

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



Property Reference	SECPMW026s_064_As_Built				Issued on Date	07/05/2021
Assessment Reference	001	Prop Type Ref	MFF			
Property						
SAP Rating	86 B	DER	12.73	TER	14.52	
Environmental	90 B	% DER<TER	12.33			
CO ₂ Emissions (t/year)	0.79	DFEE	24.09	TFEE	28.26	
General Requirements Compliance	Pass	% DFEE<TFEE	14.74			
Assessor Details	Mr. Robert Price, Robert Price, Tel: 01635 261582, keith@southernenergyconsultants.co.uk				Assessor ID	P865-0001
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 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) 14.52 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 12.73 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 28.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 24.1 kWh/m²/yr OK

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.22 (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: 10.22 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	71.1200 (1b)	x 2.4000 (2b)	= 170.6880 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.1200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.6880 (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					3.2200
Infiltration rate					0.1610 (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) =				0.1369 (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	0.1745	0.1711	0.1676	0.1505	0.1471	0.1300	0.1300	0.1266	0.1369	0.1471	0.1540	0.1608 (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)
WT-E-03	41.2400	10.2200	31.0200	0.1600	4.9632		(29a)
WT-I-02	7.4800	2.1200	5.3600	0.1584	0.8491		(29a)
Total net area of external elements Aum(A, m2)			48.7200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.5616		(33)
Party Wall 1			33.8400	0.0000	0.0000		(32)
Party Floor 1			71.1200				(32d)
Party Ceilings 1			71.1200				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.5768 (36)
Total fabric heat loss						(33) + (36) =	27.1384 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635 (38)
Heat transfer coeff	55.3019	55.3019	55.3019	55.3019	55.3019	55.3019	55.3019	55.3019	55.3019	55.3019	55.3019	55.3019 (39)
Average = Sum(39)m / 12 =												55.3019 (39)
HLP	0.7776	0.7776	0.7776	0.7776	0.7776	0.7776	0.7776	0.7776	0.7776	0.7776	0.7776	0.7776 (40)
HLP (average)												0.7776 (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												2.2730 (42)
Average daily hot water use (litres/day)												88.1839 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	97.0023	93.4749	89.9476	86.4202	82.8929	79.3655	79.3655	82.8929	86.4202	89.9476	93.4749	97.0023 (44)
Energy conte	143.8516	125.8135	129.8283	113.1874	108.6060	93.7188	86.8442	99.6550	100.8452	117.5253	128.2881	139.3126 (45)
Energy content (annual)												Total = Sum(45)m = 1387.4760 (45)
Distribution loss (46)m = 0.15 x (45)m	21.5777	18.8720	19.4742	16.9781	16.2909	14.0578	13.0266	14.9482	15.1268	17.6288	19.2432	20.8969 (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	14.0915	12.7075	14.0368	13.5476	13.9726	13.4913	13.9220	13.9548	13.5220	14.0103	13.6006	14.0809	(61)
Total heat required for water heating calculated for each month	157.9430	138.5210	143.8651	126.7350	122.5787	107.2101	100.7662	113.6098	114.3671	131.5356	141.8887	153.3935	(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	157.9430	138.5210	143.8651	126.7350	122.5787	107.2101	100.7662	113.6098	114.3671	131.5356	141.8887	153.3935	(64)
Heat gains from water heating, kWh/month	51.3535	45.0099	46.6771	41.0217	39.6047	34.5343	32.3562	36.6240	36.9115	42.5797	46.0559	49.8417	(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	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.0110	16.8854	13.7321	10.3961	7.7712	6.5608	7.0891	9.2147	12.3680	15.7040	18.3289	19.5393	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.8968	201.9711	196.7439	185.6159	171.5687	158.3664	149.5464	147.4721	152.6993	163.8273	177.8745	191.0768	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	(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)	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	(71)
Water heating gains (Table 5)	69.0235	66.9790	62.7380	56.9746	53.2321	47.9643	43.4895	49.2258	51.2660	57.2308	63.9666	66.9915	(72)
Total internal gains	348.0264	345.9306	333.3092	313.0817	292.6671	272.9866	260.2202	266.0077	276.4284	296.8573	320.2651	337.7027	(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				10.2200	46.7521		0.4500		0.0000		0.7700		165.5598 (78)
Solar gains	165.5598	271.1443	345.3898	390.3654	406.7849	391.4751	382.4950	371.4557	360.8004	292.4546	196.2448	143.0589	(83)
Total gains	513.5862	617.0749	678.6989	703.4471	699.4520	664.4617	642.7152	637.4634	637.2288	589.3119	516.5099	480.7617	(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	35.7231	35.7231	35.7231	35.7231	35.7231	35.7231	35.7231	35.7231	35.7231	35.7231	35.7231	35.7231		
alpha	3.3815	3.3815	3.3815	3.3815	3.3815	3.3815	3.3815	3.3815	3.3815	3.3815	3.3815	3.3815		
util living area	0.9339	0.8889	0.8314	0.7521	0.6423	0.5011	0.3697	0.3881	0.5514	0.7623	0.8963	0.9449	(86)	
MIT	19.7197	20.0140	20.3147	20.5960	20.8124	20.9395	20.9834	20.9799	20.9128	20.6368	20.1182	19.6306	(87)	
Th 2	20.2728	20.2728	20.2728	20.2728	20.2728	20.2728	20.2728	20.2728	20.2728	20.2728	20.2728	20.2728	(88)	
util rest of house	0.9263	0.8770	0.8141	0.7268	0.6061	0.4517	0.3116	0.3303	0.5035	0.7331	0.8831	0.9384	(89)	
MIT 2	19.0971	19.3817	19.6696	19.9334	20.1282	20.2336	20.2646	20.2625	20.2136	19.9760	19.4873	19.0103	(90)	
Living area fraction	19.3055	19.5933	19.8855	20.1551	20.3572	20.4698	20.5052	20.5025	20.4476	20.1971	19.6984	19.2179	(92)	
MIT	19.1555	19.4433	19.7355	20.0051	20.2072	20.3198	20.3552	20.3525	20.2976	20.0471	19.5484	19.0679	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	468.5140	531.7030	542.9577	504.2641	421.5744	302.3038	204.5639	214.6983	321.9093	426.2360	448.3280	444.8157	(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	821.5368	804.2715	731.9474	614.1359	470.4636	316.3163	207.6671	218.5834	342.7377	522.4441	688.4229	822.2225	(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	262.6490	183.1660	140.6083	79.1077	36.3735	0.0000	0.0000	0.0000	0.0000	71.5789	172.8683	280.7906	(98)
Space heating												1227.1424	(98)
Space heating per m2												17.2545	(99)

