0.3300	7.0224		(29a)
Total net area of external elements Aum, m ²			116.9500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.1520		(33)
Party Wall 1			34.8500	0.0000	0.0000		(32)
Party Ceilings 1			70.1500				(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)							13.2634 (36)
Total fabric heat loss						(33) + (36) =	46.4155 (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	30.9184	30.7965	30.6770	30.1158	30.0108	29.5221	29.5221	29.4316	29.7103	30.0108	30.2232	30.4453 (38)
Heat transfer coeff	77.3339	77.2120	77.0925	76.5313	76.4263	75.9376	75.9376	75.8470	76.1258	76.4263	76.6387	76.8608 (39)
Average = Sum(39)m / 12 =												76.5308 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1024	1.1007	1.0990	1.0910	1.0895	1.0825	1.0825	1.0812	1.0852	1.0895	1.0925	1.0957 (40)
HLP (average)												1.0910 (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												2.2498 (42)
Average daily hot water use (litres/day)												87.6318 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.3950	92.8897	89.3845	85.8792	82.3739	78.8686	78.8686	82.3739	85.8792	89.3845	92.8897	96.3950 (44)
Energy conte	142.9510	125.0259	129.0155	112.4788	107.9261	93.1320	86.3005	99.0311	100.2139	116.7896	127.4850	138.4404 (45)
Energy content (annual)										Total = Sum(45)m =		1378.7898 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	30.3771	26.5680	27.4158	23.9018	22.9343	19.7906	18.3389	21.0441	21.2954	24.8178	27.0906	29.4186 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	112.4881	112.4881	112.4881	112.4881	112.4881	112.4881	112.4881	112.4881	112.4881	112.4881	112.4881	112.4881	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.7418	16.6463	13.5376	10.2489	7.6612	6.4679	6.9888	9.0843	12.1929	15.4816	18.0694	19.2626	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.6469	199.6979	194.5295	183.5267	169.6377	156.5839	147.8632	145.8123	150.9806	161.9834	175.8724	188.9262	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2488	34.2488	34.2488	34.2488	34.2488	34.2488	34.2488	34.2488	34.2488	34.2488	34.2488	34.2488	(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)	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	(71)
Water heating gains (Table 5)	40.8294	39.5357	36.8492	33.1969	30.8257	27.4869	24.6490	28.2851	29.5770	33.3572	37.6258	39.5411	(72)
Total internal gains	313.9645	312.6262	301.6628	283.7189	264.8709	247.2851	236.2474	239.9280	249.4969	267.5687	288.3140	304.4764	(73)

