

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



Property Reference	SECPMW026_072_As_Built				Issued on Date	11/01/2022
Assessment Reference	001	Prop Type Ref	MFF			
Property						
SAP Rating	84 B	DER	18.14	TER	19.28	
Environmental	87 B	% DER<TER	5.90			
CO ₂ Emissions (t/year)	1.05	DFEE	47.14	TFEE	53.09	
General Requirements Compliance	Pass	% DFEE<TFEE	11.21			
Assessor Details	Mr. Stephen Smith, Southern Energy Consultants Limited, Tel: 01635261582, info@southernenergyconsultants.co.uk				Assessor ID	d168-0001
Client	Bellway Homes Thames Valley					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

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) 19.28 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 18.14 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 53.1 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 47.1 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.28 (max. 0.30)	0.33 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.25 (max. 2.00)	1.30 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.71 (measured in this dwelling)
Maximum 10.0 OK

4 Heating efficiency

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

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls:

No cylinder

Boiler interlock

Yes

OK

7 Low energy lights

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

8 Mechanical ventilation

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

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK
Based on:
Overshading: Average
Windows facing North West: 11.66 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 3.7 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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	70.8200 (1b)	x 2.4000 (2b)	= 169.9680 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.9680 (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					3.7100
Infiltration rate					0.1855 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1438 (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	0.1833	0.1797	0.1761	0.1581	0.1545	0.1366	0.1366	0.1330	0.1438	0.1545	0.1617	0.1689 (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)			11.6600	1.2357	14.4087		(27)
FT-03			70.8200	0.1247	8.8279		(28b)
WT-E-02	24.3600	11.6600	12.7000	0.2000	2.5400		(29a)
WT-I-01	24.1200	2.1200	22.0000	0.3300	7.2600		(29a)
Total net area of external elements Aum(A, m2)			119.3000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.1566		(33)
Party Wall 1			34.1700	0.0000	0.0000		(32)
Party Ceilings 1			70.8200				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.5215 (36)
Total fabric heat loss							(33) + (36) = 48.6781 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	28.0447	28.0447	28.0447	28.0447	28.0447	28.0447	28.0447	28.0447	28.0447	28.0447	28.0447	28.0447 (38)
Average = Sum(39)m / 12 =	76.7228	76.7228	76.7228	76.7228	76.7228	76.7228	76.7228	76.7228	76.7228	76.7228	76.7228	76.7228 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0833	1.0833	1.0833	1.0833	1.0833	1.0833	1.0833	1.0833	1.0833	1.0833	1.0833	1.0833 (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)												2.2659 (42)
												88.0143 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	96.8158	93.2952	89.7746	86.2541	82.7335	79.2129	79.2129	82.7335	86.2541	89.7746	93.2952	96.8158 (44)
Energy content (annual)	143.5750	125.5716	129.5786	112.9698	108.3972	93.5386	86.6772	99.4634	100.6513	117.2994	128.0414	139.0447 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1384.8083 (45)
	21.5362	18.8357	19.4368	16.9455	16.2596	14.0308	13.0016	14.9195	15.0977	17.5949	19.2062	20.8567 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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	14.0902	12.7064	14.0357	13.5467	13.9718	13.4906	13.9213	13.9541	13.5212	14.0093	13.5995	14.0796	(61)
Total heat required for water heating calculated for each month	157.6652	138.2781	143.6144	126.5165	122.3690	107.0292	100.5986	113.4174	114.1724	131.3087	141.6409	153.1244	(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	157.6652	138.2781	143.6144	126.5165	122.3690	107.0292	100.5986	113.4174	114.1724	131.3087	141.6409	153.1244	(64)
Heat gains from water heating, kWh/month	51.2612	44.9292	46.5938	40.9491	39.5350	34.4742	32.3005	36.5601	36.8468	42.5044	45.9737	49.7523	(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	113.2933	113.2933	113.2933	113.2933	113.2933	113.2933	113.2933	113.2933	113.2933	113.2933	113.2933	113.2933	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4253	16.3652	13.3091	10.0758	7.5318	6.3587	6.8708	8.9309	11.9870	15.2202	17.7643	18.9374	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.2033	201.2704	196.0613	184.9719	170.9735	157.8169	149.0276	146.9605	152.1695	163.2589	177.2574	190.4139	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3293	34.3293	34.3293	34.3293	34.3293	34.3293	34.3293	34.3293	34.3293	34.3293	34.3293	34.3293	(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)	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	(71)
Water heating gains (Table 5)	68.8995	66.8589	62.6261	56.8738	53.1385	47.8809	43.4147	49.1399	51.1762	57.1295	63.8523	66.8713	(72)
Total internal gains	346.5161	344.4825	331.9845	311.9095	291.6318	272.0445	259.3010	265.0192	275.3207	295.5967	318.8619	336.2106	(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

Northwest													
				11.6600		11.2829	0.4500		0.0000		0.7700		45.5852 (81)