8c. Space cooling requirement

Not applicable

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1355.9584 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	262.6490	183.1660	140.6083	79.1077	36.3735	0.0000	0.0000	0.0000	0.0000	71.5789	172.8683	280.7906	(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)	290.2199	202.3934	155.3683	87.4118	40.1918	0.0000	0.0000	0.0000	0.0000	79.0927	191.0147	310.2659	(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	157.9430	138.5210	143.8651	126.7350	122.5787	107.2101	100.7662	113.6098	114.3671	131.5356	141.8887	153.3935	(64)
Efficiency of water heater (217)m	89.2712	89.0937	88.8529	88.5027	88.0121	87.3000	87.3000	87.3000	87.3000	88.4016	89.0289	87.3000	(216)
Fuel for water heating, kWh/month	176.9250	155.4779	161.9138	143.1991	139.2747	122.8065	115.4252	130.1372	131.0047	148.7933	159.3737	171.6905	(219)
Water heating fuel used												1756.0216	(219)
Annual totals kWh/year													
Space heating fuel - main system												1355.9584	(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)													38.3160 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													113.3160 (231)
Electricity for lighting (calculated in Appendix L)													335.7397 (232)
Total delivered energy for all uses													3561.0358 (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	1355.9584	0.2160	292.8870	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1756.0216	0.2160	379.3007	(264)
Space and water heating			672.1877	(265)
Pumps and fans	113.3160	0.5190	58.8110	(267)
Energy for lighting	335.7397	0.5190	174.2489	(268)
Total CO2, kg/year			905.2476	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			12.7300	(273)

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

DER			12.7300	ZC1
Total Floor Area		TFA	71.1200	
Assumed number of occupants		N	2.2730	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			16.6556	ZC2
CO2 emissions from cooking, equation (L16)			2.4403	ZC3
Total CO2 emissions			31.8259	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			31.8259	ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	71.1200 (1b)	x 2.4000 (2b)	= 170.6880 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.1200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.6880 (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) = 0.1758 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4258 (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) =	0.3619 (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												
	0.4614	0.4524	0.4433	0.3981	0.3890	0.3438	0.3438	0.3348	0.3619	0.3890	0.4071	0.4252 (22b)
Effective ac	0.6065	0.6023	0.5983	0.5792	0.5757	0.5591	0.5591	0.5560	0.5655	0.5757	0.5829	0.5904 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			2.1200	1.0000	2.1200			(26)					
TER Opening Type (Uw = 1.40)			10.2200	1.3258	13.5492			(27)					
WT-E-03	41.2400	10.2200	31.0200	0.1800	5.5836			(29a)					
WT-I-02	7.4800	2.1200	5.3600	0.1800	0.9648			(29a)					
Total net area of external elements Aum(A, m2)			48.7200					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	22.2176			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								5.0115 (36)					
Total fabric heat loss						(33) + (36) =		27.2291 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 34.1597	Feb 33.9268	Mar 33.6986	Apr 32.6266	May 32.4261	Jun 31.4924	Jul 31.4924	Aug 31.3195	Sep 31.8520	Oct 32.4261	Nov 32.8318	Dec 33.2560	(38)
Heat transfer coeff	61.3888	61.1560	60.9278	59.8558	59.6552	58.7216	58.7216	58.5487	59.0812	59.6552	60.0610	60.4851	(39)
Average = Sum(39)m / 12 =												59.8548	(39)
HLP	Jan 0.8632	Feb 0.8599	Mar 0.8567	Apr 0.8416	May 0.8388	Jun 0.8257	Jul 0.8257	Aug 0.8232	Sep 0.8307	Oct 0.8388	Nov 0.8445	Dec 0.8505	(40)
HLP (average)												0.8416	(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												2.2730 (42)
Average daily hot water use (litres/day)												88.1839 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	97.0023	93.4749	89.9476	86.4202	82.8929	79.3655	79.3655	82.8929	86.4202	89.9476	93.4749	97.0023 (44)
Energy conte	143.8516	125.8135	129.8283	113.1874	108.6060	93.7188	86.8442	99.6550	100.8452	117.5253	128.2881	139.3126 (45)
Energy content (annual)										Total = Sum(45)m =		1387.4760 (45)
Distribution loss (46)m = 0.15 x (45)m	21.5777	18.8720	19.4742	16.9781	16.2909	14.0578	13.0266	14.9482	15.1268	17.6288	19.2432	20.8969 (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	49.4313	43.0241	45.8363	42.6182	42.2413	39.1392	40.4438	42.2413	42.6182	45.8363	46.0972	49.4313 (61)

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Total heat required for water heating calculated for each month												
	193.2829	168.8376	175.6646	155.8056	150.8473	132.8579	127.2880	141.8963	143.4634	163.3616	174.3853	188.7439 (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	193.2829	168.8376	175.6646	155.8056	150.8473	132.8579	127.2880	141.8963	143.4634	163.3616	174.3853	188.7439 (64)
Total per year (kWh/year) = Sum(64)m =												1916.4343 (64)
Heat gains from water heating, kWh/month												
	60.1885	52.5890	54.6270	48.2894	46.6718	40.9463	38.9866	43.6956	44.1856	50.5362	54.1801	58.6793 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.0110	16.8854	13.7321	10.3961	7.7712	6.5608	7.0891	9.2147	12.3680	15.7040	18.3289	19.5393 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.8968	201.9711	196.7439	185.6159	171.5687	158.3664	149.5464	147.4721	152.6993	163.8273	177.8745	191.0768 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650 (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)	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202 (71)
Water heating gains (Table 5)	80.8985	78.2575	73.4234	67.0686	62.7310	56.8698	52.4014	58.7307	61.3688	67.9251	75.2501	78.8700 (72)
Total internal gains	359.9014	357.2090	343.9945	323.1756	302.1660	281.8921	269.1321	275.5126	286.5312	307.5515	331.5486	349.5812 (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				
South				10.2200	46.7521	0.6300	0.7000	0.7700	146.0238 (78)			
Solar gains	146.0238	239.1493	304.6338	344.3023	358.7843	345.2811	337.3606	327.6239	318.2259	257.9449	173.0879	126.1780 (83)
Total gains	505.9251	596.3583	648.6283	667.4779	660.9503	627.1731	606.4927	603.1365	604.7572	565.4965	504.6366	475.7592 (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	80.4526	80.7589	81.0614	82.5131	82.7906	84.1069	84.1069	84.3553	83.5949	82.7906	82.2313	81.6546
alpha	6.3635	6.3839	6.4041	6.5009	6.5194	6.6071	6.6071	6.6237	6.5730	6.5194	6.4821	6.4436
util living area	0.9943	0.9835	0.9591	0.8993	0.7806	0.5909	0.4251	0.4454	0.6568	0.9036	0.9845	0.9960 (86)
MIT	20.2725	20.4450	20.6354	20.8265	20.9456	20.9927	20.9993	20.9990	20.9853	20.8468	20.5273	20.2426 (87)
Th 2	20.1989	20.2017	20.2045	20.2174	20.2198	20.2311	20.2311	20.2332	20.2268	20.2198	20.2149	20.2098 (88)
util rest of house	0.9926	0.9788	0.9476	0.8730	0.7318	0.5236	0.3513	0.3718	0.5901	0.8733	0.9792	0.9948 (89)
MIT 2	19.2319	19.4828	19.7543	20.0233	20.1694	20.2264	20.2309	20.2328	20.2163	20.0558	19.6137	19.1970 (90)
Living area fraction									fLA = Living area / (4) =			0.3346 (91)
MIT	19.5801	19.8048	20.0492	20.2921	20.4292	20.4828	20.4880	20.4892	20.4737	20.3205	19.9195	19.5469 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5801	19.8048	20.0492	20.2921	20.4292	20.4828	20.4880	20.4892	20.4737	20.3205	19.9195	19.5469 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9908	0.9759	0.9450	0.8758	0.7455	0.5459	0.3761	0.3964	0.6119	0.8776	0.9767	0.9934 (94)
Useful gains	501.2924	581.9920	612.9841	584.5454	492.7334	342.4006	228.0854	239.1006	370.0720	496.3032	492.8950	472.6124 (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												
Month fracti	938.0304	911.5169	825.5202	681.8843	520.7394	345.4501	228.3094	239.4183	376.5644	579.8774	769.9486	928.2583 (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)
	324.9331	221.4407	158.1269	70.0840	20.8365	0.0000	0.0000	0.0000	0.0000	62.1792	199.4786	339.0006 (98)
Space heating												1396.0796 (98)
Space heating per m2												19.6299 (99)
										(98) / (4) =		