6. Solar gains

[Jan]	Area		Solar flux		g		FF		Access		Gains	
	m2		Table 6a		Table 6b		Specific data		Specific data		factor	
			W/m2		or Table 6b		or Table 6c		or Table 6c		Table 6d	
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	383.5152	448.6821	525.7275	610.5039	665.3582	657.2551	626.5556	575.1970	510.0934	429.0105	375.0355	361.6715 (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	62.9935	63.0929	63.1907	63.6540	63.7415	64.1518	64.1518	64.2283	63.9931	63.7415	63.5648	63.3812	
alpha	5.1996	5.2062	5.2127	5.2436	5.2494	5.2768	5.2768	5.2819	5.2662	5.2494	5.2377	5.2254	
util living area	0.9987	0.9968	0.9895	0.9586	0.8664	0.6933	0.5241	0.5888	0.8525	0.9815	0.9973	0.9991	(86)
MIT	19.7731	19.9249	20.1924	20.5388	20.8182	20.9589	20.9922	20.9861	20.8775	20.4941	20.0647	19.7426	(87)
Th 2	19.9989	20.0003	20.0017	20.0082	20.0094	20.0151	20.0151	20.0162	20.0129	20.0094	20.0070	20.0044	(88)
util rest of house	0.9983	0.9957	0.9857	0.9431	0.8198	0.6048	0.4116	0.4718	0.7836	0.9721	0.9961	0.9987	(89)
MIT 2	18.8763	19.0288	19.2954	19.6369	19.8881	19.9966	20.0132	20.0123	19.9447	19.6005	19.1741	18.8503	(90)
Living area fraction	19.2337	19.3858	19.6528	19.9963	20.2587	20.3800	20.4032	20.4003	fLA = Living area / (4) =	20.3163	19.9565	19.5290	0.3984 (91)
MIT	19.2337	19.3858	19.6528	19.9963	20.2587	20.3800	20.4032	20.4003	20.3163	19.9565	19.5290	19.2058	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2337	19.3858	19.6528	19.9963	20.2587	20.3800	20.4032	20.4003	20.3163	19.9565	19.5290	19.2058	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	382.6841	446.3620	517.3377	575.6570	554.0695	420.1106	286.1744	298.4318	411.7938	416.7643	373.3066	361.0915	(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	(95)
Heat loss rate W	1154.8774	1118.4765	1013.9813	849.2117	654.1093	438.9207	288.8094	303.4101	473.2227	715.0844	952.5395	1153.3574	(96)
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	(97)
Space heating kWh	574.5118	451.6609	369.5028	196.9594	74.4297	0.0000	0.0000	0.0000	0.0000	221.9501	417.0477	589.4459	(98)
Space heating												2895.5084	(98)
Space heating per m2										(98) / (4) =		41.2760	(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	713.8130	561.9379	576.4375	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9051	0.9516	0.9307	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	646.0393	534.7436	536.5176	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	852.2932	814.7602	756.2423	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	148.5028	208.3323	163.4752	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												520.3103	(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	37.1257	52.0831	40.8688	0.0000	0.0000	0.0000 (107)
Space cooling											130.0776 (107)
Space cooling per m2											1.8543 (108)
Energy for space heating											41.2760 (99)
Energy for space cooling											1.8543 (108)
Total											43.1302 (109)
Dwelling Fabric Energy Efficiency (DFEE)											43.1 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	70.1500 (1b)	x 2.4000 (2b)	= 168.3600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.1500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 168.3600 (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) = 0.1782 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4282 (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) =	0.3318 (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	0.4231	0.4148	0.4065	0.3650	0.3567	0.3153	0.3153	0.3070	0.3318	0.3567	0.3733	0.3899 (22b)
	0.5895	0.5860	0.5826	0.5666	0.5636	0.5497	0.5497	0.5471	0.5551	0.5636	0.5697	0.5760 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.40)			10.2200	1.3258	13.5492		(27)
FT-03			70.1500	0.1300	9.1195		(28b)
WT-E-02	23.4000	10.2200	13.1800	0.1800	2.3724		(29a)