Solar gains	45.5852	92.7900	167.1782	274.5546	369.0552	393.4519	368.0662	293.4266	203.7092	113.3968	57.3580	37.2272	(83)
Total gains	392.1013	437.2725	499.1627	586.4641	660.6869	665.4964	627.3672	558.4459	479.0299	408.9935	376.2199	373.4378	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	64.1016	64.1016	64.1016	64.1016	64.1016	64.1016	64.1016	64.1016	64.1016	64.1016	64.1016	64.1016		
alpha	5.2734	5.2734	5.2734	5.2734	5.2734	5.2734	5.2734	5.2734	5.2734	5.2734	5.2734	5.2734		
util living area	0.9987	0.9973	0.9919	0.9654	0.8711	0.6921	0.5284	0.6101	0.8795	0.9854	0.9973	0.9990	(86)	
MIT	19.8057	19.9272	20.1712	20.5138	20.8147	20.9592	20.9919	20.9836	20.8549	20.4699	20.0721	19.7705	(87)	
Th 2	20.0145	20.0145	20.0145	20.0145	20.0145	20.0145	20.0145	20.0145	20.0145	20.0145	20.0145	20.0145	(88)	
util rest of house	0.9982	0.9964	0.9889	0.9520	0.8255	0.6036	0.4151	0.4903	0.8170	0.9778	0.9962	0.9986	(89)	
MIT 2	18.9214	19.0426	19.2852	19.6193	19.8903	19.9960	20.0124	20.0097	19.9307	19.5817	19.1875	18.8863	(90)	
Living area fraction	19.2491	19.3705	19.6136	19.9508	20.2329	20.3530	20.3754	20.3707	20.2732	19.9109	19.5154	19.2140	(91)	
MIT	19.0991	19.2205	19.4636	19.8008	20.0829	20.2030	20.2254	20.2207	20.1232	19.7609	19.3654	19.0640	(92)	
Temperature adjustment												-0.1500		
adjusted MIT												19.0640	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9976	0.9953	0.9867	0.9485	0.8291	0.6216	0.4400	0.5164	0.8251	0.9751	0.9952	0.9981	(94)
Useful gains	391.1575	435.2230	492.5183	556.2432	547.7662	413.6450	276.0177	288.3980	395.2548	398.8134	374.4193	372.7403	(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	1135.4316	1098.7090	994.6052	836.3422	643.1616	429.8801	278.1543	293.1340	462.1199	702.8490	941.0336	1140.4092	(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	553.7399	445.8626	373.5527	201.6713	70.9742	0.0000	0.0000	0.0000	0.0000	226.2025	407.9623	571.1457	(98)
Space heating												2851.1111	(98)
Space heating per m2												40.2586	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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													3150.3990 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	553.7399	445.8626	373.5527	201.6713	70.9742	0.0000	0.0000	0.0000	0.0000	226.2025	407.9623	571.1457	(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)	611.8673	492.6658	412.7654	222.8412	78.4245	0.0000	0.0000	0.0000	0.0000	249.9475	450.7871	631.1002	(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	157.6652	138.2781	143.6144	126.5165	122.3690	107.0292	100.5986	113.4174	114.1724	131.3087	141.6409	153.1244	(64)
Efficiency of water heater (217)m	89.7707	89.7215	89.5881	89.2390	88.4481	87.3000	87.3000	87.3000	87.3000	89.2978	89.6531	87.3000	(216)
Fuel for water heating, kWh/month	175.6309	154.1192	160.3052	141.7726	138.3513	122.5993	115.2332	129.9169	130.7817	147.0458	157.9878	170.5094	(219)
Water heating fuel used												1744.2534	(219)
Annual totals kWh/year													
Space heating fuel - main system												3150.3990	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 5.3360, total flow = 29.0000, SFP = 0.1840)													
mechanical ventilation fans (SFP = 0.1840)													38.1544 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													113.1544 (231)
Electricity for lighting (calculated in Appendix L)													325.3965 (232)
Total delivered energy for all uses													5333.2034 (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	3150.3990	0.2160	680.4862	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1744.2534	0.2160	376.7587	(264)
Space and water heating			1057.2449	(265)
Pumps and fans	113.1544	0.5190	58.7271	(267)
Energy for lighting	325.3965	0.5190	168.8808	(268)
Total CO2, kg/year			1284.8529	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			18.1400	(273)

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

DER			18.1400	ZC1
Total Floor Area		TFA	70.8200	
Assumed number of occupants		N	2.2659	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			16.6681	ZC2
CO2 emissions from cooking, equation (L16)			2.4482	ZC3
Total CO2 emissions			37.2563	ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000	ZC7
Net CO2 emissions			37.2563	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	70.8200 (1b)	x 2.4000 (2b)	= 169.9680 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.9680 (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) =				30.0000 / (5) = 0.1765 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4265 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3305 (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	0.4214	0.4132	0.4049	0.3636	0.3553	0.3140	0.3140	0.3057	0.3305	0.3553	0.3719	0.3884 (22b)
	0.5888	0.5854	0.5820	0.5661	0.5631	0.5493	0.5493	0.5467	0.5546	0.5631	0.5691	0.5754 (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)			11.6600	1.3258	15.4583		(27)
FT-03			70.8200	0.1300	9.2066		(28b)
WT-E-02	24.3600	11.6600	12.7000	0.1800	2.2860		(29a)
WT-I-01	24.1200	2.1200	22.0000	0.1800	3.9600		(29a)
Total net area of external elements Aum, m ²			119.3000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.0309		(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)							12.3815 (36)
Total fabric heat loss						(33) + (36) =	45.4124 (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	33.0258	32.8323	32.6428	31.7523	31.5856	30.8101	30.8101	30.6664	31.1088	31.5856	31.9227	32.2751 (38)
Heat transfer coeff	78.4382	78.2448	78.0552	77.1647	76.9981	76.2225	76.2225	76.0789	76.5212	76.9981	77.3351	77.6875 (39)
Average = Sum(39)m / 12 =												77.1639 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1076	1.1048	1.1022	1.0896	1.0872	1.0763	1.0763	1.0743	1.0805	1.0872	1.0920	1.0970 (40)
HLP (average)												1.0896 (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												2.2659 (42)
Average daily hot water use (litres/day)												88.0143 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.8158	93.2952	89.7746	86.2541	82.7335	79.2129	79.2129	82.7335	86.2541	89.7746	93.2952	96.8158 (44)
Energy conte	143.5750	125.5716	129.5786	112.9698	108.3972	93.5386	86.6772	99.4634	100.6513	117.2994	128.0414	139.0447 (45)
Energy content (annual)												Total = Sum(45)m = 1384.8083 (45)
Distribution loss (46)m = 0.15 x (45)m	21.5362	18.8357	19.4368	16.9455	16.2596	14.0308	13.0016	14.9195	15.0977	17.5949	19.2062	20.8567 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	49.3363	42.9414	45.7482	42.5362	42.1601	39.0639	40.3660	42.1601	42.5362	45.7482	46.0086	49.3363 (61)
Total heat required for water heating calculated for each month	192.9112	168.5130	175.3268	155.5061	150.5573	132.6025	127.0433	141.6235	143.1875	163.0475	174.0500	188.3810 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	192.9112	168.5130	175.3268	155.5061	150.5573	132.6025	127.0433	141.6235	143.1875	163.0475	174.0500	188.3810 (64)
Heat gains from water heating, kWh/month	60.0727	52.4879	54.5219	48.1965	46.5821	40.8675	38.9117	43.6116	44.1006	50.4391	54.0759	58.5664 (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	113.2933	113.2933	113.2933	113.2933	113.2933	113.2933	113.2933	113.2933	113.2933	113.2933	113.2933	113.2933 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4253	16.3652	13.3091	10.0758	7.5318	6.3587	6.8708	8.9309	11.9870	15.2202	17.7643	18.9374 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.2033	201.2704	196.0613	184.9719	170.9735	157.8169	149.0276	146.9605	152.1695	163.2589	177.2574	190.4139 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3293	34.3293	34.3293	34.3293	34.3293	34.3293	34.3293	34.3293	34.3293	34.3293	34.3293	34.3293 (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)	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347 (71)
Water heating gains (Table 5)	80.7429	78.1070	73.2822	66.9396	62.6103	56.7605	52.3007	58.6177	61.2509	67.7945	75.1055	78.7183 (72)
Total internal gains	358.3595	355.7306	342.6406	321.9753	301.1036	280.9241	268.1870	274.4971	285.3953	306.2616	330.1151	348.0576 (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

