

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



Property Reference	SECPMW025d_052_As_Built				Issued on Date	28/06/2021
Assessment Reference	001	Prop Type Ref	GFF			
Property						
SAP Rating	85 B	DER	15.04	TER	17.46	
Environmental	89 B	% DER<TER	13.88			
CO ₂ Emissions (t/year)	0.89	DFEE	37.17	TFEE	45.52	
General Requirements Compliance	Pass	% DFEE<TFEE	18.34			
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

Ground-floor flat, total floor area 71 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 17.46 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.04 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)45.5 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)37.2 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.20 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.30 (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: 4.35 (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): Slight OK
Based on:
Overshading: Average
Windows facing South: 10.93 m², No overhang
Windows facing West: 7.60 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Floor U-value 0.10 W/m²K
Door U-value 1.00 W/m²K

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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	70.5600 (1b)	x 2.4000 (2b)	= 169.3440 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.5600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.3440 (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					4.3500
Infiltration rate					0.2175 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1849 (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	0.2357	0.2311	0.2265	0.2034	0.1987	0.1756	0.1756	0.1710	0.1849	0.1987	0.2080	0.2172 (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 2 (Uw = 1.30)			18.5300	1.2357	22.8983		(27)
Heat Loss Floor			70.5600	0.1000	7.0560		(28a)
WT-E-01	65.5200	18.5300	46.9900	0.2000	9.3980		(29a)
Total net area of external elements Aum(A, m ²)					136.0800		(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.3523		(33)
Party Wall 1			16.3200	0.0000	0.0000		(32)
Party Ceilings 1			70.5600				(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)							11.7391 (36)
Total fabric heat loss							(33) + (36) = 51.0914 (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	27.9418	27.9418	27.9418	27.9418	27.9418	27.9418	27.9418	27.9418	27.9418	27.9418	27.9418	27.9418 (38)
Average = Sum(39)m / 12 =	79.0332	79.0332	79.0332	79.0332	79.0332	79.0332	79.0332	79.0332	79.0332	79.0332	79.0332	79.0332 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1201	1.1201	1.1201	1.1201	1.1201	1.1201	1.1201	1.1201	1.1201	1.1201	1.1201	1.1201 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												
Average daily hot water use (litres/day)												2.2596 (42)
												87.8665 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	96.6532	93.1385	89.6239	86.1092	82.5945	79.0799	79.0799	82.5945	86.1092	89.6239	93.1385	96.6532 (44)
Energy content (annual)	143.3339	125.3607	129.3610	112.7801	108.2152	93.3815	86.5317	99.2963	100.4823	117.1024	127.8264	138.8112 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1382.4826 (45)
Water storage loss:	21.5001	18.8041	19.4042	16.9170	16.2323	14.0072	12.9797	14.8945	15.0723	17.5654	19.1740	20.8217 (46)
Total storage loss												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 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)
Combi loss	14.0890	12.7055	14.0348	13.5459	13.9711	13.4900	13.9208	13.9534	13.5205	14.0084	13.5985	14.0786 (61)
Total heat required for water heating calculated for each month	157.4229	138.0662	143.3958	126.3260	122.1863	106.8715	100.4525	113.2497	114.0027	131.1108	141.4249	152.8898 (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	157.4229	138.0662	143.3958	126.3260	122.1863	106.8715	100.4525	113.2497	114.0027	131.1108	141.4249	152.8898 (64)
Heat gains from water heating, kWh/month	51.1808	44.8588	46.5212	40.8858	39.4743	34.4218	32.2520	36.5044	36.7905	42.4387	45.9019	49.6744 (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)
(66)m	112.9822	112.9822	112.9822	112.9822	112.9822	112.9822	112.9822	112.9822	112.9822	112.9822	112.9822	112.9822	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.7054	15.7258	12.7891	9.6821	7.2375	6.1102	6.6023	8.5819	11.5186	14.6255	17.0702	18.1975	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.6005	200.6614	195.4681	184.4122	170.4562	157.3394	148.5766	146.5158	151.7091	162.7649	176.7210	189.8377	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2982	34.2982	34.2982	34.2982	34.2982	34.2982	34.2982	34.2982	34.2982	34.2982	34.2982	34.2982	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	(71)
Water heating gains (Table 5)	68.7914	66.7542	62.5286	56.7859	53.0569	47.8081	43.3494	49.0650	51.0979	57.0412	63.7527	66.7666	(72)
Total internal gains	344.9919	343.0360	330.6804	310.7749	290.6452	271.1524	258.4230	264.0574	274.2202	294.3263	317.4385	334.6965	(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	
South						10.9300	46.7521	0.4500	0.0000	0.7700	177.0615	
West						7.6000	19.6403	0.4500	0.0000	0.7700	51.7207 (80)	
Solar gains	228.7822	391.1578	536.0080	660.4951	732.8632	723.5416	699.3163	646.5806	579.6557	432.8264	274.3679	195.5300 (83)
Total gains	573.7741	734.1937	866.6884	971.2700	1023.5084	994.6940	957.7393	910.6380	853.8760	727.1528	591.8064	530.2265 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.9993	61.9993	61.9993	61.9993	61.9993	61.9993	61.9993	61.9993	61.9993	61.9993	61.9993	61.9993	
alpha	5.1333	5.1333	5.1333	5.1333	5.1333	5.1333	5.1333	5.1333	5.1333	5.1333	5.1333	5.1333	
util living area	0.9921	0.9740	0.9291	0.8304	0.6755	0.5006	0.3618	0.3971	0.6140	0.8836	0.9803	0.9946	(86)
MIT	19.9955	20.2541	20.5440	20.7996	20.9417	20.9895	20.9984	20.9974	20.9718	20.7599	20.3062	19.9288	(87)
Th 2	19.9845	19.9845	19.9845	19.9845	19.9845	19.9845	19.9845	19.9845	19.9845	19.9845	19.9845	19.9845	(88)
util rest of house	0.9896	0.9664	0.9101	0.7909	0.6148	0.4247	0.2790	0.3106	0.5334	0.8451	0.9732	0.9928	(89)
MIT 2	19.0854	19.3385	19.6138	19.8401	19.9504	19.9803	19.9841	19.9838	19.9716	19.8143	19.3925	19.0195	(90)
Living area fraction	19.4130	19.6681	19.9486	20.1855	20.3072	20.3436	20.3492	20.3487	20.3317	20.1547	19.7214	19.3468	(92)
Temperature adjustment	19.2630	19.5181	19.7986	20.0355	20.1572	20.1936	20.1992	20.1987	20.1817	20.0047	19.5714	19.1968	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	566.4751	706.3566	785.2464	770.3007	640.3205	438.2286	284.0635	299.5442	469.3213	615.1684	573.7774	525.4759	(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	1182.5744	1155.3152	1051.0345	880.0750	668.4024	442.0776	284.4569	300.2210	480.6537	743.2829	985.6536	1185.2459	(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	458.3778	301.7002	197.7464	79.0375	20.8929	0.0000	0.0000	0.0000	0.0000	95.3172	296.5508	490.8688	(98)
Space heating												1940.4917	(98)
Space heating per m2												27.5013	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2144.1897 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	458.3778	301.7002	197.7464	79.0375	20.8929	0.0000	0.0000	0.0000	0.0000	95.3172	296.5508	490.8688	(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)	506.4949	333.3704	218.5043	87.3343	23.0861	0.0000	0.0000	0.0000	0.0000	105.3228	327.6805	542.3965	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	157.4229	138.0662	143.3958	126.3260	122.1863	106.8715	100.4525	113.2497	114.0027	131.1108	141.4249	152.8898	(64)
Efficiency of water heater (217)m	89.6598	89.4704	89.1268	88.5044	87.7531	87.3000	87.3000	87.3000	87.3000	88.6191	89.4414	89.7190	(216)
Fuel for water heating, kWh/month	175.5780	154.3150	160.8898	142.7341	139.2387	122.4187	115.0658	129.7248	130.5873	147.9488	158.1203	170.4097	(219)
Water heating fuel used												1747.0308	(219)
Annual totals kWh/year													
Space heating fuel - main system												2144.1897	(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)													38.0143 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													113.0143 (231)
Electricity for lighting (calculated in Appendix L)													312.6826 (232)
Total delivered energy for all uses													4316.9174 (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	2144.1897	0.2160	463.1450 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1747.0308	0.2160	377.3587 (264)
Space and water heating			840.5036 (265)
Pumps and fans	113.0143	0.5190	58.6544 (267)
Energy for lighting	312.6826	0.5190	162.2823 (268)
Total CO2, kg/year			1061.4403 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			15.0400 (273)