WT-I-01	23.4000	2.1200	21.2800	0.1800	3.8304		(29a)
Total net area of external elements Aum(A, m ²)			116.9500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.9915		(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)							11.8817 (36)
Total fabric heat loss						(33) + (36) =	42.8732 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	32.7524	32.5593	32.3700	31.4810	31.3146	30.5403	30.5403	30.3969	30.8385	31.3146	31.6511	32.0029 (38)
Heat transfer coeff	75.6256	75.4325	75.2433	74.3542	74.1879	73.4135	73.4135	73.2701	73.7118	74.1879	74.5244	74.8762 (39)
Average = Sum(39)m / 12 =												74.3534 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0781	1.0753	1.0726	1.0599	1.0576	1.0465	1.0465	1.0445	1.0508	1.0576	1.0624	1.0674 (40)
HLP (average)												1.0599 (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												2.2498 (42)
Average daily hot water use (litres/day)												87.6318 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.3950	92.8897	89.3845	85.8792	82.3739	78.8686	78.8686	82.3739	85.8792	89.3845	92.8897	96.3950 (44)
Energy conte	142.9510	125.0259	129.0155	112.4788	107.9261	93.1320	86.3005	99.0311	100.2139	116.7896	127.4850	138.4404 (45)
Energy content (annual)										Total = Sum(45)m =		1378.7898 (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	(59)
Heat gains from water heating, kWh/month	30.3771	26.5680	27.4158	23.9018	22.9343	19.7906	18.3389	21.0441	21.2954	24.8178	27.0906	29.4186 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	112.4881	112.4881	112.4881	112.4881	112.4881	112.4881	112.4881	112.4881	112.4881	112.4881	112.4881	112.4881	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.7418	16.6463	13.5376	10.2489	7.6612	6.4679	6.9888	9.0843	12.1929	15.4816	18.0694	19.2626	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.6469	199.6979	194.5295	183.5267	169.6377	156.5839	147.8632	145.8123	150.9806	161.9834	175.8724	188.9262	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2488	34.2488	34.2488	34.2488	34.2488	34.2488	34.2488	34.2488	34.2488	34.2488	34.2488	34.2488	(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)	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	(71)
Water heating gains (Table 5)	40.8294	39.5357	36.8492	33.1969	30.8257	27.4869	24.6490	28.2851	29.5770	33.3572	37.6258	39.5411	(72)
Total internal gains	313.9645	312.6262	301.6628	283.7189	264.8709	247.2851	236.2474	239.9280	249.4969	267.5687	288.3140	304.4764	(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	375.3082	432.6276	499.2878	571.9433	618.1007	608.8786	580.4992	535.6352	479.3430	409.9604	364.8024	354.9225 (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	64.4163	64.5813	64.7437	65.5179	65.6648	66.3574	66.3574	66.4872	66.0889	65.6648	65.3683	65.0611	
alpha	5.2944	5.3054	5.3162	5.3679	5.3777	5.4238	5.4238	5.4325	5.4059	5.3777	5.3579	5.3374	
util living area	0.9989	0.9973	0.9914	0.9661	0.8856	0.7184	0.5459	0.6094	0.8678	0.9841	0.9976	0.9992	(86)
MIT	19.7953	19.9373	20.1907	20.5275	20.8059	20.9557	20.9917	20.9855	20.8737	20.4987	20.0858	19.7722	(87)
Th 2	20.0188	20.0211	20.0233	20.0337	20.0356	20.0447	20.0447	20.0464	20.0412	20.0356	20.0317	20.0276	(88)
util rest of house	0.9985	0.9964	0.9883	0.9531	0.8434	0.6318	0.4329	0.4930	0.8034	0.9759	0.9966	0.9989	(89)
MIT 2	18.9145	19.0580	19.3116	19.6489	19.9034	20.0243	20.0426	20.0422	19.9692	19.6272	19.2152	18.8986	(90)
Living area fraction										fLA = Living area / (4) =		0.3984	(91)
MIT	19.2655	19.4083	19.6618	19.9989	20.2630	20.3954	20.4207	20.4180	20.3296	19.9745	19.5620	19.2467	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2655	19.4083	19.6618	19.9989	20.2630	20.3954	20.4207	20.4180	20.3296	19.9745	19.5620	19.2467	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9981	0.9956	0.9868	0.9525	0.8545	0.6653	0.4783	0.5398	0.8252	0.9752	0.9959	0.9986	(94)