Northwest				11.6600	11.2829	0.6300	0.7000				0.7700	40.2062 (81)

Solar gains	40.2062	81.8408	147.4511	242.1571	325.5067	347.0246	324.6344	258.8023	179.6715	100.0160	50.5898	32.8344 (83)
Total gains	398.5657	437.5714	490.0917	564.1325	626.6103	627.9487	592.8213	533.2993	465.0669	406.2776	380.7048	380.8920 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	62.6997	62.8547	63.0074	63.7345	63.8724	64.5224	64.5224	64.6442	64.2705	63.8724	63.5941	63.3056
alpha	5.1800	5.1903	5.2005	5.2490	5.2582	5.3015	5.3015	5.3096	5.2847	5.2582	5.2396	5.2204
util living area	0.9985	0.9973	0.9927	0.9706	0.8906	0.7198	0.5534	0.6303	0.8891	0.9859	0.9972	0.9989 (86)
MIT	19.7812	19.8991	20.1367	20.4822	20.7880	20.9518	20.9902	20.9814	20.8462	20.4631	20.0681	19.7618 (87)
Th 2	19.9947	19.9969	19.9991	20.0093	20.0113	20.0202	20.0202	20.0219	20.0168	20.0113	20.0074	20.0033 (88)
util rest of house	0.9980	0.9964	0.9899	0.9590	0.8489	0.6316	0.4366	0.5091	0.8294	0.9785	0.9960	0.9985 (89)
MIT 2	18.3636	18.5373	18.8851	19.3882	19.7991	19.9877	20.0165	20.0139	19.8849	19.3686	18.7923	18.3413 (90)
Living area fraction									fLA = Living area / (4) =			0.3707 (91)
MIT	18.8890	19.0421	19.3490	19.7937	20.1656	20.3451	20.3774	20.3725	20.2412	19.7743	19.2651	18.8678 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8890	19.0421	19.3490	19.7937	20.1656	20.3451	20.3774	20.3725	20.2412	19.7743	19.2651	18.8678 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9972	0.9951	0.9875	0.9558	0.8563	0.6625	0.4802	0.5543	0.8452	0.9761	0.9948	0.9978 (94)
Ext temp.	397.4629	435.4206	483.9708	539.2010	536.5760	416.0413	284.6712	295.6217	393.0875	396.5555	378.7177	380.0600 (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	1144.3383	1106.5434	1002.9344	840.6121	651.8377	437.9021	287.9245	302.2254	469.9341	706.4003	940.7930	1139.5071 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating per m ²	555.6753	450.9945	386.1089	217.0160	85.7546	0.0000	0.0000	0.0000	0.0000	230.5245	404.6942	565.0287 (98)
												2895.7967 (98)
												40.8895 (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)
---	--------------