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

DER		15.0400	ZC1
Total Floor Area	TFA	70.5600	
Assumed number of occupants	N	2.2596	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.6789	ZC2
CO2 emissions from cooking, equation (L16)		2.4551	ZC3
Total CO2 emissions		34.1740	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		34.1740	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	70.5600 (1b)	x 2.4000 (2b)	= 169.3440 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.5600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.3440 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					30.0000 / (5) = 0.1772 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4272 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3631 (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	0.4629	0.4539	0.4448	0.3994	0.3903	0.3449	0.3449	0.3358	0.3631	0.3903	0.4085	0.4266 (22b)
Effective ac	0.6072	0.6030	0.5989	0.5798	0.5762	0.5595	0.5595	0.5564	0.5659	0.5762	0.5834	0.5910 (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 Opening Type (Uw = 1.40)			17.6400	1.3258	23.3864		(27)
Heat Loss Floor			70.5600	0.1300	9.1728		(28a)
WT-E-01	65.5200	17.6400	47.8800	0.1800	8.6184		(29a)
Total net area of external elements Aum(A, m ²)			136.0800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		41.1776		(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)							9.4760 (36)
Total fabric heat loss						(33) + (36) =	50.6536 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	33.9298	33.6972	33.4693	32.3988	32.1985	31.2661	31.2661
Heat transfer coeff	84.5833	84.3508	84.1229	83.0524	82.8521	81.9197	81.9197
Average = Sum(39)m / 12 =						81.7470	82.2788
						82.8521	83.2573
						83.2573	83.6809 (39)
						83.6809	83.0514 (39)
HLP	1.1987	1.1954	1.1922	1.1770	1.1742	1.1610	1.1610
HLP (average)						1.1585	1.1661
Days in month	31	28	31	30	31	30	31
						30	31
						31	30
						31	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2596 (42)
Average daily hot water use (litres/day)												87.8665 (43)
Daily hot water use	96.6532	93.1385	89.6239	86.1092	82.5945	79.0799	79.0799	82.5945	86.1092	89.6239	93.1385	96.6532 (44)
Energy conte	143.3339	125.3607	129.3610	112.7801	108.2152	93.3815	86.5317	99.2963	100.4823	117.1024	127.8264	138.8112 (45)
Energy content (annual)												1382.4826 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.5001	18.8041	19.4042	16.9170	16.2323	14.0072	12.9797	14.8945	15.0723	17.5654	19.1740	20.8217 (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	49.2534	42.8692	45.6713	42.4648	42.0893	38.9983	40.2982	42.0893	42.4648	45.6713	45.9313	49.2534 (61)
Total heat required for water heating calculated for each month												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Solar input	192.5873	168.2300	175.0324	155.2449	150.3044	132.3798	126.8299	141.3856	142.9471	162.7737	173.7577	188.0646 (62)
	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	192.5873	168.2300	175.0324	155.2449	150.3044	132.3798	126.8299	141.3856	142.9471	162.7737	173.7577	188.0646 (64)
Heat gains from water heating, kWh/month	59.9719	52.3997	54.4304	48.1156	46.5039	40.7989	38.8463	43.5384	44.0266	50.3544	53.9851	58.4681 (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	112.9822	112.9822	112.9822	112.9822	112.9822	112.9822	112.9822	112.9822	112.9822	112.9822	112.9822	112.9822 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.7054	15.7258	12.7891	9.6821	7.2375	6.1102	6.6023	8.5819	11.5186	14.6255	17.0702	18.1975 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.6005	200.6614	195.4681	184.4122	170.4562	157.3394	148.5766	146.5158	151.7091	162.7649	176.7210	189.8377 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2982	34.2982	34.2982	34.2982	34.2982	34.2982	34.2982	34.2982	34.2982	34.2982	34.2982	34.2982 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857 (71)
Water heating gains (Table 5)	80.6073	77.9758	73.1591	66.8272	62.5052	56.6652	52.2128	58.5193	61.1480	67.6806	74.9793	78.5861 (72)
Total internal gains	356.8079	354.2576	341.3109	320.8162	300.0935	280.0094	267.2864	273.5116	284.2703	304.9658	328.6652	346.5160 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
South	10.4100	46.7521	0.6300		0.7000	0.7700	148.7385 (78)
West	7.2300	19.6403	0.6300		0.7000	0.7700	43.3968 (80)