Ext temp.	374.5807	430.7200	492.7075	544.7849	528.1793	405.0807	277.6616	289.1568	395.5627	399.8002	363.3160	354.4113	(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	1131.7720	1094.3997	990.3396	825.2527	635.2711	425.4601	280.4934	294.4024	459.1932	695.4705	928.7257	1126.6370	(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	563.3504	445.9928	370.2383	201.9368	79.6763	0.0000	0.0000	0.0000	0.0000	219.9787	407.0950	574.5359	(98)
Space heating per m2												2862.8042	(98)
												(98) / (4) =	40.8098 (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	690.0870	543.2600	556.8529	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8977	0.9480	0.9271	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	619.5149	515.0294	516.2570	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	795.7493	760.9281	710.0013	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	126.8888	182.9486	144.1458	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												453.9831	(104)
Cooled fraction												1.0000	(105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	31.7222	45.7372	36.0364	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling													113.4958 (107)
Space cooling per m2													1.6179 (108)
Energy for space heating													40.8098 (99)
Energy for space cooling													1.6179 (108)
Total													42.4277 (109)
Target Fabric Energy Efficiency (TFEE)													48.8 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF HEAT DEMAND 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
CALCULATION OF HEAT DEMAND 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	70.1500 (1b)	x 2.4000 (2b)	= 168.3600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.1500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 168.3600 (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					3.2400
Infiltration rate					0.1620 (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) =				0.1256 (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	0.1318	0.1256	0.1256	0.1161	0.1161	0.1036	0.1067	0.1004	0.1036	0.1099	0.1099	0.1193 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			10.2200	1.2357	12.6293		(27)
FT-03			70.1500	0.1247	8.7444		(28b)
WT-E-02	23.4000	10.2200	13.1800	0.2000	2.6360		(29a)
WT-I-01	23.4000	2.1200	21.2800	0.3300	7.0224		(29a)
Total net area of external elements Aum(A, m2)			116.9500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.1520		(33)
Party Wall 1			34.8500	0.0000	0.0000		(32)
Party Ceilings 1			70.1500				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.2634 (36)
Total fabric heat loss							(33) + (36) = 46.4155 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	27.7794	27.7794	27.7794	27.7794	27.7794	27.7794	27.7794	27.7794	27.7794	27.7794	27.7794	27.7794 (38)
Heat transfer coeff	74.1949	74.1949	74.1949	74.1949	74.1949	74.1949	74.1949	74.1949	74.1949	74.1949	74.1949	74.1949 (39)
Average = Sum(39)m / 12 =												74.1949 (39)
HLP	1.0577	1.0577	1.0577	1.0577	1.0577	1.0577	1.0577	1.0577	1.0577	1.0577	1.0577	1.0577 (40)
HLP (average)												1.0577 (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												2.2498 (42)
Average daily hot water use (litres/day)												87.6318 (43)
Daily hot water use	96.3950	92.8897	89.3845	85.8792	82.3739	78.8686	78.8686	82.3739	85.8792	89.3845	92.8897	96.3950 (44)
Energy conte	142.9510	125.0259	129.0155	112.4788	107.9261	93.1320	86.3005	99.0311	100.2139	116.7896	127.4850	138.4404 (45)
Energy content (annual)												Total = Sum(45)m = 1378.7898 (45)
Distribution loss (46)m = 0.15 x (45)m	21.4427	18.7539	19.3523	16.8718	16.1889	13.9698	12.9451	14.8547	15.0321	17.5184	19.1227	20.7661 (46)