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3100.4247 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	555.6753	450.9945	386.1089	217.0160	85.7546	0.0000	0.0000	0.0000	0.0000	230.5245	404.6942	565.0287	(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)	594.9414	482.8635	413.3928	232.3511	91.8144	0.0000	0.0000	0.0000	0.0000	246.8142	433.2914	604.9557	(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	192.9112	168.5130	175.3268	155.5061	150.5573	132.6025	127.0433	141.6235	143.1875	163.0475	174.0500	188.3810	(64)
Efficiency of water heater	87.5618	87.4095	86.9834	85.8903	83.6932	80.3000	80.3000	80.3000	80.3000	85.9228	87.1051	80.3000	(216)
Fuel for water heating, kWh/month	220.3143	192.7857	201.5635	181.0519	179.8918	165.1338	158.2108	176.3679	178.3157	189.7605	199.8160	214.9396	(219)
Water heating fuel used												2258.1516	(219)
Annual totals kWh/year													
Space heating fuel - main system													3100.4247 (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)													325.3965 (232)
Total delivered energy for all uses													5758.9728 (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	3100.4247	0.2160	669.6917 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2258.1516	0.2160	487.7607 (264)
Space and water heating			1157.4525 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	325.3965	0.5190	168.8808 (268)
Total CO2, kg/m2/year			1365.2583 (272)
Emissions per m2 for space and water heating			16.3436 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3846 (272b)
Emissions per m2 for pumps and fans			0.5496 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.3436 * 1.00) + 2.3846 + 0.5496, rounded to 2 d.p.			19.2800 (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	70.8200 (1b)	x 2.4000 (2b)	= 169.9680 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.9680 (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) = 0.1765 (8)
Measured/design AP50					Yes
Infiltration rate					3.7100
Number of sides sheltered					0.3620 (18)
					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.2806 (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	0.3577	0.3507	0.3437	0.3086	0.3016	0.2665	0.2665	0.2595	0.2806	0.3016	0.3156	0.3296 (22b)
	0.5640	0.5615	0.5591	0.5476	0.5455	0.5355	0.5355	0.5337	0.5394	0.5455	0.5498	0.5543 (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)			11.6600	1.2357	14.4087		(27)
FT-03			70.8200	0.1247	8.8279		(28b)
WT-E-02	24.3600	11.6600	12.7000	0.2000	2.5400		(29a)
WT-I-01	24.1200	2.1200	22.0000	0.3300	7.2600		(29a)
Total net area of external elements Aum, m ²			119.3000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 35.1566		(33)
Party Wall 1			34.1700	0.0000	0.0000		(32)
Party Ceilings 1			70.8200				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.5215 (36)
Total fabric heat loss						(33) + (36) =	48.6781 (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	31.6331	31.4938	31.3572	30.7157	30.5956	30.0369	30.0369	29.9334	30.2521	30.5956	30.8385	31.0923 (38)
Heat transfer coeff	80.3112	80.1719	80.0353	79.3938	79.2738	78.7150	78.7150	78.6115	78.9302	79.2738	79.5166	79.7704 (39)
Average = Sum(39)m / 12 =												79.3932 (39)
HLP	1.1340	1.1321	1.1301	1.1211	1.1194	1.1115	1.1115	1.1100	1.1145	1.1194	1.1228	1.1264 (40)
HLP (average)												1.1211 (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												2.2659 (42)
Average daily hot water use (litres/day)												88.0143 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	96.8158	93.2952	89.7746	86.2541	82.7335	79.2129	79.2129	82.7335	86.2541	89.7746	93.2952	96.8158 (44)
Energy content (annual)	143.5750	125.5716	129.5786	112.9698	108.3972	93.5386	86.6772	99.4634	100.6513	117.2994	128.0414	139.0447 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1384.8083 (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	30.5097	26.6840	27.5355	24.0061	23.0344	19.8769	18.4189	21.1360	21.3884	24.9261	27.2088	29.5470 (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	113.2933	113.2933	113.2933	113.2933	113.2933	113.2933	113.2933	113.2933	113.2933	113.2933	113.2933	113.2933	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4253	16.3652	13.3091	10.0758	7.5318	6.3587	6.8708	8.9309	11.9870	15.2202	17.7643	18.9374	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.2033	201.2704	196.0613	184.9719	170.9735	157.8169	149.0276	146.9605	152.1695	163.2589	177.2574	190.4139	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3293	34.3293	34.3293	34.3293	34.3293	34.3293	34.3293	34.3293	34.3293	34.3293	34.3293	34.3293	(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)	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	(71)
Water heating gains (Table 5)	41.0076	39.7083	37.0100	33.3418	30.9602	27.6069	24.7566	28.4086	29.7061	33.5028	37.7900	39.7137	(72)
Total internal gains	315.6242	314.3318	303.3684	285.3775	266.4535	248.7705	237.6429	241.2879	250.8506	268.9700	289.7996	306.0530	(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	
Northwest					11.6600	11.2829	0.4500	0.0000	0.7700		45.5852 (81)	
Solar gains	45.5852	92.7900	167.1782	274.5546	369.0552	393.4519	368.0662	293.4266	203.7092	113.3968	57.3580	37.2272 (83)
Total gains	361.2094	407.1219	470.5466	559.9321	635.5087	642.2224	605.7091	534.7145	454.5598	382.3668	347.1576	343.2802 (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	61.2375	61.3439	61.4486	61.9451	62.0389	62.4793	62.4793	62.5615	62.3089	62.0389	61.8494	61.6526	
alpha	5.0825	5.0896	5.0966	5.1297	5.1359	5.1653	5.1653	5.1708	5.1539	5.1359	5.1233	5.1102	
util living area	0.9991	0.9981	0.9940	0.9728	0.8924	0.7223	0.5577	0.6445	0.9030	0.9895	0.9982	0.9993	(86)