Solar gains	192.1353	328.4886	450.1044	554.6036	615.3421	607.5046	587.1687	542.9088	486.7436	363.4734	230.4165	164.2111 (83)
Total gains	548.9432	682.7462	791.4153	875.4198	915.4356	887.5141	854.4551	816.4204	771.0139	668.4392	559.0817	510.7271 (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	57.9310	58.0907	58.2481	58.9989	59.1416	59.8147	59.8147	59.9410	59.5536	59.1416	58.8537	58.5558
alpha	4.8621	4.8727	4.8832	4.9333	4.9428	4.9876	4.9876	4.9961	4.9702	4.9428	4.9236	4.9037
util living area	0.9938	0.9823	0.9539	0.8833	0.7530	0.5724	0.4185	0.4554	0.6858	0.9179	0.9854	0.9955 (86)
MIT	19.8562	20.0926	20.3860	20.6931	20.8924	20.9784	20.9962	20.9943	20.9483	20.6712	20.1973	19.8133 (87)
Th 2	19.9210	19.9236	19.9262	19.9384	19.9407	19.9513	19.9513	19.9533	19.9472	19.9407	19.9361	19.9313 (88)
util rest of house	0.9918	0.9767	0.9399	0.8500	0.6919	0.4864	0.3205	0.3545	0.6000	0.8864	0.9799	0.9941 (89)
MIT 2	18.4199	18.7628	19.1802	19.6035	19.8449	19.9383	19.9501	19.9512	19.9113	19.5886	18.9262	18.3650 (90)
Living area fraction									fLA = Living area / (4) =			0.3600 (91)
MIT	18.9369	19.2415	19.6143	19.9958	20.2220	20.3128	20.3267	20.3267	20.2846	19.9783	19.3838	18.8864 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9369	19.2415	19.6143	19.9958	20.2220	20.3128	20.3267	20.3267	20.2846	19.9783	19.3838	18.8864 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9892	0.9722	0.9350	0.8521	0.7091	0.5168	0.3559	0.3909	0.6289	0.8877	0.9762	0.9921 (94)
Useful gains	543.0349	663.7693	739.9463	745.9093	649.1684	458.6960	304.1281	319.1537	484.9245	593.3537	545.7510	506.6784 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	16.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1238.0401	1209.7158	1103.2111	921.5296	706.0618	467.9869	305.2876	320.9975	508.8635	777.0126	1022.7158	1228.9673 (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	517.0839	366.8761	270.2690	126.4466	42.3287	0.0000	0.0000	0.0000	0.0000	136.6422	343.4147	537.3830 (98)
Space heating												2340.4441 (98)
Space heating per m ²										(98) / (4) =		33.1696 (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)
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												2505.8288 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	517.0839	366.8761	270.2690	126.4466	42.3287	0.0000	0.0000	0.0000	0.0000	136.6422	343.4147	537.3830 (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)	553.6230	392.8009	289.3673	135.3818	45.3198	0.0000	0.0000	0.0000	0.0000	146.2978	367.6816	575.3565 (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	192.5873	168.2300	175.0324	155.2449	150.3044	132.3798	126.8299	141.3856	142.9471	162.7737	173.7577	188.0646 (64)
Efficiency of water heater (217)m	87.4162	86.9613	86.1413	84.5398	82.3210	80.3000	80.3000	80.3000	80.3000	84.6143	86.7347	87.5454 (217)
Fuel for water heating, kWh/month	220.3107	193.4538	203.1923	183.6352	182.5834	164.8565	157.9451	176.0718	178.0163	192.3715	200.3324	214.8194 (219)
Water heating fuel used												2267.5883 (219)
Annual totals kWh/year												
Space heating fuel - main system												2505.8288 (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)												312.6826 (232)
Total delivered energy for all uses												5161.0997 (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	2505.8288	0.2160	541.2590 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2267.5883	0.2160	489.7991 (264)
Space and water heating			1031.0581 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	312.6826	0.5190	162.2823 (268)
Total CO2, kg/m2/year			1232.2654 (272)
Emissions per m2 for space and water heating			14.6125 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.2999 (272b)
Emissions per m2 for pumps and fans			0.5517 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.6125 * 1.00) + 2.2999 + 0.5517, rounded to 2 d.p.			17.4600 (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	70.5600 (1b)	x 2.4000 (2b)	= 169.3440 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.5600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.3440 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					30.0000 / (5) = 0.1772 (8)
Measured/design AP50					Yes
Infiltration rate					4.3500
Number of sides sheltered					0.3947 (18)
					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3355 (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	0.4277	0.4193	0.4109	0.3690	0.3606	0.3187	0.3187	0.3103	0.3355	0.3606	0.3774	0.3942 (22b)
	0.5915	0.5879	0.5844	0.5681	0.5650	0.5508	0.5508	0.5481	0.5563	0.5650	0.5712	0.5777 (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 2 (Uw = 1.30)			18.5300	1.2357	22.8983		(27)
Heat Loss Floor			70.5600	0.1000	7.0560		(28a)
WT-E-01	65.5200	18.5300	46.9900	0.2000	9.3980		(29a)
Total net area of external elements Aum(A, m ²)			136.0800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.3523		(33)
Party Wall 1			16.3200	0.0000	0.0000		(32)
Party Ceilings 1			70.5600				(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)							11.7391 (36)
Total fabric heat loss						(33) + (36) =	51.0914 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	33.0532	32.8547	32.6602	31.7464	31.5754	30.7795	30.7795	30.6321	31.0861	31.5754	31.9213	32.2829 (38)
Heat transfer coeff	84.1447	83.9462	83.7516	82.8378	82.6668	81.8709	81.8709	81.7235	82.1775	82.6668	83.0127	83.3743 (39)
Average = Sum(39)m / 12 =												82.8370 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1925	1.1897	1.1870	1.1740	1.1716	1.1603	1.1603	1.1582	1.1646	1.1716	1.1765	1.1816 (40)
HLP (average)												1.1740 (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												2.2596 (42)
Average daily hot water use (litres/day)												87.8665 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.6532	93.1385	89.6239	86.1092	82.5945	79.0799	79.0799	82.5945	86.1092	89.6239	93.1385	96.6532 (44)
Energy conte	143.3339	125.3607	129.3610	112.7801	108.2152	93.3815	86.5317	99.2963	100.4823	117.1024	127.8264	138.8112 (45)
Energy content (annual)												Total = Sum(45)m = 1382.4826 (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	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	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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF 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	30.4584	26.6392	27.4892	23.9658	22.9957	19.8436	18.3880	21.1005	21.3525	24.8843	27.1631	29.4974 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	112.9822	112.9822	112.9822	112.9822	112.9822	112.9822	112.9822	112.9822	112.9822	112.9822	112.9822	112.9822 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	17.7054	15.7258	12.7891	9.6821	7.2375	6.1102	6.6023	8.5819	11.5186	14.6255	17.0702	18.1975 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	198.6005	200.6614	195.4681	184.4122	170.4562	157.3394	148.5766	146.5158	151.7091	162.7649	176.7210	189.8377 (68)
Pumps, fans	34.2982	34.2982	34.2982	34.2982	34.2982	34.2982	34.2982	34.2982	34.2982	34.2982	34.2982	34.2982 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857 (71)
Total internal gains	40.9388	39.6416	36.9479	33.2858	30.9082	27.5605	24.7150	28.3609	29.6562	33.4466	37.7265	39.6470 (72)
	314.1393	312.9234	302.0997	284.2748	265.4965	247.9048	236.7886	240.3532	249.7786	267.7317	288.4124	304.5769 (73)