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													1494.7319 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	324.9331	221.4407	158.1269	70.0840	20.8365	0.0000	0.0000	0.0000	0.0000	62.1792	199.4786	339.0006	(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)	347.8941	237.0886	169.3007	75.0364	22.3088	0.0000	0.0000	0.0000	0.0000	66.5730	213.5745	362.9556	(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	193.2829	168.8376	175.6646	155.8056	150.8473	132.8579	127.2880	141.8963	143.4634	163.3616	174.3853	188.7439	(64)
Efficiency of water heater	86.3491	85.7349	84.7876	83.1835	81.4038	80.3000	80.3000	80.3000	80.3000	82.8520	85.3903	86.5085	(216)
Fuel for water heating, kWh/month	223.8388	196.9298	207.1819	187.3036	185.3075	165.4519	158.5156	176.7077	178.6592	197.1729	204.2214	218.1795	(219)
Water heating fuel used												2299.4697	(219)
Annual totals kWh/year													
Space heating fuel - main system												1494.7319	(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)												335.7397	(232)
Total delivered energy for all uses												4204.9413	(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	1494.7319	0.2160	322.8621 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2299.4697	0.2160	496.6855 (264)
Space and water heating			819.5476 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	335.7397	0.5190	174.2489 (268)
Total CO2, kg/m2/year			1032.7215 (272)
Emissions per m2 for space and water heating			11.5234 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4501 (272b)
Emissions per m2 for pumps and fans			0.5473 (272c)
Target Carbon Dioxide Emission Rate (TER) = (11.5234 * 1.00) + 2.4501 + 0.5473, rounded to 2 d.p.			14.5200 (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	71.1200 (1b)	x 2.4000 (2b)	= 170.6880 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.1200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.6880 (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 30.0000 / (5) = 0.1758 (8)
Pressure test					Yes
Measured/design AP50					3.2200
Infiltration rate					0.3368 (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) =	0.2862 (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	0.3650	0.3578	0.3507	0.3149	0.3077	0.2719	0.2719	0.2648	0.2862	0.3077	0.3220	0.3363 (22b)
Effective ac	0.5666	0.5640	0.5615	0.5496	0.5473	0.5370	0.5370	0.5351	0.5410	0.5473	0.5519	0.5566 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			10.2200	1.2357	12.6293		(27)
WT-E-03	41.2400	10.2200	31.0200	0.1600	4.9632		(29a)
WT-T-02	7.4800	2.1200	5.3600	0.1584	0.8491		(29a)
Total net area of external elements Aum(A, m ²)			48.7200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	20.5616		(33)
Party Wall 1			33.8400	0.0000	0.0000		(32)
Party Floor 1			71.1200				(32d)
Party Ceilings 1			71.1200				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.5768 (36)
Total fabric heat loss						(33) + (36) =	27.1384 (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	31.9148	31.7692	31.6264	30.9557	30.8303	30.2461	30.2461	30.1380	30.4711	30.8303	31.0841	31.3495 (38)
Heat transfer coeff	59.0532	58.9076	58.7648	58.0941	57.9687	57.3846	57.3846	57.2764	57.6095	57.9687	58.2225	58.4879 (39)
Average = Sum(39)m / 12 =												58.0935 (39)
HLP	0.8303	0.8283	0.8263	0.8168	0.8151	0.8069	0.8069	0.8053	0.8100	0.8151	0.8187	0.8224 (40)
HLP (average)												0.8168 (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												2.2730 (42)
Average daily hot water use (litres/day)												88.1839 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	97.0023	93.4749	89.9476	86.4202	82.8929	79.3655	79.3655	82.8929	86.4202	89.9476	93.4749	97.0023 (44)
Energy content (annual)	143.8516	125.8135	129.8283	113.1874	108.6060	93.7188	86.8442	99.6550	100.8452	117.5253	128.2881	139.3126 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1387.4760 (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)