MIT	19.6962	19.8233	20.0779	20.4455	20.7731	20.9467	20.9886	20.9773	20.8209	20.4051	19.9888	19.6720	(87)
Th 2	19.9731	19.9747	19.9763	19.9837	19.9850	19.9915	19.9915	19.9927	19.9890	19.9850	19.9823	19.9793	(88)
util rest of house	0.9987	0.9974	0.9917	0.9618	0.8505	0.6322	0.4371	0.5188	0.8467	0.9838	0.9974	0.9990	(89)
MIT 2	18.7788	18.9070	19.1619	19.5285	19.8300	19.9669	19.9886	19.9860	19.8823	19.4945	19.0785	18.7597	(90)
Living area fraction	19.1189	19.2466	19.5014	19.8684	20.1795	20.3301	20.3592	20.3534	20.2302	19.8321	19.4159	19.0978	(91)
MIT	19.1189	19.2466	19.5014	19.8684	20.1795	20.3301	20.3592	20.3534	20.2302	19.8321	19.4159	19.0978	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1189	19.2466	19.5014	19.8684	20.1795	20.3301	20.3592	20.3534	20.2302	19.8321	19.4159	19.0978	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9984	0.9967	0.9903	0.9603	0.8596	0.6643	0.4823	0.5660	0.8625	0.9827	0.9968	0.9988	(94)
Ext temp.	360.6218	405.7880	465.9962	537.7007	546.2716	426.6409	292.1207	302.6283	392.0520	375.7356	346.0519	342.8518	(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	1190.1212	1150.1976	1040.5725	870.8227	672.2053	451.0442	295.9077	310.7832	483.8580	731.8599	979.3208	1188.4066	(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	617.1475	500.2432	427.4847	239.8478	93.6946	0.0000	0.0000	0.0000	0.0000	264.9565	455.9536	629.0928	(98)
Space heating per m2												3228.4208	(98)
												(98) / (4) =	45.5863 (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	739.9211	582.4910	597.4477	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8840	0.9360	0.9006	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	654.0725	545.1902	538.0401	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	835.1084	790.7483	709.2243	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	130.3459	182.6952	127.3611	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												440.4022	(104)
Cooled fraction												1.0000	(105)
												fC = cooled area / (4) =	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	32.5865	45.6738	31.8403	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											110.1005 (107)
Space cooling per m2											1.5547 (108)
Energy for space heating											45.5863 (99)
Energy for space cooling											1.5547 (108)
Total											47.1409 (109)
Dwelling Fabric Energy Efficiency (DFEE)											47.1 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	70.8200 (1b)	x 2.4000 (2b)	= 169.9680 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.9680 (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) = 0.1765 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4265 (18)
Number of sides sheltered					3 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3305 (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	0.4214	0.4132	0.4049	0.3636	0.3553	0.3140	0.3140	0.3057	0.3305	0.3553	0.3719	0.3884 (22b)
	0.5888	0.5854	0.5820	0.5661	0.5631	0.5493	0.5493	0.5467	0.5546	0.5631	0.5691	0.5754 (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)			11.6600	1.3258	15.4583		(27)
FT-03			70.8200	0.1300	9.2066		(28b)
WT-E-02	24.3600	11.6600	12.7000	0.1800	2.2860		(29a)
WT-I-01	24.1200	2.1200	22.0000	0.1800	3.9600		(29a)
Total net area of external elements Aum, m ²			119.3000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.0309		(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)							12.3815 (36)
Total fabric heat loss						(33) + (36) =	45.4124 (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	33.0258	32.8323	32.6428	31.7523	31.5856	30.8101	30.8101	30.6664	31.1088	31.5856	31.9227	32.2751 (38)
Heat transfer coeff	78.4382	78.2448	78.0552	77.1647	76.9981	76.2225	76.2225	76.0789	76.5212	76.9981	77.3351	77.6875 (39)
Average = Sum(39)m / 12 =												77.1639 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1076	1.1048	1.1022	1.0896	1.0872	1.0763	1.0763	1.0743	1.0805	1.0872	1.0920	1.0970 (40)
HLP (average)												1.0896 (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												2.2659 (42)
Average daily hot water use (litres/day)												88.0143 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.8158	93.2952	89.7746	86.2541	82.7335	79.2129	79.2129	82.7335	86.2541	89.7746	93.2952	96.8158 (44)
Energy conte	143.5750	125.5716	129.5786	112.9698	108.3972	93.5386	86.6772	99.4634	100.6513	117.2994	128.0414	139.0447 (45)
Energy content (annual)												Total = Sum(45)m = 1384.8083 (45)
Distribution loss (46)m = 0.15 x (45)m												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	30.5097	26.6840	27.5355	24.0061	23.0344	19.8769	18.4189	21.1360	21.3884	24.9261	27.2088	29.5470 (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	113.2933	113.2933	113.2933	113.2933	113.2933	113.2933	113.2933	113.2933	113.2933	113.2933	113.2933	113.2933 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	18.4253	16.3652	13.3091	10.0758	7.5318	6.3587	6.8708	8.9309	11.9870	15.2202	17.7643	18.9374 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	199.2033	201.2704	196.0613	184.9719	170.9735	157.8169	149.0276	146.9605	152.1695	163.2589	177.2574	190.4139 (68)
Pumps, fans	34.3293	34.3293	34.3293	34.3293	34.3293	34.3293	34.3293	34.3293	34.3293	34.3293	34.3293	34.3293 (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)	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347 (71)
Total internal gains	41.0076	39.7083	37.0100	33.3418	30.9602	27.6069	24.7566	28.4086	29.7061	33.5028	37.7900	39.7137 (72)
	315.6242	314.3318	303.3684	285.3775	266.4535	248.7705	237.6429	241.2879	250.8506	268.9700	289.7996	306.0530 (73)