6. Solar gains

[Jan]												
	Area											
	m2											
	Solar flux											
	Table 6a											
	W/m2											
	Specific data											
	or Table 6b											
	Specific data											
	or Table 6c											
	Access											
	factor											
	Table 6d											
	Gains											
	W											
South	10.9300											
West	7.6000											
Solar gains	228.7822	391.1578	536.0080	660.4951	732.8632	723.5416	699.3163	646.5806	579.6557	432.8264	274.3679	195.5300 (83)
Total gains	542.9215	704.0811	838.1077	944.7699	998.3598	971.4464	936.1049	886.9339	829.4343	700.5582	562.7803	500.1069 (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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	58.2331	58.3707	58.5063	59.1517	59.2741	59.8503	59.8503	59.9582	59.6270	59.2741	59.0271	58.7711
util living area	4.8822	4.8914	4.9004	4.9434	4.9516	4.9900	4.9900	4.9972	4.9751	4.9516	4.9351	4.9181
	0.9941	0.9798	0.9433	0.8554	0.7085	0.5277	0.3828	0.4205	0.6473	0.9046	0.9850	0.9959 (86)
MIT	19.8568	20.1257	20.4397	20.7426	20.9185	20.9849	20.9975	20.9960	20.9600	20.7004	20.2058	19.8055 (87)
Th 2	19.9260	19.9282	19.9304	19.9409	19.9428	19.9519	19.9519	19.9536	19.9484	19.9428	19.9389	19.9347 (88)
util rest of house	0.9921	0.9737	0.9268	0.8180	0.6461	0.4463	0.2927	0.3266	0.5627	0.8698	0.9793	0.9946 (89)
MIT 2	18.9008	19.1670	19.4703	19.7529	19.8946	19.9458	19.9513	19.9526	19.9299	19.7267	19.2572	18.8569 (90)
Living area fraction												
MIT	19.2450	19.5121	19.8193	20.1092	20.2632	20.3199	20.3279	20.3282	20.3007	20.0772	19.5987	19.1984 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2450	19.5121	19.8193	20.1092	20.2632	20.3199	20.3279	20.3282	20.3007	20.0772	19.5987	19.1984 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9905	0.9707	0.9248	0.8245	0.6659	0.4754	0.3252	0.3605	0.5922	0.8749	0.9770	0.9934 (94)
Ext temp.	537.7757	683.4471	775.1120	778.9272	664.7888	461.8496	304.4408	319.7480	491.1507	612.8974	549.8573	496.7824 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Month fracti	1257.5385	1226.6321	1115.5092	928.5448	707.8896	468.2909	305.2081	321.0270	509.5592	783.4511	1037.5474	1250.4774 (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	535.5035	365.0204	253.2555	107.7247	32.0670	0.0000	0.0000	0.0000	0.0000	126.8920	351.1369	560.7491 (98)
Space heating per m2												2332.3490 (98)
												33.0548 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	769.5867	605.8449	621.0989	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.9604	0.9820	0.9759	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	739.0932	594.9231	606.1420	0.0000	0.0000	0.0000	0.0000 (102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1219.3793	1176.3700	1120.2499	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	345.8060	432.5965	382.4963	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												1160.8988 (104)
Intermittency factor (Table 10b)												1.0000 (105)

$$fC = \text{cooled area} / (4) = 1.0000 (105)$$

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	86.4515	108.1491	95.6241	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling per m2													290.2247 (107)
Energy for space heating													4.1132 (108)
Energy for space cooling													33.0548 (99)
Total													4.1132 (108)
Dwelling Fabric Energy Efficiency (DFEE)													37.1680 (109)
													37.2 (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	70.5600 (1b)	x 2.4000 (2b)	= 169.3440 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.5600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.3440 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
					Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1772 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4272 (18)
Number of sides sheltered					2 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3631 (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	0.4629	0.4539	0.4448	0.3994	0.3903	0.3449	0.3449	0.3358	0.3631	0.3903	0.4085	0.4266 (22b)
Effective ac	0.6072	0.6030	0.5989	0.5798	0.5762	0.5595	0.5595	0.5564	0.5659	0.5762	0.5834	0.5910 (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 Opening Type (Uw = 1.40)			17.6400	1.3258	23.3864		(27)					
Heat Loss Floor			70.5600	0.1300	9.1728		(28a)					
WT-E-01	65.5200	17.6400	47.8800	0.1800	8.6184		(29a)					
Total net area of external elements Aum(A, m2)			136.0800				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	41.1776		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.4760 (36)					
Total fabric heat loss						(33) + (36) =	50.6536 (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	33.9298	33.6972	33.4693	32.3988	32.1985	31.2661	31.2661	31.0935	31.6253	32.1985	32.6037	33.0273 (38)
Average = Sum(39)m / 12 =	84.5833	84.3508	84.1229	83.0524	82.8521	81.9197	81.9197	81.7470	82.2788	82.8521	83.2573	83.6809 (39)
												83.0514 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1987	1.1954	1.1922	1.1770	1.1742	1.1610	1.1610	1.1585	1.1661	1.1742	1.1799	1.1860 (40)
Days in month												1.1770 (40)
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2596 (42)
Average daily hot water use (litres/day)												87.8665 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	96.6532	93.1385	89.6239	86.1092	82.5945	79.0799	79.0799	82.5945	86.1092	89.6239	93.1385	96.6532 (44)
Energy content (annual)	143.3339	125.3607	129.3610	112.7801	108.2152	93.3815	86.5317	99.2963	100.4823	117.1024	127.8264	138.8112 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1382.4826 (45)
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

30.4584 26.6392 27.4892 23.9658 22.9957 19.8436 18.3880 21.1005 21.3525 24.8843 27.1631 29.4974 (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	112.9822	112.9822	112.9822	112.9822	112.9822	112.9822	112.9822	112.9822	112.9822	112.9822	112.9822	112.9822	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.7054	15.7258	12.7891	9.6821	7.2375	6.1102	6.6023	8.5819	11.5186	14.6255	17.0702	18.1975	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.6005	200.6614	195.4681	184.4122	170.4562	157.3394	148.5766	146.5158	151.7091	162.7649	176.7210	189.8377	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2982	34.2982	34.2982	34.2982	34.2982	34.2982	34.2982	34.2982	34.2982	34.2982	34.2982	34.2982	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	(71)
Water heating gains (Table 5)	40.9388	39.6416	36.9479	33.2858	30.9082	27.5605	24.7150	28.3609	29.6562	33.4466	37.7265	39.6470	(72)
Total internal gains	314.1393	312.9234	302.0997	284.2748	265.4965	247.9048	236.7886	240.3532	249.7786	267.7317	288.4124	304.5769	(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	
South					10.4100	46.7521	0.6300		0.7000			0.7700			148.7385 (78)
West					7.2300	19.6403	0.6300		0.7000			0.7700			43.3968 (80)

Solar gains	192.1353	328.4886	450.1044	554.6036	615.3421	607.5046	587.1687	542.9088	486.7436	363.4734	230.4165			164.2111 (83)	
Total gains	506.2746	641.4120	752.2040	838.8784	880.8386	855.4094	823.9573	783.2620	736.5222	631.2052	518.8289			468.7880 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)