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Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	14.0873	12.7040	14.0333	13.5446	13.9699	13.4891	13.9199	13.9523	13.5194	14.0071	13.5970	14.0768 (61)
Total heat required for water heating calculated for each month	157.0383	137.7299	143.0488	126.0235	121.8960	106.6211	100.2204	112.9835	113.7332	130.7967	141.0820	152.5173 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
								Solar input (sum of months) = Sum(63)m =				0.0000 (63)
Output from w/h	157.0383	137.7299	143.0488	126.0235	121.8960	106.6211	100.2204	112.9835	113.7332	130.7967	141.0820	152.5173 (64)
								Total per year (kWh/year) = Sum(64)m =				1543.6906 (64)
RHI water heating demand												1544 (64)
Heat gains from water heating, kWh/month	51.0530	44.7471	46.4060	40.7854	39.3779	34.3387	32.1749	36.4159	36.7009	42.3343	45.7880	49.5506 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	134.9857	134.9857	134.9857	134.9857	134.9857	134.9857	134.9857	134.9857	134.9857	134.9857	134.9857	134.9857 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	46.8544	41.6156	33.8441	25.6222	19.1529	16.1697	17.4719	22.7106	30.4822	38.7041	45.1734	48.1566 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	294.9954	298.0565	290.3426	273.9205	253.1906	233.7074	220.6914	217.6302	225.3442	241.7663	262.4962	281.9794 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7483	50.7483	50.7483	50.7483	50.7483	50.7483	50.7483	50.7483	50.7483	50.7483	50.7483	50.7483 (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)	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904 (71)
Water heating gains (Table 5)	68.6197	66.5879	62.3736	56.6463	52.9273	47.6926	43.2458	48.9461	50.9735	56.9010	63.5944	66.6003 (72)
Total internal gains	509.2130	505.0037	485.3039	454.9326	424.0143	396.3132	380.1527	388.0306	405.5434	436.1149	470.0076	495.4799 (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		
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	588.2933	644.1569	711.2642	793.5823	827.5298	838.0347	796.2722	754.1171	690.0890	612.3200	571.0230	559.8807 (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	65.6585	65.6585	65.6585	65.6585	65.6585	65.6585	65.6585	65.6585	65.6585	65.6585	65.6585	65.6585
alpha	5.3772	5.3772	5.3772	5.3772	5.3772	5.3772	5.3772	5.3772	5.3772	5.3772	5.3772	5.3772
util living area	0.9880	0.9795	0.9496	0.8584	0.6787	0.4396	0.2886	0.3144	0.6041	0.8925	0.9748	0.9904 (86)
MIT	20.1850	20.3033	20.5457	20.8062	20.9565	20.9965	20.9997	20.9996	20.9817	20.7945	20.4445	20.1487 (87)
Th 2	20.0356	20.0356	20.0356	20.0356	20.0356	20.0356	20.0356	20.0356	20.0356	20.0356	20.0356	20.0356 (88)
util rest of house	0.9841	0.9731	0.9340	0.8196	0.6102	0.3564	0.1990	0.2199	0.5124	0.8523	0.9654	0.9872 (89)
MIT 2	19.3150	19.4306	19.6636	19.8973	20.0123	20.0345	20.0355	20.0355	20.0285	19.8939	19.5703	19.2793 (90)
Living area fraction									fLA = Living area / (4) =			0.3984 (91)
MIT	19.6616	19.7783	20.0150	20.2594	20.3885	20.4178	20.4197	20.4196	20.4083	20.2527	19.9186	19.6257 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.5116	19.6283	19.8650	20.1094	20.2385	20.2678	20.2697	20.2696	20.2583	20.1027	19.7686	19.4757 (93)