6. Solar gains

[Jan]												Gains	
	Area				Solar flux		g		FF		Access		W
	m2				Table 6a		Specific data		Specific data		factor		
					W/m2		or Table 6b		or Table 6c		Table 6d		
Northwest	11.6600				11.2829		0.6300		0.7000		0.7700		40.2062 (81)
Solar gains	40.2062	81.8408	147.4511	242.1571	325.5067	347.0246	324.6344	258.8023	179.6715	100.0160	50.5898	32.8344 (83)	
Total gains	355.8304	396.1727	450.8196	527.5346	591.9602	595.7950	562.2773	500.0902	430.5221	368.9860	340.3894	338.8874 (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	62.6997	62.8547	63.0074	63.7345	63.8724	64.5224	64.5224	64.6442	64.2705	63.8724	63.5941	63.3056	63.3056
util living area	5.1800	5.1903	5.2005	5.2490	5.2582	5.3015	5.3015	5.3096	5.2847	5.2582	5.2396	5.2204	5.2204
	0.9991	0.9983	0.9950	0.9776	0.9085	0.7470	0.5803	0.6645	0.9131	0.9908	0.9983	0.9994 (86)	
MIT	19.7245	19.8444	20.0860	20.4396	20.7608	20.9425	20.9878	20.9763	20.8188	20.4162	20.0147	19.7058 (87)	
Th 2	19.9947	19.9969	19.9991	20.0093	20.0113	20.0202	20.0202	20.0219	20.0168	20.0113	20.0074	20.0033 (88)	
util rest of house	0.9989	0.9977	0.9930	0.9684	0.8711	0.6595	0.4594	0.5403	0.8613	0.9857	0.9976	0.9991 (89)	
MIT 2	18.8244	18.9459	19.1884	19.5449	19.8445	19.9931	20.0170	20.0147	19.9067	19.5271	19.1247	18.8127 (90)	
Living area fraction	19.1580	19.2790	19.5211	19.8765	20.1841	20.3450	20.3768	20.3711	20.2448	19.8566	19.4546	19.1438 (92)	
MIT													0.3707 (91)
Temperature adjustment													0.0000
adjusted MIT	19.1580	19.2790	19.5211	19.8765	20.1841	20.3450	20.3768	20.3711	20.2448	19.8566	19.4546	19.1438 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9985	0.9971	0.9918	0.9669	0.8786	0.6905	0.5047	0.5869	0.8755	0.9846	0.9971	0.9989 (94)	
Ext temp.	355.3003	395.0317	447.1364	510.0534	520.0736	411.4097	283.7809	293.5275	376.9273	363.3104	339.4057	338.4995 (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	1165.4375	1125.0780	1016.3630	846.9991	653.2632	437.8992	287.8804	302.1189	470.2073	712.7429	955.4420	1160.9429 (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	602.7421	490.5911	423.5046	242.6009	99.0931	0.0000	0.0000	0.0000	0.0000	259.9778	443.5461	611.8979 (98)	
Space heating per m2												3173.9536 (98)	
												(98) / (4) =	44.8172 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (100)	
Useful 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 (101)	
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (102)	
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (103)	
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (103a)	
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	110.7379	159.7714	112.1577	0.0000	0.0000	0.0000	0.0000 (104)	
Cooled fraction												382.6671 (104)	
Intermittency factor (Table 10b)												1.0000 (105)	
	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	27.6845	39.9429	28.0394	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling													95.6668 (107)
Space cooling per m2													1.3508 (108)
Energy for space heating													44.8172 (99)
Energy for space cooling													1.3508 (108)
Total													46.1680 (109)
Target Fabric Energy Efficiency (TFEE)													53.1 (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	70.8200 (1b)	x 2.4000 (2b)	= 169.9680 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.9680 (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					3.7100
Infiltration rate					0.1855 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1438 (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	0.1510	0.1438	0.1438	0.1330	0.1330	0.1186	0.1222	0.1150	0.1186	0.1258	0.1258	0.1366 (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)			11.6600	1.2357	14.4087		(27)
FT-03			70.8200	0.1247	8.8279		(28b)
WT-E-02	24.3600	11.6600	12.7000	0.2000	2.5400		(29a)
WT-I-01	24.1200	2.1200	22.0000	0.3300	7.2600		(29a)
Total net area of external elements Aum(A, m2)			119.3000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.1566		(33)
Party Wall 1			34.1700	0.0000	0.0000		(32)
Party Ceilings 1			70.8200				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.5215 (36)
Total fabric heat loss							(33) + (36) = 48.6781 (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	28.0447	28.0447	28.0447	28.0447	28.0447	28.0447	28.0447	28.0447	28.0447	28.0447	28.0447	28.0447 (38)
Heat transfer coeff	76.7228	76.7228	76.7228	76.7228	76.7228	76.7228	76.7228	76.7228	76.7228	76.7228	76.7228	76.7228 (39)
Average = Sum(39)m / 12 =												76.7228 (39)
HLP	1.0833	1.0833	1.0833	1.0833	1.0833	1.0833	1.0833	1.0833	1.0833	1.0833	1.0833	1.0833 (40)
HLP (average)												1.0833 (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												2.2659 (42)
Average daily hot water use (litres/day)												88.0143 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.8158	93.2952	89.7746	86.2541	82.7335	79.2129	79.2129	82.7335	86.2541	89.7746	93.2952	96.8158 (44)
Energy conte	143.5750	125.5716	129.5786	112.9698	108.3972	93.5386	86.6772	99.4634	100.6513	117.2994	128.0414	139.0447 (45)
Energy content (annual)												Total = Sum(45)m = 1384.8083 (45)
Distribution loss (46)m = 0.15 x (45)m	21.5362	18.8357	19.4368	16.9455	16.2596	14.0308	13.0016	14.9195	15.0977	17.5949	19.2062	20.8567 (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	14.0902	12.7064	14.0357	13.5467	13.9718	13.4906	13.9213	13.9541	13.5212	14.0093	13.5995	14.0796	14.0796	(61)
Total heat required for water heating calculated for each month	157.6652	138.2781	143.6144	126.5165	122.3690	107.0292	100.5986	113.4174	114.1724	131.3087	141.6409	153.1244	153.1244	(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	157.6652	138.2781	143.6144	126.5165	122.3690	107.0292	100.5986	113.4174	114.1724	131.3087	141.6409	153.1244	153.1244	(64)
RHI water heating demand	51.2612	44.9292	46.5938	40.9491	39.5350	34.4742	32.3005	36.5601	36.8468	42.5044	45.9737	49.7523	49.7523	(65)
Heat gains from water heating, kWh/month	51.2612	44.9292	46.5938	40.9491	39.5350	34.4742	32.3005	36.5601	36.8468	42.5044	45.9737	49.7523	49.7523	(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	135.9520	135.9520	135.9520	135.9520	135.9520	135.9520	135.9520	135.9520	135.9520	135.9520	135.9520	135.9520	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	46.0632	40.9130	33.2727	25.1895	18.8295	15.8966	17.1769	22.3272	29.9675	38.0506	44.4106	47.3435	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	297.3183	300.4035	292.6289	276.0775	255.1843	235.5477	222.4292	219.3440	227.1187	243.6701	264.5632	284.1998	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.8611	50.8611	50.8611	50.8611	50.8611	50.8611	50.8611	50.8611	50.8611	50.8611	50.8611	50.8611	(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)	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	(71)
Water heating gains (Table 5)	68.8995	66.8589	62.6261	56.8738	53.1385	47.8809	43.4147	49.1399	51.1762	57.1295	63.8523	66.8713	(72)
Total internal gains	511.4595	507.3538	487.7060	457.3192	426.3307	398.5036	382.1992	389.9894	407.4407	438.0286	472.0046	497.5931	(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				