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	30.5685	26.7354	27.5885	24.0523	23.0788	19.9152	18.4544	21.1767	21.4296	24.9741	27.2612	29.6039 (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	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.0110	16.8854	13.7321	10.3961	7.7712	6.5608	7.0891	9.2147	12.3680	15.7040	18.3289	19.5393	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.8968	201.9711	196.7439	185.6159	171.5687	158.3664	149.5464	147.4721	152.6993	163.8273	177.8745	191.0768	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	(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)	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	(71)
Water heating gains (Table 5)	41.0866	39.7848	37.0813	33.4060	31.0199	27.6600	24.8043	28.4633	29.7633	33.5674	37.8628	39.7902	(72)
Total internal gains	317.0895	315.7364	304.6525	286.5131	267.4549	249.6823	238.5350	242.2452	251.9257	270.1938	291.1613	307.5015	(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					10.2200	46.7521	0.4500	0.0000			0.7700			165.5598 (78)
Solar gains	165.5598	271.1443	345.3898	390.3654	406.7849	391.4751	382.4950	371.4557	360.8004	292.4546	196.2448	143.0589	(83)	
Total gains	482.6493	586.8807	650.0422	676.8785	674.2398	641.1574	621.0300	613.7009	612.7261	562.6484	487.4062	450.5604	(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	33.4538	33.5365	33.6180	34.0061	34.0797	34.4266	34.4266	34.4916	34.2922	34.0797	33.9311	33.7772	
alpha	3.2303	3.2358	3.2412	3.2671	3.2720	3.2951	3.2951	3.2994	3.2861	3.2720	3.2621	3.2518	
util living area	0.9466	0.9072	0.8555	0.7799	0.6743	0.5299	0.3939	0.4139	0.5836	0.7916	0.9140	0.9555	(86)
MIT	19.5048	19.8239	20.1626	20.5029	20.7600	20.9215	20.9775	20.9729	20.8863	20.5525	19.9676	19.4355	(87)
Th 2	20.2271	20.2289	20.2306	20.2388	20.2403	20.2474	20.2474	20.2487	20.2446	20.2403	20.2372	20.2340	(88)
util rest of house	0.9400	0.8965	0.8393	0.7551	0.6373	0.4776	0.3308	0.3512	0.5333	0.7633	0.9023	0.9499	(89)
MIT 2	18.8518	19.1634	19.4912	19.8196	20.0546	20.1964	20.2363	20.2348	20.1671	19.8727	19.3146	18.7893	(90)
Living area fraction									fLA = Living area / (4) =			0.3346	(91)
MIT	19.0703	19.3845	19.7159	20.0483	20.2906	20.4391	20.4843	20.4818	20.4078	20.1002	19.5331	19.0055	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0703	19.3845	19.7159	20.0483	20.2906	20.4391	20.4843	20.4818	20.4078	20.1002	19.5331	19.0055	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	447.9366	518.2287	537.7004	506.6277	431.4526	314.9825	217.9573	227.7017	333.6578	426.2846	433.6217	423.0226	(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	872.2344	853.2442	776.6297	647.6502	497.9878	335.0724	222.9011	233.7910	363.3885	550.7122	723.8869	865.9452	(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	315.6776	225.1304	177.7634	101.5362	49.5022	0.0000	0.0000	0.0000	0.0000	92.5742	208.9910	329.5344	(98)
Space heating												1500.7094	(98)
Space heating per m2										(98) / (4) =		21.1011	(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	539.4148	424.6457	435.3005	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9008	0.9394	0.9344	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	485.8934	398.9206	406.7452	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	834.3692	809.1740	802.1479	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	250.9026	305.2286	294.1796	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												850.3108	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)