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	57.9310	58.0907	58.2481	58.9989	59.1416	59.8147	59.8147	59.9410	59.5536	59.1416	58.8537	58.5558	21.0000 (85)
alpha	4.8621	4.8727	4.8832	4.9333	4.9428	4.9876	4.9876	4.9961	4.9702	4.9428	4.9236	4.9037	
util living area	0.9956	0.9862	0.9616	0.8969	0.7717	0.5911	0.4334	0.4736	0.7094	0.9318	0.9893	0.9969	(86)
MIT	19.8014	20.0423	20.3442	20.6655	20.8797	20.9752	20.9956	20.9933	20.9400	20.6376	20.1475	19.7590	(87)
Th 2	19.9210	19.9236	19.9262	19.9384	19.9407	19.9513	19.9513	19.9533	19.9472	19.9407	19.9361	19.9313	(88)
util rest of house	0.9942	0.9818	0.9495	0.8661	0.7117	0.5034	0.3323	0.3692	0.6236	0.9041	0.9851	0.9959	(89)
MIT 2	18.8419	19.0820	19.3778	19.6865	19.8666	19.9410	19.9503	19.9516	19.9183	19.6714	19.1980	18.8079	(90)
Living area fraction									fLA = Living area / (4) =			0.3600	(91)
MIT	19.1873	19.4277	19.7257	20.0389	20.2313	20.3133	20.3266	20.3266	20.2861	20.0192	19.5398	19.1503	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1873	19.4277	19.7257	20.0389	20.2313	20.3133	20.3266	20.3266	20.2861	20.0192	19.5398	19.1503	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9928	0.9792	0.9468	0.8694	0.7292	0.5346	0.3689	0.4070	0.6528	0.9065	0.9831	0.9949	(94)
Useful gains	502.6510	628.0731	712.1747	729.3127	642.3485	457.2710	303.9200	318.7778	480.8239	572.2032	510.0718	466.4006	(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	1259.2171	1225.4240	1112.5813	925.1134	706.8355	468.0327	305.2819	320.9856	508.9820	780.4006	1035.7002	1251.0504	(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	562.8852	401.4198	297.9025	140.9765	47.9784	0.0000	0.0000	0.0000	0.0000	154.8989	378.4524	583.7795	(98)
Space heating												2568.2932	(98)
Space heating per m ²										(98) / (4) =		36.3987	(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	770.0450	606.2057	621.2774	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9395	0.9712	0.9626	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	723.4896	588.7179	598.0439	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1083.7517	1045.2884	999.0750	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	259.3887	339.6885	298.3671	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												897.4443	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
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	64.8472	84.9221	74.5918	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling													224.3611 (107)
Space cooling per m2													3.1797 (108)
Energy for space heating													36.3987 (99)
Energy for space cooling													3.1797 (108)
Total													39.5784 (109)
Target Fabric Energy Efficiency (TFEE)													45.5 (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	70.5600 (1b)	x 2.4000 (2b)	= 169.3440 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.5600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.3440 (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					4.3500
Infiltration rate					0.2175 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1849 (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	0.1941	0.1849	0.1849	0.1710	0.1710	0.1525	0.1571	0.1479	0.1525	0.1618	0.1618	0.1756 (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 2 (Uw = 1.30)			18.5300	1.2357	22.8983		(27)
Heat Loss Floor			70.5600	0.1000	7.0560		(28a)
WT-E-01	65.5200	18.5300	46.9900	0.2000	9.3980		(29a)
Total net area of external elements Aum(A, m ²)					136.0800		(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.3523		(33)
Party Wall 1			16.3200	0.0000	0.0000		(32)
Party Ceilings 1			70.5600				(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)							11.7391 (36)
Total fabric heat loss							(33) + (36) = 51.0914 (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	27.9418	27.9418	27.9418	27.9418	27.9418	27.9418	27.9418	27.9418	27.9418	27.9418	27.9418	27.9418 (38)
Heat transfer coeff	79.0332	79.0332	79.0332	79.0332	79.0332	79.0332	79.0332	79.0332	79.0332	79.0332	79.0332	79.0332 (39)
Average = Sum(39)m / 12 =												79.0332 (39)
HLP	1.1201	1.1201	1.1201	1.1201	1.1201	1.1201	1.1201	1.1201	1.1201	1.1201	1.1201	1.1201 (40)
HLP (average)												1.1201 (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												2.2596 (42)
Average daily hot water use (litres/day)												87.8665 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	96.6532	93.1385	89.6239	86.1092	82.5945	79.0799	79.0799	82.5945	86.1092	89.6239	93.1385	96.6532 (44)
Energy content (annual)	143.3339	125.3607	129.3610	112.7801	108.2152	93.3815	86.5317	99.2963	100.4823	117.1024	127.8264	138.8112 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1382.4826 (45)
Water storage loss:	21.5001	18.8041	19.4042	16.9170	16.2323	14.0072	12.9797	14.8945	15.0723	17.5654	19.1740	20.8217 (46)
Total storage loss												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 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)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Total heat required for water heating calculated for each month	14.0890	12.7055	14.0348	13.5459	13.9711	13.4900	13.9208	13.9534	13.5205	14.0084	13.5985	14.0786 (61)
Solar input	157.4229	138.0662	143.3958	126.3260	122.1863	106.8715	100.4525	113.2497	114.0027	131.1108	141.4249	152.8898 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
RHI water heating demand	157.4229	138.0662	143.3958	126.3260	122.1863	106.8715	100.4525	113.2497	114.0027	131.1108	141.4249	152.8898 (64)
Heat gains from water heating, kWh/month	157.4229	138.0662	143.3958	126.3260	122.1863	106.8715	100.4525	113.2497	114.0027	131.1108	141.4249	152.8898 (64)
	51.1808	44.8588	46.5212	40.8858	39.4743	34.4218	32.2520	36.5044	36.7905	42.4387	45.9019	49.6744 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	135.5786	135.5786	135.5786	135.5786	135.5786	135.5786	135.5786	135.5786	135.5786	135.5786	135.5786	135.5786	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	44.2635	39.3144	31.9726	24.2053	18.0938	15.2755	16.5057	21.4548	28.7966	36.5639	42.6754	45.4937	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	296.4187	299.4946	291.7434	275.2421	254.4122	234.8350	221.7562	218.6803	226.4314	242.9328	263.7627	283.3399	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.8175	50.8175	50.8175	50.8175	50.8175	50.8175	50.8175	50.8175	50.8175	50.8175	50.8175	50.8175	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	(71)