Northwest				11.6600	12.9236	0.4500	0.0000	0.7700	52.2136 (81)				

Solar gains	52.2136	96.1420	171.7296	290.2663	378.7266	431.1226	399.3537	326.7213	226.8338	125.6894	67.4212	42.1524	(83)
Total gains	563.6731	603.4958	659.4357	747.5855	805.0572	829.6262	781.5528	716.7107	634.2745	563.7180	539.4258	539.7454	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	64.1016	64.1016	64.1016	64.1016	64.1016	64.1016	64.1016	64.1016	64.1016	64.1016	64.1016	64.1016	
alpha	5.2734	5.2734	5.2734	5.2734	5.2734	5.2734	5.2734	5.2734	5.2734	5.2734	5.2734	5.2734	
util living area	0.9908	0.9856	0.9653	0.8900	0.7094	0.4581	0.3039	0.3418	0.6654	0.9243	0.9817	0.9924	(86)
MIT	20.1121	20.2124	20.4538	20.7499	20.9427	20.9952	20.9996	20.9992	20.9692	20.7313	20.3719	20.0814	(87)
Th 2	20.0145	20.0145	20.0145	20.0145	20.0145	20.0145	20.0145	20.0145	20.0145	20.0145	20.0145	20.0145	(88)
util rest of house	0.9877	0.9809	0.9537	0.8559	0.6397	0.3700	0.2075	0.2370	0.5678	0.8917	0.9745	0.9899	(89)
MIT 2	19.2258	19.3246	19.5595	19.8316	19.9833	20.0131	20.0144	20.0144	20.0021	19.8226	19.4827	19.1956	(90)
Living area fraction	19.5543	19.6536	19.8910	20.1720	20.3389	20.3771	20.3796	20.3794	20.3605	20.1594	19.8123	19.5239	(92)
Temperature adjustment										fLA = Living area / (4) =			
adjusted MIT	19.4043	19.5036	19.7410	20.0220	20.1889	20.2271	20.2296	20.2294	20.2105	20.0094	19.6623	19.3739	(93)
												-0.1500	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	555.3791	590.1224	626.2991	640.0467	525.4845	322.9165	178.6738	186.2781	373.1347	502.5684	523.9223	533.1071	(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	1097.4646	1066.7267	946.8348	776.5884	551.5558	324.3152	178.7314	186.3917	384.4221	645.1957	894.7657	1095.1361	(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	403.3116	320.2780	238.4786	98.3100	19.3970	0.0000	0.0000	0.0000	0.0000	106.1147	267.0073	418.1496	(98)
Space heating												1871.0468	(98)
RHI space heating demand												1871	(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	70.8200 (1b)	x 2.4000 (2b)	= 169.9680 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.9680 (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					3.7100
Infiltration rate					0.1855 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1438 (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	0.1833	0.1797	0.1761	0.1581	0.1545	0.1366	0.1366	0.1330	0.1438	0.1545	0.1617	0.1689 (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)			11.6600	1.2357	14.4087		(27)
FT-03			70.8200	0.1247	8.8279		(28b)
WT-E-02	24.3600	11.6600	12.7000	0.2000	2.5400		(29a)
WT-I-01	24.1200	2.1200	22.0000	0.3300	7.2600		(29a)
Total net area of external elements Aum(A, m2)			119.3000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.1566		(33)
Party Wall 1			34.1700	0.0000	0.0000		(32)
Party Ceilings 1			70.8200				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.5215 (36)
Total fabric heat loss							(33) + (36) = 48.6781 (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	28.0447	28.0447	28.0447	28.0447	28.0447	28.0447	28.0447	28.0447	28.0447	28.0447	28.0447	28.0447 (38)
Heat transfer coeff	76.7228	76.7228	76.7228	76.7228	76.7228	76.7228	76.7228	76.7228	76.7228	76.7228	76.7228	76.7228 (39)
Average = Sum(39)m / 12 =												76.7228 (39)
HLP	1.0833	1.0833	1.0833	1.0833	1.0833	1.0833	1.0833	1.0833	1.0833	1.0833	1.0833	1.0833 (40)
HLP (average)												1.0833 (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												2.2659 (42)
Average daily hot water use (litres/day)												88.0143 (43)
Daily hot water use	96.8158	93.2952	89.7746	86.2541	82.7335	79.2129	79.2129	82.7335	86.2541	89.7746	93.2952	96.8158 (44)
Energy conte	143.5750	125.5716	129.5786	112.9698	108.3972	93.5386	86.6772	99.4634	100.6513	117.2994	128.0414	139.0447 (45)
Energy content (annual)												Total = Sum(45)m = 1384.8083 (45)
Distribution loss (46)m = 0.15 x (45)m	21.5362	18.8357	19.4368	16.9455	16.2596	14.0308	13.0016	14.9195	15.0977	17.5949	19.2062	20.8567 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	14.0902	12.7064	14.0357	13.5467	13.9718	13.4906	13.9213	13.9541	13.5212	14.0093	13.5995	14.0796	(61)
Total heat required for water heating calculated for each month	157.6652	138.2781	143.6144	126.5165	122.3690	107.0292	100.5986	113.4174	114.1724	131.3087	141.6409	153.1244	(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	157.6652	138.2781	143.6144	126.5165	122.3690	107.0292	100.5986	113.4174	114.1724	131.3087	141.6409	153.1244	(64)
Heat gains from water heating, kWh/month	51.2612	44.9292	46.5938	40.9491	39.5350	34.4742	32.3005	36.5601	36.8468	42.5044	45.9737	49.7523	(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	135.9520	135.9520	135.9520	135.9520	135.9520	135.9520	135.9520	135.9520	135.9520	135.9520	135.9520	135.9520	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	46.0632	40.9130	33.2727	25.1895	18.8295	15.8966	17.1769	22.3272	29.9675	38.0506	44.4106	47.3435	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	297.3183	300.4035	292.6289	276.0775	255.1843	235.5477	222.4292	219.3440	227.1187	243.6701	264.5632	284.1998	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.8611	50.8611	50.8611	50.8611	50.8611	50.8611	50.8611	50.8611	50.8611	50.8611	50.8611	50.8611	(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)	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	(71)
Water heating gains (Table 5)	68.8995	66.8589	62.6261	56.8738	53.1385	47.8809	43.4147	49.1399	51.1762	57.1295	63.8523	66.8713	(72)
Total internal gains	511.4595	507.3538	487.7060	457.3192	426.3307	398.5036	382.1992	389.9894	407.4407	438.0286	472.0046	497.5931	(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
-----	-----											
Northwest			11.6600	11.2829		0.4500		0.0000		0.7700		45.5852 (81)
Solar gains	45.5852	92.7900	167.1782	274.5546	369.0552	393.4519	368.0662	293.4266	203.7092	113.3968	57.3580	37.2272 (83)
Total gains	557.0447	600.1439	654.8842	731.8738	795.3858	791.9555	750.2653	683.4161	611.1499	551.4254	529.3626	534.8203 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	64.1016	64.1016	64.1016	64.1016	64.1016	64.1016	64.1016	64.1016	64.1016	64.1016	64.1016	64.1016		
alpha	5.2734	5.2734	5.2734	5.2734	5.2734	5.2734	5.2734	5.2734	5.2734	5.2734	5.2734	5.2734		
util living area	0.9930	0.9884	0.9739	0.9221	0.7917	0.6001	0.4463	0.5086	0.7747	0.9512	0.9873	0.9943	(86)	
MIT	20.0225	20.1381	20.3628	20.6597	20.8875	20.9788	20.9963	20.9929	20.9249	20.6330	20.2700	19.9836	(87)	
Th 2	20.0145	20.0145	20.0145	20.0145	20.0145	20.0145	20.0145	20.0145	20.0145	20.0145	20.0145	20.0145	(88)	
util rest of house	0.9908	0.9848	0.9654	0.8973	0.7358	0.5161	0.3483	0.4037	0.6955	0.9302	0.9826	0.9925	(89)	
MIT 2	19.1368	19.2511	19.4713	19.7514	19.9438	20.0055	20.0136	20.0125	19.9759	19.7334	19.3826	19.0982	(90)	
Living area fraction	19.4651	19.5799	19.8017	20.0880	20.2936	20.3662	20.3778	20.3759	20.3276	20.0668	19.7115	19.4264	(91)	