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	62.7256	76.3071	73.5449	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											212.5777 (107)
Space cooling per m2											2.9890 (108)
Energy for space heating											21.1011 (99)
Energy for space cooling											2.9890 (108)
Total											24.0901 (109)
Dwelling Fabric Energy Efficiency (DFEE)											24.1 (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	71.1200 (1b)	x 2.4000 (2b)	= 170.6880 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.1200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.6880 (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) = 0.1758 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4258 (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) = 0.3619 (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	0.4614	0.4524	0.4433	0.3981	0.3890	0.3438	0.3438	0.3348	0.3619	0.3890	0.4071	0.4252 (22b)
Effective ac	0.6065	0.6023	0.5983	0.5792	0.5757	0.5591	0.5591	0.5560	0.5655	0.5757	0.5829	0.5904 (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)
WT-E-03	41.2400	10.2200	31.0200	0.1800	5.5836		(29a)
WT-I-02	7.4800	2.1200	5.3600	0.1800	0.9648		(29a)
Total net area of external elements Aum(A, m ²)			48.7200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 22.2176		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.0115 (36)
Total fabric heat loss						(33) + (36) =	27.2291 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	34.1597	33.9268	33.6986	32.6266	32.4261	31.4924	31.4924
Heat transfer coeff	61.3888	61.1560	60.9278	59.8558	59.6552	58.7216	58.7216
Average = Sum(39)m / 12 =							
HLP	0.8632	0.8599	0.8567	0.8416	0.8388	0.8257	0.8257
HLP (average)						0.8232	0.8232
Days in month	31	28	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2730 (42)
Average daily hot water use (litres/day)												88.1839 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	97.0023	93.4749	89.9476	86.4202	82.8929	79.3655	79.3655	82.8929	86.4202	89.9476	93.4749	97.0023 (44)
Energy content (annual)	143.8516	125.8135	129.8283	113.1874	108.6060	93.7188	86.8442	99.6550	100.8452	117.5253	128.2881	139.3126 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1387.4760 (45)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Heat gains from water heating, kWh/month
30.5685 26.7354 27.5885 24.0523 23.0788 19.9152 18.4544 21.1767 21.4296 24.9741 27.2612 29.6039 (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	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.0110	16.8854	13.7321	10.3961	7.7712	6.5608	7.0891	9.2147	12.3680	15.7040	18.3289	19.5393 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.8968	201.9711	196.7439	185.6159	171.5687	158.3664	149.5464	147.4721	152.6993	163.8273	177.8745	191.0768 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650 (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)	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202 (71)
Water heating gains (Table 5)	41.0866	39.7848	37.0813	33.4060	31.0199	27.6600	24.8043	28.4633	29.7633	33.5674	37.8628	39.7902 (72)
Total internal gains	317.0895	315.7364	304.6525	286.5131	267.4549	249.6823	238.5350	242.2452	251.9257	270.1938	291.1613	307.5015 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	g Specific data or Table 6c	FF Access factor Table 6d	Gains W						
South	10.2200	46.7521	0.6300	0.7000	0.7700	146.0238 (78)						
Solar gains	146.0238	239.1493	304.6338	344.3023	358.7843	345.2811	337.3606	327.6239	318.2259	257.9449	173.0879	126.1780 (83)
Total gains	463.1133	554.8856	609.2862	630.8154	626.2392	594.9634	575.8956	569.8691	570.1517	528.1388	464.2493	433.6795 (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	80.4526	80.7589	81.0614	82.5131	82.7906	84.1069	84.1069	84.3553	83.5949	82.7906	82.2313	81.6546
alpha	6.3635	6.3839	6.4041	6.5009	6.5194	6.6071	6.6071	6.6237	6.5730	6.5194	6.4821	6.4436
util living area	0.9965	0.9886	0.9693	0.9185	0.8092	0.6201	0.4474	0.4709	0.6906	0.9258	0.9900	0.9976 (86)
MIT	20.2146	20.3921	20.5914	20.7974	20.9327	20.9904	20.9990	20.9986	20.9805	20.8160	20.4753	20.1850 (87)
Th 2	20.1989	20.2017	20.2045	20.2174	20.2198	20.2311	20.2311	20.2332	20.2268	20.2198	20.2149	20.2098 (88)
util rest of house	0.9954	0.9852	0.9602	0.8955	0.7621	0.5506	0.3699	0.3933	0.6228	0.9002	0.9864	0.9969 (89)
MIT 2	19.4813	19.6592	19.8558	20.0600	20.1764	20.2268	20.2309	20.2328	20.2171	20.0820	19.7538	19.4611 (90)
Living area fraction									fLA = Living area / (4) =			0.3346 (91)
MIT	19.7267	19.9045	20.1020	20.3067	20.4295	20.4824	20.4879	20.4891	20.4726	20.3276	19.9952	19.7034 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7267	19.9045	20.1020	20.3067	20.4295	20.4824	20.4879	20.4891	20.4726	20.3276	19.9952	19.7034 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9946	0.9837	0.9589	0.8984	0.7755	0.5738	0.3959	0.4193	0.6450	0.9041	0.9852	0.9963 (94)
Useful gains	460.6051	545.8234	584.2157	566.7172	485.6293	341.3678	227.9997	238.9663	367.7633	477.5164	457.3595	432.0541 (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	947.0270	917.6130	828.7376	682.7588	520.7613	345.4209	228.3050	239.4113	376.4998	580.3036	774.5010	937.7230 (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	361.8979	249.8426	181.9243	83.5500	26.1382	0.0000	0.0000	0.0000	0.0000	76.4737	228.3419	376.2176 (98)
Space heating												1584.3861 (98)
Space heating per m ²										(98) / (4) =		22.2776 (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	551.9827	434.5395	444.9698	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9680	0.9889	0.9870	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	534.3187	429.7216	439.1996	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	780.3762	756.4195	750.9160	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	177.1614	243.0632	231.9170	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												652.1416 (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	44.2903	60.7658	57.9793	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling													163.0354 (107)
Space cooling per m2													2.2924 (108)
Energy for space heating													22.2776 (99)
Energy for space cooling													2.2924 (108)
Total													24.5700 (109)
Target Fabric Energy Efficiency (TFEE)													28.3 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	71.1200 (1b)	x 2.4000 (2b)	= 170.6880 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.1200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.6880 (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					3.2200
Infiltration rate					0.1610 (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) =				0.1369 (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	0.1437	0.1369	0.1369	0.1266	0.1266	0.1129	0.1163	0.1095	0.1129	0.1197	0.1197	0.1300 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			10.2200	1.2357	12.6293		(27)
WT-E-03	41.2400	10.2200	31.0200	0.1600	4.9632		(29a)
WT-T-02	7.4800	2.1200	5.3600	0.1584	0.8491		(29a)
Total net area of external elements Aum(A, m ²)			48.7200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.5616		(33)
Party Wall 1			33.8400	0.0000	0.0000		(32)
Party Floor 1			71.1200				(32d)
Party Ceilings 1			71.1200				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.5768 (36)
Total fabric heat loss							(33) + (36) = 27.1384 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635 (38)
Heat transfer coeff	55.3019	55.3019	55.3019	55.3019	55.3019	55.3019	55.3019	55.3019	55.3019	55.3019	55.3019	55.3019 (39)
Average = Sum(39)m / 12 =												55.3019 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.7776	0.7776	0.7776	0.7776	0.7776	0.7776	0.7776	0.7776	0.7776	0.7776	0.7776	0.7776 (40)
HLP (average)												0.7776 (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												2.2730 (42)
Average daily hot water use (litres/day)												88.1839 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	97.0023	93.4749	89.9476	86.4202	82.8929	79.3655	79.3655	82.8929	86.4202	89.9476	93.4749	97.0023 (44)
Energy conte	143.8516	125.8135	129.8283	113.1874	108.6060	93.7188	86.8442	99.6550	100.8452	117.5253	128.2881	139.3126 (45)
Energy content (annual)												Total = Sum(45)m = 1387.4760 (45)
Distribution loss (46)m = 0.15 x (45)m	21.5777	18.8720	19.4742	16.9781	16.2909	14.0578	13.0266	14.9482	15.1268	17.6288	19.2432	20.8969 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Water storage loss:														
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	14.0915	12.7075	14.0368	13.5476	13.9726	13.4913	13.9220	13.9548	13.5220	14.0103	13.6006	14.0809	14.0809	(61)
Total heat required for water heating calculated for each month	157.9430	138.5210	143.8651	126.7350	122.5787	107.2101	100.7662	113.6098	114.3671	131.5356	141.8887	153.3935	153.3935	(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	157.9430	138.5210	143.8651	126.7350	122.5787	107.2101	100.7662	113.6098	114.3671	131.5356	141.8887	153.3935	153.3935	(64)
RHI water heating demand	51.3535	45.0099	46.6771	41.0217	39.6047	34.5343	32.3562	36.6240	36.9115	42.5797	46.0559	49.8417	49.8417	(65)
Heat gains from water heating, kWh/month	51.3535	45.0099	46.6771	41.0217	39.6047	34.5343	32.3562	36.6240	36.9115	42.5797	46.0559	49.8417	49.8417	(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	136.3804	136.3804	136.3804	136.3804	136.3804	136.3804	136.3804	136.3804	136.3804	136.3804	136.3804	136.3804	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	47.5274	42.2134	34.3303	25.9902	19.4280	16.4019	17.7229	23.0369	30.9200	39.2601	45.8223	48.8484	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	298.3535	301.4494	293.6477	277.0387	256.0728	236.3678	223.2036	220.1076	227.9094	244.5184	265.4843	285.1893	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.9110	50.9110	50.9110	50.9110	50.9110	50.9110	50.9110	50.9110	50.9110	50.9110	50.9110	50.9110	(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)	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	(71)
Water heating gains (Table 5)	69.0235	66.9790	62.7380	56.9746	53.2321	47.9643	43.4895	49.2258	51.2660	57.2308	63.9666	66.9915	(72)
Total internal gains	514.2756	510.0130	490.0872	459.3746	428.1040	400.1052	383.7872	391.7414	409.4666	440.3805	474.6444	500.4003	(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				10.2200	50.9848	0.4500	0.0000	0.7700	180.5490 (78)			
Solar gains	180.5490	265.3663	333.3669	389.6318	398.2891	411.8829	397.3472	392.0371	377.7133	305.2939	219.0656	154.6394 (83)
Total gains	694.8246	775.3793	823.4540	849.0064	826.3931	811.9880	781.1344	783.7786	787.1799	745.6744	693.7100	655.0397 (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	35.7231	35.7231	35.7231	35.7231	35.7231	35.7231	35.7231	35.7231	35.7231	35.7231	35.7231	35.7231	
alpha	3.3815	3.3815	3.3815	3.3815	3.3815	3.3815	3.3815	3.3815	3.3815	3.3815	3.3815	3.3815	
util living area	0.8530	0.8065	0.7356	0.6348	0.5032	0.3346	0.2185	0.2246	0.3956	0.6186	0.7853	0.8700	(86)
MIT	20.1733	20.3474	20.5779	20.7841	20.9234	20.9861	20.9977	20.9974	20.9731	20.8312	20.4978	20.1075	(87)
Th 2	20.2728	20.2728	20.2728	20.2728	20.2728	20.2728	20.2728	20.2728	20.2728	20.2728	20.2728	20.2728	(88)
util rest of house	0.8385	0.7890	0.7127	0.6047	0.4638	0.2878	0.1677	0.1741	0.3493	0.5829	0.7633	0.8566	(89)
MIT 2	19.5331	19.6969	19.9123	20.0991	20.2183	20.2653	20.2720	20.2719	20.2567	20.1430	19.8424	19.4710	(90)
Living area fraction	19.7473	19.9146	20.1350	20.3283	20.4543	20.5065	20.5149	20.5147	20.4965	20.3733	20.0617	19.6840	(91)
MIT	19.5973	19.7646	19.9850	20.1783	20.3043	20.3565	20.3649	20.3647	20.3465	20.2233	19.9117	19.5340	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.5973	19.7646	19.9850	20.1783	20.3043	20.3565	20.3649	20.3647	20.3465	20.2233	19.9117	19.5340	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	572.2383	601.4536	578.9734	509.9620	384.7541	238.1271	136.0056	141.4740	278.7161	432.7460	521.2650	551.1235	(94)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Heat loss rate W	801.7289	783.3284	695.9750	568.4117	403.9398	240.9248	136.3129	141.8328	284.6098	476.8867	658.7411	798.2300	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	170.7410	122.2198	87.0492	42.0838	14.2742	0.0000	0.0000	0.0000	0.0000	32.8407	98.9829	183.8473	(98)
Space heating												752.0388	(98)
RHI space heating demand												752	(98)