Water heating gains (Table 5)	68.7914	66.7542	62.5286	56.7859	53.0569	47.8081	43.3494	49.0650	51.0979	57.0412	63.7527	66.7666	(72)
Total internal gains	508.4839	504.5736	485.2550	455.2437	424.5732	396.9290	380.6217	388.2105	405.3363	435.5482	469.2012	494.6106	(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
South					10.9300	50.9848	0.4500	0.0000			0.7700	193.0920
West					7.6000	22.3313	0.4500	0.0000			0.7700	58.8073
Solar gains	251.8993	387.2817	524.5595	668.5336	726.0291	768.9788	734.3947	691.5092	615.5531	457.5364	309.4035	213.2735
Total gains	760.3832	891.8552	1009.8145	1123.7774	1150.6023	1165.9078	1115.0164	1079.7196	1020.8894	893.0845	778.6047	707.8840
												(83)
												(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.9993	61.9993	61.9993	61.9993	61.9993	61.9993	61.9993	61.9993	61.9993	61.9993	61.9993	61.9993	
alpha	5.1333	5.1333	5.1333	5.1333	5.1333	5.1333	5.1333	5.1333	5.1333	5.1333	5.1333	5.1333	
util living area	0.9686	0.9364	0.8619	0.7191	0.5378	0.3381	0.2197	0.2341	0.4449	0.7515	0.9286	0.9764	(86)
MIT	20.3039	20.4888	20.7263	20.9075	20.9819	20.9986	20.9999	20.9998	20.9944	20.9040	20.5926	20.2432	(87)
Th 2	19.9845	19.9845	19.9845	19.9845	19.9845	19.9845	19.9845	19.9845	19.9845	19.9845	19.9845	19.9845	(88)
util rest of house	0.9596	0.9199	0.8305	0.6690	0.4739	0.2699	0.1477	0.1599	0.3690	0.6927	0.9070	0.9693	(89)
MIT 2	19.3866	19.5610	19.7758	19.9239	19.9755	19.9841	19.9845	19.9844	19.9825	19.9256	19.6619	19.3284	(90)
Living area fraction									fLA = Living area / (4) =			0.3600	(91)
MIT	19.7168	19.8950	20.1180	20.2780	20.3378	20.3493	20.3500	20.3500	20.3468	20.2778	19.9970	19.6577	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.5668	19.7450	19.9680	20.1280	20.1878	20.1993	20.2000	20.2000	20.1968	20.1278	19.8470	19.5077	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9550	0.9154	0.8300	0.6764	0.4870	0.2843	0.1630	0.1757	0.3850	0.7016	0.9035	0.9651	(94)
Ext temp.	726.2020	816.4354	838.1178	760.1445	560.2916	331.5093	181.7617	189.6565	393.0576	626.5569	703.4874	683.2065	(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	1143.3591	1117.9242	993.2878	808.3520	568.0739	331.8847	181.7755	189.6773	394.9111	673.9772	936.3026	1138.6865	(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	310.3649	202.6005	115.4465	34.7094	5.7900	0.0000	0.0000	0.0000	0.0000	35.2807	167.6269	338.8771	(98)
RHI space heating demand												1211	(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	70.5600 (1b)	x 2.4000 (2b)	= 169.3440 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.5600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.3440 (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					4.3500
Infiltration rate					0.2175 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1849 (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	0.2357	0.2311	0.2265	0.2034	0.1987	0.1756	0.1756	0.1710	0.1849	0.1987	0.2080	0.2172 (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 2 (Uw = 1.30)			18.5300	1.2357	22.8983		(27)
Heat Loss Floor			70.5600	0.1000	7.0560		(28a)
WT-E-01	65.5200	18.5300	46.9900	0.2000	9.3980		(29a)
Total net area of external elements Aum(A, m2)			136.0800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.3523		(33)
Party Wall 1			16.3200	0.0000	0.0000		(32)
Party Ceilings 1			70.5600				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.7391 (36)
Total fabric heat loss						(33) + (36) =	51.0914 (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	27.9418	27.9418	27.9418	27.9418	27.9418	27.9418	27.9418	27.9418	27.9418	27.9418	27.9418	27.9418 (38)
Average = Sum(39)m / 12 =	79.0332	79.0332	79.0332	79.0332	79.0332	79.0332	79.0332	79.0332	79.0332	79.0332	79.0332	79.0332 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1201	1.1201	1.1201	1.1201	1.1201	1.1201	1.1201	1.1201	1.1201	1.1201	1.1201	1.1201 (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												2.2596 (42)
Average daily hot water use (litres/day)												87.8665 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.6532	93.1385	89.6239	86.1092	82.5945	79.0799	79.0799	82.5945	86.1092	89.6239	93.1385	96.6532 (44)
Energy conte	143.3339	125.3607	129.3610	112.7801	108.2152	93.3815	86.5317	99.2963	100.4823	117.1024	127.8264	138.8112 (45)
Energy content (annual)												Total = Sum(45)m = 1382.4826 (45)
Distribution loss	(46)m = 0.15 x (45)m											
	21.5001	18.8041	19.4042	16.9170	16.2323	14.0072	12.9797	14.8945	15.0723	17.5654	19.1740	20.8217 (46)
Water storage loss:												
Total storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 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)
Combi loss	14.0890	12.7055	14.0348	13.5459	13.9711	13.4900	13.9208	13.9534	13.5205	14.0084	13.5985	14.0786	(61)
Total heat required for water heating calculated for each month	157.4229	138.0662	143.3958	126.3260	122.1863	106.8715	100.4525	113.2497	114.0027	131.1108	141.4249	152.8898	(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	157.4229	138.0662	143.3958	126.3260	122.1863	106.8715	100.4525	113.2497	114.0027	131.1108	141.4249	152.8898	(64)
Heat gains from water heating, kWh/month	51.1808	44.8588	46.5212	40.8858	39.4743	34.4218	32.2520	36.5044	36.7905	42.4387	45.9019	49.6744	(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)
(66)m	135.5786	135.5786	135.5786	135.5786	135.5786	135.5786	135.5786	135.5786	135.5786	135.5786	135.5786	135.5786	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	44.2635	39.3144	31.9726	24.2053	18.0938	15.2755	16.5057	21.4548	28.7966	36.5639	42.6754	45.4937	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	296.4187	299.4946	291.7434	275.2421	254.4122	234.8350	221.7562	218.6803	226.4314	242.9328	263.7627	283.3399	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.8175	50.8175	50.8175	50.8175	50.8175	50.8175	50.8175	50.8175	50.8175	50.8175	50.8175	50.8175	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	(71)
Water heating gains (Table 5)	68.7914	66.7542	62.5286	56.7859	53.0569	47.8081	43.3494	49.0650	51.0979	57.0412	63.7527	66.7666	(72)
Total internal gains	508.4839	504.5736	485.2550	455.2437	424.5732	396.9290	380.6217	388.2105	405.3363	435.5482	469.2012	494.6106	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	g Specific data or Table 6c	FF			Access factor Table 6d	Gains W
South					10.9300	46.7521	0.4500		0.0000			0.7700	177.0615
West					7.6000	19.6403	0.4500		0.0000			0.7700	51.7207 (80)