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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	70.1500 (1b)	x 2.4000 (2b)	= 168.3600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.1500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 168.3600 (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					3.2400
Number of sides sheltered					0.1620 (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) =	0.1256 (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	0.1601	0.1569	0.1538	0.1381	0.1350	0.1193	0.1193	0.1161	0.1256	0.1350	0.1412	0.1475 (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)
FT-03			70.1500	0.1247	8.7444		(28b)
WT-E-02	23.4000	10.2200	13.1800	0.2000	2.6360		(29a)
WT-I-01	23.4000	2.1200	21.2800	0.3300	7.0224		(29a)
Total net area of external elements Aum(A, m ²)			116.9500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.1520		(33)
Party Wall 1			34.8500	0.0000	0.0000		(32)
Party Ceilings 1			70.1500				(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)							13.2634 (36)
Total fabric heat loss						(33) + (36) =	46.4155 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	27.7794	27.7794	27.7794	27.7794	27.7794	27.7794	27.7794	27.7794	27.7794	27.7794	27.7794	27.7794 (38)
Heat transfer coeff	74.1949	74.1949	74.1949	74.1949	74.1949	74.1949	74.1949	74.1949	74.1949	74.1949	74.1949	74.1949 (39)
Average = Sum(39)m / 12 =												74.1949 (39)
HLP	1.0577	1.0577	1.0577	1.0577	1.0577	1.0577	1.0577	1.0577	1.0577	1.0577	1.0577	1.0577 (40)
HLP (average)												1.0577 (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												2.2498 (42)
Average daily hot water use (litres/day)												87.6318 (43)
Daily hot water use	96.3950	92.8897	89.3845	85.8792	82.3739	78.8686	78.8686	82.3739	85.8792	89.3845	92.8897	96.3950 (44)
Energy conte	142.9510	125.0259	129.0155	112.4788	107.9261	93.1320	86.3005	99.0311	100.2139	116.7896	127.4850	138.4404 (45)
Energy content (annual)										Total = Sum(45)m =		1378.7898 (45)
Distribution loss (46)m = 0.15 x (45)m	21.4427	18.7539	19.3523	16.8718	16.1889	13.9698	12.9451	14.8547	15.0321	17.5184	19.1227	20.7661 (46)