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	71.1200 (1b)	x 2.4000 (2b)	= 170.6880 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.1200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.6880 (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					3.2200
Infiltration rate					0.1610 (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) =				0.1369 (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	0.1745	0.1711	0.1676	0.1505	0.1471	0.1300	0.1300	0.1266	0.1369	0.1471	0.1540	0.1608 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			10.2200	1.2357	12.6293		(27)
WT-E-03	41.2400	10.2200	31.0200	0.1600	4.9632		(29a)
WT-T-02	7.4800	2.1200	5.3600	0.1584	0.8491		(29a)
Total net area of external elements Aum(A, m ²)				48.7200			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	20.5616		(33)
Party Wall 1				33.8400	0.0000	0.0000	(32)
Party Floor 1				71.1200			(32d)
Party Ceilings 1				71.1200			(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.5768 (36)
Total fabric heat loss							(33) + (36) = 27.1384 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635 (38)
Heat transfer coeff	55.3019	55.3019	55.3019	55.3019	55.3019	55.3019	55.3019	55.3019	55.3019	55.3019	55.3019	55.3019 (39)
Average = Sum(39)m / 12 =												55.3019 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.7776	0.7776	0.7776	0.7776	0.7776	0.7776	0.7776	0.7776	0.7776	0.7776	0.7776	0.7776 (40)
HLP (average)												0.7776 (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												2.2730 (42)
Average daily hot water use (litres/day)												88.1839 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	97.0023	93.4749	89.9476	86.4202	82.8929	79.3655	79.3655	82.8929	86.4202	89.9476	93.4749	97.0023 (44)
Energy conte	143.8516	125.8135	129.8283	113.1874	108.6060	93.7188	86.8442	99.6550	100.8452	117.5253	128.2881	139.3126 (45)
Energy content (annual)												Total = Sum(45)m = 1387.4760 (45)
Distribution loss (46)m = 0.15 x (45)m	21.5777	18.8720	19.4742	16.9781	16.2909	14.0578	13.0266	14.9482	15.1268	17.6288	19.2432	20.8969 (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	14.0915	12.7075	14.0368	13.5476	13.9726	13.4913	13.9220	13.9548	13.5220	14.0103	13.6006	14.0809	(61)
Total heat required for water heating calculated for each month	157.9430	138.5210	143.8651	126.7350	122.5787	107.2101	100.7662	113.6098	114.3671	131.5356	141.8887	153.3935	(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	157.9430	138.5210	143.8651	126.7350	122.5787	107.2101	100.7662	113.6098	114.3671	131.5356	141.8887	153.3935	(64)
Heat gains from water heating, kWh/month	51.3535	45.0099	46.6771	41.0217	39.6047	34.5343	32.3562	36.6240	36.9115	42.5797	46.0559	49.8417	(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	136.3804	136.3804	136.3804	136.3804	136.3804	136.3804	136.3804	136.3804	136.3804	136.3804	136.3804	136.3804	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	47.5274	42.2134	34.3303	25.9902	19.4280	16.4019	17.7229	23.0369	30.9200	39.2601	45.8223	48.8484	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	298.3535	301.4494	293.6477	277.0387	256.0728	236.3678	223.2036	220.1076	227.9094	244.5184	265.4843	285.1893	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.9110	50.9110	50.9110	50.9110	50.9110	50.9110	50.9110	50.9110	50.9110	50.9110	50.9110	50.9110	(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)	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	(71)
Water heating gains (Table 5)	69.0235	66.9790	62.7380	56.9746	53.2321	47.9643	43.4895	49.2258	51.2660	57.2308	63.9666	66.9915	(72)
Total internal gains	514.2756	510.0130	490.0872	459.3746	428.1040	400.1052	383.7872	391.7414	409.4666	440.3805	474.6444	500.4003	(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					10.2200	46.7521	0.4500	0.0000			0.7700			165.5598 (78)
Solar gains	165.5598	271.1443	345.3898	390.3654	406.7849	391.4751	382.4950	371.4557	360.8004	292.4546	196.2448	143.0589	(83)	
Total gains	679.8354	781.1573	835.4769	849.7401	834.8889	791.5803	766.2822	763.1971	770.2670	732.8351	670.8892	643.4592	(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	35.7231	35.7231	35.7231	35.7231	35.7231	35.7231	35.7231	35.7231	35.7231	35.7231	35.7231	35.7231		
alpha	3.3815	3.3815	3.3815	3.3815	3.3815	3.3815	3.3815	3.3815	3.3815	3.3815	3.3815	3.3815		
util living area	0.8732	0.8194	0.7557	0.6725	0.5638	0.4304	0.3130	0.3279	0.4710	0.6710	0.8212	0.8890	(86)	
MIT	20.0485	20.2782	20.5082	20.7182	20.8743	20.9618	20.9900	20.9880	20.9459	20.7595	20.3719	19.9703	(87)	
Th 2	20.2728	20.2728	20.2728	20.2728	20.2728	20.2728	20.2728	20.2728	20.2728	20.2728	20.2728	20.2728	(88)	
util rest of house	0.8608	0.8033	0.7349	0.6452	0.5283	0.3857	0.2629	0.2779	0.4270	0.6391	0.8025	0.8777	(89)	
MIT 2	19.4129	19.6306	19.8468	20.0402	20.1776	20.2485	20.2680	20.2667	20.2368	20.0807	19.7244	19.3381	(90)	
Living area fraction	19.6256	19.8473	20.0681	20.2671	20.4108	20.4872	20.5096	20.5081	20.4741	20.3079	19.9411	19.5496	(91)	
MIT	19.4756	19.6973	19.9181	20.1171	20.2608	20.3372	20.3596	20.3581	20.3241	20.1579	19.7911	19.3996	(92)	
Temperature adjustment												-0.1500		
adjusted MIT	19.4756	19.6973	19.9181	20.1171	20.2608	20.3372	20.3596	20.3581	20.3241	20.1579	19.7911	19.3996	(93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8454	0.7894	0.7240	0.6391	0.5277	0.3897	0.2689	0.2838	0.4302	0.6338	0.7889	0.8623	(94)
Useful gains	574.7365	616.6164	604.9260	543.0863	440.5933	308.4808	206.0671	216.5938	331.3324	464.4481	529.2338	554.8584	(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	839.2391	818.3190	742.0474	620.3259	473.4267	317.2775	207.9129	218.8904	344.2038	528.5695	701.8434	840.5698	(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	196.7900	135.5442	102.0183	55.6125	24.4281	0.0000	0.0000	0.0000	0.0000	47.7063	124.2789	212.5693	(98)
Space heating												898.9476	(98)
Space heating per m2												(98) / (4) =	12.6399 (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												993.3123 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	196.7900	135.5442	102.0183	55.6125	24.4281	0.0000	0.0000	0.0000	0.0000	47.7063	124.2789	212.5693 (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)	217.4475	149.7726	112.7275	61.4503	26.9923	0.0000	0.0000	0.0000	0.0000	52.7141	137.3248	234.8832 (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	157.9430	138.5210	143.8651	126.7350	122.5787	107.2101	100.7662	113.6098	114.3671	131.5356	141.8887	153.3935 (64)
Efficiency of water heater (217)m	89.0467	88.8538	88.5998	88.2517	87.8160	87.3000	87.3000	87.3000	87.3000	88.1294	88.7655	87.3000 (216)
Fuel for water heating, kWh/month	177.3710	155.8976	162.3763	143.6063	139.5858	122.8065	115.4252	130.1372	131.0047	149.2528	159.8467	172.0997 (219)
Water heating fuel used												1759.4099 (219)
Annual totals kWh/year												
Space heating fuel - main system												993.3123 (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)												38.3160 (230a)
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												113.3160 (231)
Electricity for lighting (calculated in Appendix L)												335.7397 (232)
Total delivered energy for all uses												3201.7779 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	993.3123	3.4800	34.5673 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1759.4099	3.4800	61.2275 (247)
Mechanical ventilation fans	38.3160	13.1900	5.0539 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	335.7397	13.1900	44.2841 (250)
Additional standing charges			120.0000 (251)
Total energy cost			275.0252 (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] = 0.9948 (257)
SAP value	86.1232
SAP rating (Section 12)	86 (258)
SAP band	B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	993.3123	0.2160	214.5555 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1759.4099	0.2160	380.0325 (264)
Space and water heating			594.5880 (265)
Pumps and fans	113.3160	0.5190	58.8110 (267)
Energy for lighting	335.7397	0.5190	174.2489 (268)
Total kg/year			827.6479 (272)
CO2 emissions per m2			11.6400 (273)
EI value			90.4491
EI rating			90 (274)
EI band			B