Solar gains	228.7822	391.1578	536.0080	660.4951	732.8632	723.5416	699.3163	646.5806	579.6557	432.8264	274.3679		195.5300 (83)
Total gains	737.2661	895.7313	1021.2630	1115.7388	1157.4364	1120.4706	1079.9380	1034.7911	984.9920	868.3746	743.5690		690.1406 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	61.9993	61.9993	61.9993	61.9993	61.9993	61.9993	61.9993	61.9993	61.9993	61.9993	61.9993	61.9993		
alpha	5.1333	5.1333	5.1333	5.1333	5.1333	5.1333	5.1333	5.1333	5.1333	5.1333	5.1333	5.1333		
util living area	0.9771	0.9447	0.8811	0.7664	0.6110	0.4472	0.3214	0.3503	0.5414	0.8131	0.9520	0.9830	(86)	
MIT	20.1978	20.4296	20.6706	20.8645	20.9628	20.9937	20.9991	20.9985	20.9839	20.8450	20.4772	20.1310	(87)	
Th 2	19.9845	19.9845	19.9845	19.9845	19.9845	19.9845	19.9845	19.9845	19.9845	19.9845	19.9845	19.9845	(88)	
util rest of house	0.9706	0.9307	0.8543	0.7221	0.5521	0.3782	0.2475	0.2735	0.4668	0.7646	0.9372	0.9780	(89)	
MIT 2	19.2832	19.5046	19.7258	19.8903	19.9634	19.9820	19.9843	19.9841	19.9774	19.8805	19.5543	19.2183	(90)	
Living area fraction	19.6124	19.8376	20.0659	20.2410	20.3232	20.3462	20.3496	20.3493	20.3397	20.2277	19.8865	19.5468	(92)	
Temperature adjustment	19.4624	19.6876	19.9159	20.0910	20.1732	20.1962	20.1996	20.1993	20.1897	20.0777	19.7365	19.3968	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	712.5727	829.3424	870.3597	811.1957	652.0366	440.0105	284.2623	299.8969	474.9818	668.2021	693.6027	672.4682	(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	1198.3365	1168.7123	1060.3002	884.4613	669.6607	442.2846	284.4849	300.2689	481.2910	749.0507	998.7020	1201.0525	(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	361.4083	228.0566	141.3157	52.7513	13.1123	0.0000	0.0000	0.0000	0.0000	60.1514	219.6715	393.2668	(98)
Space heating												1469.7339	(98)
Space heating per m2												20.8296	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1624.0154 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	361.4083	228.0566	141.3157	52.7513	13.1123	0.0000	0.0000	0.0000	0.0000	60.1514	219.6715	393.2668	(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)	399.3462	251.9963	156.1500	58.2887	14.4888	0.0000	0.0000	0.0000	0.0000	66.4656	242.7309	434.5489	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	157.4229	138.0662	143.3958	126.3260	122.1863	106.8715	100.4525	113.2497	114.0027	131.1108	141.4249	152.8898	(64)
Efficiency of water heater (217)m	89.5045	89.2661	88.8595	88.2189	87.6002	87.3000	87.3000	87.3000	87.3000	88.2817	89.2192	89.5808	(216)
Fuel for water heating, kWh/month	175.8826	154.6682	161.3736	143.1961	139.4817	122.4187	115.0658	129.7248	130.5873	148.5141	158.5141	170.6725	(219)
Water heating fuel used												1750.0995	(219)
Annual totals kWh/year													
Space heating fuel - main system												1624.0154	(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)													38.0143 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													113.0143 (231)
Electricity for lighting (calculated in Appendix L)													312.6826 (232)
Total delivered energy for all uses													3799.8118 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1624.0154	3.4800	56.5157 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1750.0995	3.4800	60.9035 (247)
Mechanical ventilation fans	38.0143	13.1900	5.0141 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	312.6826	13.1900	41.2428 (250)
Additional standing charges			120.0000 (251)
Total energy cost			293.5686 (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] =	1.0670 (257)
SAP value		85.1158
SAP rating (Section 12)		85 (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	1624.0154	0.2160	350.7873 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1750.0995	0.2160	378.0215 (264)
Space and water heating			728.8088 (265)
Pumps and fans	113.0143	0.5190	58.6544 (267)
Energy for lighting	312.6826	0.5190	162.2823 (268)
Total kg/year			949.7455 (272)
CO2 emissions per m2			13.4600 (273)
EI value			88.9870
EI rating			89 (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	$3.48 / 0.8831 = 3.941$, stars = 4
Water heating environmental impact	$0.216 / 0.8831 = 0.2446$, stars = 4