FULL SAP CALCULATION PRINTOUT

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Water storage loss:														
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	14.0873	12.7040	14.0333	13.5446	13.9699	13.4891	13.9199	13.9523	13.5194	14.0071	13.5970	14.0768	14.0768	(61)
Total heat required for water heating calculated for each month	157.0383	137.7299	143.0488	126.0235	121.8960	106.6211	100.2204	112.9835	113.7332	130.7967	141.0820	152.5173	152.5173	(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	157.0383	137.7299	143.0488	126.0235	121.8960	106.6211	100.2204	112.9835	113.7332	130.7967	141.0820	152.5173	152.5173	(64)
Heat gains from water heating, kWh/month	51.0530	44.7471	46.4060	40.7854	39.3779	34.3387	32.1749	36.4159	36.7009	42.3343	45.7880	49.5506	49.5506	(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	134.9857	134.9857	134.9857	134.9857	134.9857	134.9857	134.9857	134.9857	134.9857	134.9857	134.9857	134.9857	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	46.8544	41.6156	33.8441	25.6222	19.1529	16.1697	17.4719	22.7106	30.4822	38.7041	45.1734	48.1566	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	294.9954	298.0565	290.3426	273.9205	253.1906	233.7074	220.6914	217.6302	225.3442	241.7663	262.4962	281.9794	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7483	50.7483	50.7483	50.7483	50.7483	50.7483	50.7483	50.7483	50.7483	50.7483	50.7483	50.7483	(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)	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	-89.9904	(71)
Water heating gains (Table 5)	68.6197	66.5879	62.3736	56.6463	52.9273	47.6926	43.2458	48.9461	50.9735	56.9010	63.5944	66.6003	(72)
Total internal gains	509.2130	505.0037	485.3039	454.9326	424.0143	396.3132	380.1527	388.0306	405.5434	436.1149	470.0076	495.4799	(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	578.7637	641.0596	709.3686	781.7176	824.5016	806.2832	770.4608	723.2995	666.1399	597.5567	556.7291	552.6750 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.6585	65.6585	65.6585	65.6585	65.6585	65.6585	65.6585	65.6585	65.6585	65.6585	65.6585	65.6585	
alpha	5.3772	5.3772	5.3772	5.3772	5.3772	5.3772	5.3772	5.3772	5.3772	5.3772	5.3772	5.3772	
util living area	0.9910	0.9834	0.9610	0.8953	0.7597	0.5744	0.4213	0.4674	0.7154	0.9290	0.9829	0.9929	(86)
MIT	20.0938	20.2318	20.4633	20.7305	20.9133	20.9840	20.9975	20.9956	20.9518	20.7052	20.3408	20.0499	(87)
Th 2	20.0356	20.0356	20.0356	20.0356	20.0356	20.0356	20.0356	20.0356	20.0356	20.0356	20.0356	20.0356	(88)
util rest of house	0.9883	0.9783	0.9492	0.8656	0.7026	0.4941	0.3303	0.3718	0.6350	0.9017	0.9768	0.9907	(89)
MIT 2	19.2247	19.3604	19.5849	19.8319	19.9822	20.0289	20.0350	20.0344	20.0119	19.8160	19.4692	19.1813	(90)
Living area fraction									fLA = Living area / (4) =			0.3984	(91)
MIT	19.5710	19.7076	19.9349	20.1899	20.3532	20.4094	20.4184	20.4174	20.3864	20.1703	19.8165	19.5274	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.4210	19.5576	19.7849	20.0399	20.2032	20.2594	20.2684	20.2674	20.2364	20.0203	19.6665	19.3774	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9860	0.9752	0.9455	0.8657	0.7131	0.5132	0.3524	0.3950	0.6528	0.9012	0.9738	0.9888	(94)
Ext temp.	570.6693	625.1687	670.7141	676.7370	587.9778	413.7787	271.5250	285.7376	434.8678	538.4982	542.1697	546.4818	(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	1121.8977	1087.5201	985.6706	826.5248	630.8932	419.9009	272.1799	286.9410	455.2906	698.9366	932.3691	1126.0850	(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	410.1139	310.7002	234.3276	107.8473	31.9290	0.0000	0.0000	0.0000	0.0000	119.3661	280.9436	431.2248	(98)
Space heating per m2										(98) / (4) =		27.4619	(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													2128.6768 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	410.1139	310.7002	234.3276	107.8473	31.9290	0.0000	0.0000	0.0000	0.0000	119.3661	280.9436	431.2248	(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)	453.1645	343.3151	258.9256	119.1682	35.2807	0.0000	0.0000	0.0000	0.0000	131.8963	310.4349	476.4915	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	157.0383	137.7299	143.0488	126.0235	121.8960	106.6211	100.2204	112.9835	113.7332	130.7967	141.0820	152.5173	(64)
Efficiency of water heater (217)m	89.5907	89.4925	89.2598	88.7471	87.9455	87.3000	87.3000	87.3000	87.3000	88.7982	89.4045	87.3000	(216)
Fuel for water heating, kWh/month	175.2841	153.9011	160.2612	142.0030	138.6041	122.1319	114.8000	129.4198	130.2786	147.2966	157.8019	170.1414	(219)
Water heating fuel used												1741.9237	(219)
Annual totals kWh/year													
Space heating fuel - main system												2128.6768	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 5.3360, total flow = 29.0000, SFP = 0.1840)													
mechanical ventilation fans (SFP = 0.1840)													37.7935 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													112.7935 (231)
Electricity for lighting (calculated in Appendix L)													330.9852 (232)
Total delivered energy for all uses													4314.3791 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2128.6768	3.4800	74.0780 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1741.9237	3.4800	60.6189 (247)
Mechanical ventilation fans	37.7935	13.1900	4.9850 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	330.9852	13.1900	43.6570 (250)
Additional standing charges			120.0000 (251)
Total energy cost			313.2313 (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] =	1.1425 (257)
SAP value		84.0623
SAP rating (Section 12)		84 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2128.6768	0.2160	459.7942 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1741.9237	0.2160	376.2555 (264)
Space and water heating			836.0497 (265)
Pumps and fans	112.7935	0.5190	58.5398 (267)
Energy for lighting	330.9852	0.5190	171.7813 (268)
Total kg/year			1066.3708 (272)
CO2 emissions per m2			15.2000 (273)
EI value			87.5906
EI rating			88 (274)
EI band			B