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9050 = 3.845$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9050 = 0.2387$, stars = 4
Water heating energy efficiency	$3.48 / 0.8815 = 3.948$, stars = 4
Water heating environmental impact	$0.216 / 0.8815 = 0.2450$, 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	71.1200 (1b)	x 2.4000 (2b)	= 170.6880 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.1200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.6880 (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					3.2200
Infiltration rate					0.1610 (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) =				0.1369 (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	0.1437	0.1369	0.1369	0.1266	0.1266	0.1129	0.1163	0.1095	0.1129	0.1197	0.1197	0.1300 (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)
WT-E-03	41.2400	10.2200	31.0200	0.1600	4.9632		(29a)
WT-I-02	7.4800	2.1200	5.3600	0.1584	0.8491		(29a)
Total net area of external elements Aum(A, m2)			48.7200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.5616		(33)
Party Wall 1			33.8400	0.0000	0.0000		(32)
Party Floor 1			71.1200				(32d)
Party Ceilings 1			71.1200				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.5768 (36)
Total fabric heat loss						(33) + (36) =	27.1384 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635 (38)
Heat transfer coeff	55.3019	55.3019	55.3019	55.3019	55.3019	55.3019	55.3019	55.3019	55.3019	55.3019	55.3019	55.3019 (39)
Average = Sum(39)m / 12 =												55.3019 (39)
HLP	0.7776	0.7776	0.7776	0.7776	0.7776	0.7776	0.7776	0.7776	0.7776	0.7776	0.7776	0.7776 (40)
HLP (average)												0.7776 (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												2.2730 (42)
Average daily hot water use (litres/day)												88.1839 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	97.0023	93.4749	89.9476	86.4202	82.8929	79.3655	79.3655	82.8929	86.4202	89.9476	93.4749	97.0023 (44)
Energy conte	143.8516	125.8135	129.8283	113.1874	108.6060	93.7188	86.8442	99.6550	100.8452	117.5253	128.2881	139.3126 (45)
Energy content (annual)	Total = Sum(45)m =											1387.4760 (45)
Distribution loss (46)m = 0.15 x (45)m	21.5777	18.8720	19.4742	16.9781	16.2909	14.0578	13.0266	14.9482	15.1268	17.6288	19.2432	20.8969 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Water storage loss:														
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	14.0915	12.7075	14.0368	13.5476	13.9726	13.4913	13.9220	13.9548	13.5220	14.0103	13.6006	14.0809	14.0809	(61)
Total heat required for water heating calculated for each month	157.9430	138.5210	143.8651	126.7350	122.5787	107.2101	100.7662	113.6098	114.3671	131.5356	141.8887	153.3935	153.3935	(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	157.9430	138.5210	143.8651	126.7350	122.5787	107.2101	100.7662	113.6098	114.3671	131.5356	141.8887	153.3935	153.3935	(64)
Heat gains from water heating, kWh/month	51.3535	45.0099	46.6771	41.0217	39.6047	34.5343	32.3562	36.6240	36.9115	42.5797	46.0559	49.8417	49.8417	(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	136.3804	136.3804	136.3804	136.3804	136.3804	136.3804	136.3804	136.3804	136.3804	136.3804	136.3804	136.3804	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	47.5274	42.2134	34.3303	25.9902	19.4280	16.4019	17.7229	23.0369	30.9200	39.2601	45.8223	48.8484	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	298.3535	301.4494	293.6477	277.0387	256.0728	236.3678	223.2036	220.1076	227.9094	244.5184	265.4843	285.1893	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.9110	50.9110	50.9110	50.9110	50.9110	50.9110	50.9110	50.9110	50.9110	50.9110	50.9110	50.9110	(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)	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	(71)
Water heating gains (Table 5)	69.0235	66.9790	62.7380	56.9746	53.2321	47.9643	43.4895	49.2258	51.2660	57.2308	63.9666	66.9915	(72)
Total internal gains	514.2756	510.0130	490.0872	459.3746	428.1040	400.1052	383.7872	391.7414	409.4666	440.3805	474.6444	500.4003	(73)