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	70.5600 (1b)	x 2.4000 (2b)	= 169.3440 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.5600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.3440 (5)

2. Ventilation rate

					main heating	secondary heating		other		total	m3 per hour	
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =										0.0000 / (5) =	0.0000 (8)
Pressure test											Yes	
Measured/design AP50											4.3500	
Infiltration rate											0.2175	(18)
Number of sides sheltered											2	(19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1849 (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	0.1941	0.1849	0.1849	0.1710	0.1710	0.1525	0.1571	0.1479	0.1525	0.1618	0.1618	0.1756 (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 2 (Uw = 1.30)			18.5300	1.2357	22.8983		(27)					
Heat Loss Floor			70.5600	0.1000	7.0560		(28a)					
WT-E-01	65.5200	18.5300	46.9900	0.2000	9.3980		(29a)					
Total net area of external elements Aum(A, m2)			136.0800				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	39.3523		(33)					
Party Wall 1			16.3200	0.0000	0.0000		(32)					
Party Ceilings 1			70.5600				(32b)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.7391 (36)					
Total fabric heat loss						(33) + (36) =	51.0914 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 27.9418	Feb 27.9418	Mar 27.9418	Apr 27.9418	May 27.9418	Jun 27.9418	Jul 27.9418	Aug 27.9418	Sep 27.9418	Oct 27.9418	Nov 27.9418	Dec 27.9418 (38)
Heat transfer coeff	79.0332	79.0332	79.0332	79.0332	79.0332	79.0332	79.0332	79.0332	79.0332	79.0332	79.0332	79.0332 (39)
Average = Sum(39)m / 12 =												79.0332 (39)
HLP	Jan 1.1201	Feb 1.1201	Mar 1.1201	Apr 1.1201	May 1.1201	Jun 1.1201	Jul 1.1201	Aug 1.1201	Sep 1.1201	Oct 1.1201	Nov 1.1201	Dec 1.1201 (40)
HLP (average)												1.1201 (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												2.2596 (42)
Average daily hot water use (litres/day)												87.8665 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.6532	93.1385	89.6239	86.1092	82.5945	79.0799	79.0799	82.5945	86.1092	89.6239	93.1385	96.6532 (44)
Energy conte	143.3339	125.3607	129.3610	112.7801	108.2152	93.3815	86.5317	99.2963	100.4823	117.1024	127.8264	138.8112 (45)
Energy content (annual)												Total = Sum(45)m = 1382.4826 (45)
Distribution loss	(46)m = 0.15 x (45)m											
	21.5001	18.8041	19.4042	16.9170	16.2323	14.0072	12.9797	14.8945	15.0723	17.5654	19.1740	20.8217 (46)
Water storage loss:												
Total storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 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)
Combi loss	14.0890	12.7055	14.0348	13.5459	13.9711	13.4900	13.9208	13.9534	13.5205	14.0084	13.5985	14.0786 (61)
Total heat required for water heating calculated for each month	157.4229	138.0662	143.3958	126.3260	122.1863	106.8715	100.4525	113.2497	114.0027	131.1108	141.4249	152.8898 (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	157.4229	138.0662	143.3958	126.3260	122.1863	106.8715	100.4525	113.2497	114.0027	131.1108	141.4249	152.8898 (64)
Heat gains from water heating, kWh/month	51.1808	44.8588	46.5212	40.8858	39.4743	34.4218	32.2520	36.5044	36.7905	42.4387	45.9019	49.6744 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	135.5786	135.5786	135.5786	135.5786	135.5786	135.5786	135.5786	135.5786	135.5786	135.5786	135.5786	135.5786	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	44.2635	39.3144	31.9726	24.2053	18.0938	15.2755	16.5057	21.4548	28.7966	36.5639	42.6754	45.4937	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	296.4187	299.4946	291.7434	275.2421	254.4122	234.8350	221.7562	218.6803	226.4314	242.9328	263.7627	283.3399	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.8175	50.8175	50.8175	50.8175	50.8175	50.8175	50.8175	50.8175	50.8175	50.8175	50.8175	50.8175	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	-90.3857	(71)
Water heating gains (Table 5)	68.7914	66.7542	62.5286	56.7859	53.0569	47.8081	43.3494	49.0650	51.0979	57.0412	63.7527	66.7666	(72)
Total internal gains	508.4839	504.5736	485.2550	455.2437	424.5732	396.9290	380.6217	388.2105	405.3363	435.5482	469.2012	494.6106	(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			
South	10.9300				50.9848	0.4500	0.0000	0.7700	193.0920			
West	7.6000				22.3313	0.4500	0.0000	0.7700	58.8073 (80)			
Solar gains	251.8993	387.2817	524.5595	668.5336	726.0291	768.9788	734.3947	691.5092	615.5531	457.5364	309.4035	213.2735 (83)
Total gains	760.3832	891.8552	1009.8145	1123.7774	1150.6023	1165.9078	1115.0164	1079.7196	1020.8894	893.0845	778.6047	707.8840 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.9993	61.9993	61.9993	61.9993	61.9993	61.9993	61.9993	61.9993	61.9993	61.9993	61.9993	61.9993	
alpha	5.1333	5.1333	5.1333	5.1333	5.1333	5.1333	5.1333	5.1333	5.1333	5.1333	5.1333	5.1333	
util living area	0.9686	0.9364	0.8619	0.7191	0.5378	0.3381	0.2197	0.2341	0.4449	0.7515	0.9286	0.9764	(86)
MIT	20.3039	20.4888	20.7263	20.9075	20.9819	20.9986	20.9999	20.9998	20.9944	20.9040	20.5926	20.2432	(87)
Th 2	19.9845	19.9845	19.9845	19.9845	19.9845	19.9845	19.9845	19.9845	19.9845	19.9845	19.9845	19.9845	(88)
util rest of house	0.9596	0.9199	0.8305	0.6690	0.4739	0.2699	0.1477	0.1599	0.3690	0.6927	0.9070	0.9693	(89)
MIT 2	19.3866	19.5610	19.7758	19.9239	19.9755	19.9841	19.9845	19.9844	19.9825	19.9256	19.6619	19.3284	(90)
Living area fraction	19.7168	19.8950	20.1180	20.2780	20.3378	20.3493	20.3500	20.3500	20.3468	20.2778	19.9970	19.6577	(92)
Temperature adjustment	19.5668	19.7450	19.9680	20.1280	20.1878	20.1993	20.2000	20.2000	20.1968	20.1278	19.8470	19.5077	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	726.2020	816.4354	838.1178	760.1445	560.2916	331.5093	181.7617	189.6565	393.0576	626.5569	703.4874	683.2065	(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	1143.3591	1117.9242	993.2878	808.3520	568.0739	331.8847	181.7755	189.6773	394.9111	673.9772	936.3026	1138.6865	(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	310.3649	202.6005	115.4465	34.7094	5.7900	0.0000	0.0000	0.0000	0.0000	35.2807	167.6269	338.8771	(98)
Space heating												1210.6959	(98)
Space heating per m2												17.1584	(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													1337.7855 (211)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	310.3649	202.6005	115.4465	34.7094	5.7900	0.0000	0.0000	0.0000	0.0000	35.2807	167.6269	338.8771	(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)	342.9446	223.8679	127.5652	38.3529	6.3978	0.0000	0.0000	0.0000	0.0000	38.9842	185.2231	374.4498	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	157.4229	138.0662	143.3958	126.3260	122.1863	106.8715	100.4525	113.2497	114.0027	131.1108	141.4249	152.8898	(64)
Efficiency of water heater (217)m	89.3972	89.1752	88.6988	87.9704	87.4399	87.3000	87.3000	87.3000	87.3000	87.9595	89.0070	89.4803	(216)
Fuel for water heating, kWh/month	176.0937	154.8257	161.6660	143.6005	139.7374	122.4187	115.0658	129.7248	130.5873	149.0582	158.8919	170.8642	(219)
Water heating fuel used												1752.5343	(219)
Annual totals kWh/year													
Space heating fuel - main system												1337.7855	(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)													38.0143 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													113.0143 (231)
Electricity for lighting (calculated in Appendix L)													312.6826 (232)
Total delivered energy for all uses													3516.0167 (238)

10a. Fuel costs - using BEDF prices (478)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1337.7855	3.8700	51.7723 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1752.5343	3.8700	67.8231 (247)
Mechanical ventilation fans	38.0143	18.9000	7.1847 (249)
Pumps and fans for heating	75.0000	18.9000	14.1750 (249)
Energy for lighting	312.6826	18.9000	59.0970 (250)
Additional standing charges			93.0000 (251)
Total energy cost			293.0521 (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	1337.7855	0.2160	288.9617 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1752.5343	0.2160	378.5474 (264)
Space and water heating			667.5091 (265)
Pumps and fans	113.0143	0.5190	58.6544 (267)
Energy for lighting	312.6826	0.5190	162.2823 (268)
Total kg/year			888.4458 (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	1337.7855	1.2200	1632.0984 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1752.5343	1.2200	2138.0918 (264)
Space and water heating			3770.1902 (265)
Pumps and fans	113.0143	3.0700	346.9540 (267)
Energy for lighting	312.6826	3.0700	959.9355 (268)
Primary energy kWh/year			5077.0797 (272)
Primary energy kWh/m2/year			71.9541 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 85
Current environmental impact rating: B 89

(For testing purposes):

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



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

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 85	
Potential environmental impact rating:			B 89

Fuel prices for cost data on this page from database revision number 478 TEST (27 May 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	£80	£80	£0
Mains gas	£213	£213	£0
Space heating	£166	£166	£0
Water heating	£68	£68	£0
Lighting	£59	£59	£0
Total cost of fuels	£293	£293	£0
Total cost of uses	£293	£293	£0
Delivered energy	50 kWh/m²	50 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.9 tonnes	0.9 tonnes	0.0 tonnes
CO2 emissions per m²	13 kg/m²	13 kg/m²	0 kg/m²
Primary energy	72 kWh/m²	72 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	EndTerrace Flat
Number of storeys	1
Cross ventilation possible	Yes
SAP Region	Thames Valley
Front of dwelling faces	South
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	335.30 (P1)
Transmission heat loss coefficient	51.09 (37)
Summer heat loss coefficient	386.39 (P2)

Overhangs	Ratio	Z_overhangs	Overhang type
Orientation			
South	0.000	1.000	None
West	0.000	1.000	None

Solar shading	Z blinds	Solar access	Z overhangs	Z summer
Orientation				
South	1.000	0.90	1.000	0.900 (P8)
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	Shading	Gains W
South	10.9300	112.2060	0.4500	0.0000	0.9000	496.6967
West	7.6000	117.5071	0.4500	0.0000	0.9000	361.6868
total:						858.3834

	Jun	Jul	Aug	
Solar gains	899	858	808	(P4)
Internal gains	394	378	385	
Total summer gains	1293	1236	1193	(P5)
Summer gain/loss ratio	3.35	3.20	3.09	(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	19.60	21.35	21.14	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	
Assessment of likelihood of high internal temperature:	Slight			