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9050 = 3.845$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9050 = 0.2387$, stars = 4
Water heating energy efficiency	$3.48 / 0.8851 = 3.932$, stars = 4
Water heating environmental impact	$0.216 / 0.8851 = 0.2440$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	70.1500 (1b)	x 2.4000 (2b)	= 168.3600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.1500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 168.3600 (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) =					0.0000 / (5) = 0.0000 (8)							
Pressure test					Yes							
Measured/design AP50					3.2400							
Infiltration rate					0.1620 (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) =				0.1256 (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)
	0.1318	0.1256	0.1256	0.1161	0.1161	0.1036	0.1067	0.1004	0.1036	0.1099	0.1099	0.1193 (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)			10.2200	1.2357	12.6293		(27)
FT-03			70.1500	0.1247	8.7444		(28b)
WT-E-02	23.4000	10.2200	13.1800	0.2000	2.6360		(29a)
WT-I-01	23.4000	2.1200	21.2800	0.3300	7.0224		(29a)
Total net area of external elements Aum(A, m ²)				116.9500			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.1520		(33)
Party Wall 1				34.8500	0.0000	0.0000	(32)
Party Ceilings 1				70.1500			(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)							13.2634 (36)
Total fabric heat loss							(33) + (36) = 46.4155 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	27.7794	27.7794	27.7794	27.7794	27.7794	27.7794	27.7794	27.7794	27.7794	27.7794	27.7794	27.7794 (38)
Heat transfer coeff	74.1949	74.1949	74.1949	74.1949	74.1949	74.1949	74.1949	74.1949	74.1949	74.1949	74.1949	74.1949 (39)
Average = Sum(39)m / 12 =												74.1949 (39)
HLP	1.0577	1.0577	1.0577	1.0577	1.0577	1.0577	1.0577	1.0577	1.0577	1.0577	1.0577	1.0577 (40)
HLP (average)												1.0577 (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												2.2498 (42)
Average daily hot water use (litres/day)												87.6318 (43)
Daily hot water use	96.3950	92.8897	89.3845	85.8792	82.3739	78.8686	78.8686	82.3739	85.8792	89.3845	92.8897	96.3950 (44)
Energy conte	142.9510	125.0259	129.0155	112.4788	107.9261	93.1320	86.3005	99.0311	100.2139	116.7896	127.4850	138.4404 (45)
Energy content (annual)												Total = Sum(45)m = 1378.7898 (45)
Distribution loss (46)m = 0.15 x (45)m	21.4427	18.7539	19.3523	16.8718	16.1889	13.9698	12.9451	14.8547	15.0321	17.5184	19.1227	20.7661 (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	(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	(57)
Combi loss	14.0873	12.7040	14.0333	13.5446	13.9699	13.4891	13.9199	13.9523	13.5194	14.0071	(61)
Total heat required for water heating calculated for each month											
	157.0383	137.7299	143.0488	126.0235	121.8960	106.6211	100.2204	112.9835	113.7332	130.7967	(62)
Solar input	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 =	(63)
Output from w/h	157.0383	137.7299	143.0488	126.0235	121.8960	106.6211	100.2204	112.9835	113.7332	130.7967	(64)
								Total per year (kWh/year) =	Sum(64)m =	1543.6906	(65)
Heat gains from water heating, kWh/month											
	51.0530	44.7471	46.4060	40.7854	39.3779	34.3387	32.1749	36.4159	36.7009	42.3343	(65)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1797.7951 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	365.9485	279.6773	195.5465	75.1904	14.6473	0.0000	0.0000	0.0000	0.0000	79.6278	233.0793	383.2874	(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)	404.3629	309.0357	216.0735	83.0833	16.1849	0.0000	0.0000	0.0000	0.0000	87.9865	257.5462	423.5220	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	157.0383	137.7299	143.0488	126.0235	121.8960	106.6211	100.2204	112.9835	113.7332	130.7967	141.0820	152.5173	(64)
Efficiency of water heater (217)m	89.5148	89.4185	89.1199	88.4690	87.6324	87.3000	87.3000	87.3000	87.3000	88.4840	89.2662	87.3000	(216)
Fuel for water heating, kWh/month	175.4329	154.0284	160.5128	142.4494	139.0993	122.1319	114.8000	129.4198	130.2786	147.8197	158.0463	170.2858	(219)
Water heating fuel used												1744.3047	(219)
Annual totals kWh/year													
Space heating fuel - main system												1797.7951	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 5.3360, total flow = 29.0000, SFP = 0.1840)													
mechanical ventilation fans (SFP = 0.1840)													37.7935 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													112.7935 (231)
Electricity for lighting (calculated in Appendix L)													330.9852 (232)
Total delivered energy for all uses													3985.8785 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1797.7951	3.7400	67.2375 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1744.3047	3.7400	65.2370 (247)
Mechanical ventilation fans	37.7935	19.1200	7.2261 (249)
Pumps and fans for heating	75.0000	19.1200	14.3400 (249)
Energy for lighting	330.9852	19.1200	63.2844 (250)
Additional standing charges			94.0000 (251)
Total energy cost			311.3250 (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	1797.7951	0.2160	388.3237 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1744.3047	0.2160	376.7698 (264)
Space and water heating			765.0936 (265)
Pumps and fans	112.7935	0.5190	58.5398 (267)
Energy for lighting	330.9852	0.5190	171.7813 (268)
Total kg/year			995.4147 (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	1797.7951	1.2200	2193.3101 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1744.3047	1.2200	2128.0518 (264)
Space and water heating			4321.3618 (265)
Pumps and fans	112.7935	3.0700	346.2759 (267)
Energy for lighting	330.9852	3.0700	1016.1246 (268)
Primary energy kWh/year			5683.7624 (272)
Primary energy kWh/m2/year			81.0230 (273)

SAP 2012 EPC IMPROVEMENTS

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

(For testing purposes):

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

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

Recommended measures	Typical annual savings		Energy efficiency	Environmental impact
(none)	Total Savings	£0	0.00 kg/m²	

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

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

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£85	£85	£0
Mains gas	£226	£226	£0
Space heating	£183	£183	£0
Water heating	£65	£65	£0
Lighting	£63	£63	£0
Total cost of fuels	£311	£311	£0
Total cost of uses	£311	£311	£0
Delivered energy	57 kWh/m²	57 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.0 tonnes	1.0 tonnes	0.0 tonnes
CO2 emissions per m²	14 kg/m²	14 kg/m²	0 kg/m²
Primary energy	81 kWh/m²	81 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	333.35 (P1)
Transmission heat loss coefficient	46.42 (37)
Summer heat loss coefficient	379.77 (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:				486.3735

Solar gains	Jun	Jul	Aug	
Internal gains	516	486	428	(P4)
Total summer gains	393	377	385	
	910	864	813	(P5)
Summer gain/loss ratio	2.40	2.27	2.14	(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	18.65	20.42	20.19	(P7)
Likelihood of high internal temperature	Not significant	Not significant	Not significant	
Assessment of likelihood of high internal temperature:	Not significant			