6. Solar gains

[Jan]				Area	Solar flux		g		FF		Access		Gains
				m2	Table 6a						factor		W
					W/m2		Specific data		Specific data		Table 6d		
							or Table 6b		or Table 6c				
South				10.2200	50.9848		0.4500		0.0000		0.7700		180.5490 (78)
Solar gains	180.5490	265.3663	333.3669	389.6318	398.2891	411.8829	397.3472	392.0371	377.7133	305.2939	219.0656	154.6394	(83)
Total gains	694.8246	775.3793	823.4540	849.0064	826.3931	811.9880	781.1344	783.7786	787.1799	745.6744	693.7100	655.0397	(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	35.7231	35.7231	35.7231	35.7231	35.7231	35.7231	35.7231	35.7231	35.7231	35.7231	35.7231	35.7231	
alpha	3.3815	3.3815	3.3815	3.3815	3.3815	3.3815	3.3815	3.3815	3.3815	3.3815	3.3815	3.3815	
util living area	0.8530	0.8065	0.7356	0.6348	0.5032	0.3346	0.2185	0.2246	0.3956	0.6186	0.7853	0.8700	(86)
MIT	20.1733	20.3474	20.5779	20.7841	20.9234	20.9861	20.9977	20.9974	20.9731	20.8312	20.4978	20.1075	(87)
Th 2	20.2728	20.2728	20.2728	20.2728	20.2728	20.2728	20.2728	20.2728	20.2728	20.2728	20.2728	20.2728	(88)
util rest of house	0.8385	0.7890	0.7127	0.6047	0.4638	0.2878	0.1677	0.1741	0.3493	0.5829	0.7633	0.8566	(89)
MIT 2	19.5331	19.6969	19.9123	20.0991	20.2183	20.2653	20.2720	20.2719	20.2567	20.1430	19.8424	19.4710	(90)
Living area fraction	19.7473	19.9146	20.1350	20.3283	20.4543	20.5065	20.5149	20.5147	20.4965	20.3733	20.0617	19.6840	(91)
MIT	19.7473	19.9146	20.1350	20.3283	20.4543	20.5065	20.5149	20.5147	20.4965	20.3733	20.0617	19.6840	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.5973	19.7646	19.9850	20.1783	20.3043	20.3565	20.3649	20.3647	20.3465	20.2233	19.9117	19.5340	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.8236	0.7757	0.7031	0.6007	0.4656	0.2933	0.1741	0.1805	0.3541	0.5803	0.7514	0.8414	(94)
Useful gains	572.2383	601.4536	578.9734	509.9620	384.7541	238.1271	136.0056	141.4740	278.7161	432.7460	521.2650	551.1235	(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	801.7289	783.3284	695.9750	568.4117	403.9398	240.9248	136.3129	141.8328	284.6098	476.8867	658.7411	798.2300	(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	170.7410	122.2198	87.0492	42.0838	14.2742	0.0000	0.0000	0.0000	0.0000	32.8407	98.9829	183.8473	(98)
Space heating												752.0388	(98)
Space heating per m2												10.5742	(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												830.9821 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	170.7410	122.2198	87.0492	42.0838	14.2742	0.0000	0.0000	0.0000	0.0000	32.8407	98.9829	183.8473 (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)	188.6641	135.0495	96.1869	46.5014	15.7726	0.0000	0.0000	0.0000	0.0000	36.2880	109.3733	203.1461 (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	157.9430	138.5210	143.8651	126.7350	122.5787	107.2101	100.7662	113.6098	114.3671	131.5356	141.8887	153.3935 (64)
Efficiency of water heater (217)m	88.9335	88.7713	88.4794	88.0763	87.6232	87.3000	87.3000	87.3000	87.3000	87.9211	88.5872	87.3000 (216)
Fuel for water heating, kWh/month	177.5967	156.0426	162.5973	143.8922	139.8930	122.8065	115.4252	130.1372	131.0047	149.6064	160.1684	172.3215 (219)
Water heating fuel used												1761.4917 (219)
Annual totals kWh/year												
Space heating fuel - main system												830.9821 (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)												38.3160 (230a)
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												113.3160 (231)
Electricity for lighting (calculated in Appendix L)												335.7397 (232)
Total delivered energy for all uses												3041.5295 (238)

10a. Fuel costs - using BEDF prices (476)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	830.9821	3.8700	32.1590 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1761.4917	3.8700	68.1697 (247)
Mechanical ventilation fans	38.3160	18.9000	7.2417 (249)
Pumps and fans for heating	75.0000	18.9000	14.1750 (249)
Energy for lighting	335.7397	18.9000	63.4548 (250)
Additional standing charges			93.0000 (251)
Total energy cost			278.2003 (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	830.9821	0.2160	179.4921 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1761.4917	0.2160	380.4822 (264)
Space and water heating			559.9743 (265)
Pumps and fans	113.3160	0.5190	58.8110 (267)
Energy for lighting	335.7397	0.5190	174.2489 (268)
Total kg/year			793.0343 (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	830.9821	1.2200	1013.7982 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1761.4917	1.2200	2149.0198 (264)
Space and water heating			3162.8180 (265)
Pumps and fans	113.3160	3.0700	347.8802 (267)
Energy for lighting	335.7397	3.0700	1030.7208 (268)
Primary energy kWh/year			4541.4191 (272)
Primary energy kWh/m2/year			63.8557 (273)

SAP 2012 EPC IMPROVEMENTS

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



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

(For testing purposes):

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

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

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

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

Fuel prices for cost data on this page from database revision number 476 TEST (01 Apr 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	£193	£193	£0
Space heating	£147	£147	£0
Water heating	£68	£68	£0
Lighting	£63	£63	£0
Total cost of fuels	£278	£278	£0
Total cost of uses	£278	£278	£0
Delivered energy	43 kWh/m²	43 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.8 tonnes	0.8 tonnes	0.0 tonnes
CO2 emissions per m²	11 kg/m²	11 kg/m²	0 kg/m²
Primary energy	64 kWh/m²	64 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	North
Overshading	Average or unknown
Thermal mass parameter	100.0
Night ventilation	Yes
Ventilation rate during hot weather (ach)	6.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient	337.96 (P1)
Transmission heat loss coefficient	27.14 (37)
Summer heat loss coefficient	365.10 (P2)

Overhangs	Ratio	Z_overhangs	Overhang type
Orientation			
South	0.000	1.000	None
Solar shading			
Orientation	Z blinds	Solar access	Z overhangs Z summer
South	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
South	10.2200	112.2060	0.4500 0.0000
total:			0.9000 464.4318

Solar gains	Jun	Jul	Aug	
Internal gains	481	464	458	(P4)
Total summer gains	397	381	389	
	879	845	847	(P5)
Summer gain/loss ratio	2.41	2.32	2.32	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 100.0)	1.30	1.30	1.30	
Threshold temperature	19.71	21.52	21.42	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	
Assessment of likelihood of high internal temperature:	Slight			