MIT	19.3151	19.4299	19.6517	19.9380	20.1436	20.2162	20.2278	20.2259	20.1776	19.9168	19.5615	19.2764	(92)	
Temperature adjustment												-0.1500		
adjusted MIT	19.3151	19.4299	19.6517	19.9380	20.1436	20.2162	20.2278	20.2259	20.1776	19.9168	19.5615	19.2764	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9887	0.9820	0.9615	0.8951	0.7437	0.5338	0.3697	0.4267	0.7098	0.9276	0.9797	0.9907	(94)
Ext temp.	550.7439	589.3448	629.6934	655.1135	591.5657	422.7852	277.3962	291.5820	433.8023	511.5155	518.6409	529.8604	(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	1152.0027	1114.7763	1009.0362	846.8694	647.8145	430.8943	278.3362	293.5345	466.2939	714.8125	956.0823	1156.7036	(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	447.3365	353.0899	282.2311	138.0642	41.8491	0.0000	0.0000	0.0000	0.0000	151.2530	314.9579	466.3714	(98)
Space heating per m2												2195.1530	(98)
										(98) / (4) =		30.9962	(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													2425.5835 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	447.3365	353.0899	282.2311	138.0642	41.8491	0.0000	0.0000	0.0000	0.0000	151.2530	314.9579	466.3714	(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)	494.2945	390.1546	311.8575	152.5572	46.2421	0.0000	0.0000	0.0000	0.0000	167.1304	348.0197	515.3275	(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	157.6652	138.2781	143.6144	126.5165	122.3690	107.0292	100.5986	113.4174	114.1724	131.3087	141.6409	153.1244	(64)
Efficiency of water heater (217)m	89.6437	89.5760	89.3949	88.9411	88.0938	87.3000	87.3000	87.3000	87.3000	88.9842	89.4825	87.3000	(216)
Fuel for water heating, kWh/month	175.8798	154.3695	160.6516	142.2475	138.9076	122.5993	115.2332	129.9169	130.7817	147.5640	158.2890	170.7312	(219)
Water heating fuel used												1747.1713	(219)
Annual totals kWh/year													
Space heating fuel - main system												2425.5835	(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)													38.1544 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													113.1544 (231)
Electricity for lighting (calculated in Appendix L)													325.3965 (232)
Total delivered energy for all uses													4611.3057 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2425.5835	3.4800	84.4103 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1747.1713	3.4800	60.8016 (247)
Mechanical ventilation fans	38.1544	13.1900	5.0326 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	325.3965	13.1900	42.9198 (250)
Additional standing charges			120.0000 (251)
Total energy cost			323.0567 (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] = 1.1715 (257)
SAP value	83.6575
SAP rating (Section 12)	84 (258)
SAP band	B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2425.5835	0.2160	523.9260 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1747.1713	0.2160	377.3890 (264)
Space and water heating			901.3150 (265)
Pumps and fans	113.1544	0.5190	58.7271 (267)
Energy for lighting	325.3965	0.5190	168.8808 (268)
Total kg/year			1128.9230 (272)
CO2 emissions per m2			15.9400 (273)
EI value			86.9387
EI rating			87 (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	$3.48 / 0.8858 = 3.928$, stars = 4
Water heating environmental impact	$0.216 / 0.8858 = 0.2438$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	70.8200 (1b)	x 2.4000 (2b)	= 169.9680 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.9680 (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					3.7100
Infiltration rate					0.1855 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1438 (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	0.1510	0.1438	0.1438	0.1330	0.1330	0.1186	0.1222	0.1150	0.1186	0.1258	0.1258	0.1366 (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)			11.6600	1.2357	14.4087		(27)
FT-03			70.8200	0.1247	8.8279		(28b)
WT-E-02	24.3600	11.6600	12.7000	0.2000	2.5400		(29a)
WT-I-01	24.1200	2.1200	22.0000	0.3300	7.2600		(29a)
Total net area of external elements Aum(A, m2)			119.3000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.1566		(33)
Party Wall 1			34.1700	0.0000	0.0000		(32)
Party Ceilings 1			70.8200				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.5215 (36)
Total fabric heat loss						(33) + (36) =	48.6781 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	28.0447	28.0447	28.0447	28.0447	28.0447	28.0447	28.0447	28.0447	28.0447	28.0447	28.0447	28.0447 (38)
Average = Sum(39)m / 12 =	76.7228	76.7228	76.7228	76.7228	76.7228	76.7228	76.7228	76.7228	76.7228	76.7228	76.7228	76.7228 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0833	1.0833	1.0833	1.0833	1.0833	1.0833	1.0833	1.0833	1.0833	1.0833	1.0833	1.0833 (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													2.2659 (42)
Average daily hot water use (litres/day)													88.0143 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	96.8158	93.2952	89.7746	86.2541	82.7335	79.2129	79.2129	82.7335	86.2541	89.7746	93.2952	96.8158 (44)	
Energy conte	143.5750	125.5716	129.5786	112.9698	108.3972	93.5386	86.6772	99.4634	100.6513	117.2994	128.0414	139.0447 (45)	
Energy content (annual)												Total = Sum(45)m = 1384.8083 (45)	
Distribution loss (46)m = 0.15 x (45)m	21.5362	18.8357	19.4368	16.9455	16.2596	14.0308	13.0016	14.9195	15.0977	17.5949	19.2062	20.8567 (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	14.0902	12.7064	14.0357	13.5467	13.9718	13.4906	13.9213	13.9541	13.5212	14.0093	13.5995	14.0796	14.0796	(61)
Total heat required for water heating calculated for each month	157.6652	138.2781	143.6144	126.5165	122.3690	107.0292	100.5986	113.4174	114.1724	131.3087	141.6409	153.1244	153.1244	(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	157.6652	138.2781	143.6144	126.5165	122.3690	107.0292	100.5986	113.4174	114.1724	131.3087	141.6409	153.1244	153.1244	(64)
Heat gains from water heating, kWh/month	51.2612	44.9292	46.5938	40.9491	39.5350	34.4742	32.3005	36.5601	36.8468	42.5044	45.9737	49.7523	49.7523	(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	135.9520	135.9520	135.9520	135.9520	135.9520	135.9520	135.9520	135.9520	135.9520	135.9520	135.9520	135.9520	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	46.0632	40.9130	33.2727	25.1895	18.8295	15.8966	17.1769	22.3272	29.9675	38.0506	44.4106	47.3435	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	297.3183	300.4035	292.6289	276.0775	255.1843	235.5477	222.4292	219.3440	227.1187	243.6701	264.5632	284.1998	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.8611	50.8611	50.8611	50.8611	50.8611	50.8611	50.8611	50.8611	50.8611	50.8611	50.8611	50.8611	(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)	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	-90.6347	(71)
Water heating gains (Table 5)	68.8995	66.8589	62.6261	56.8738	53.1385	47.8809	43.4147	49.1399	51.1762	57.1295	63.8523	66.8713	(72)
Total internal gains	511.4595	507.3538	487.7060	457.3192	426.3307	398.5036	382.1992	389.9894	407.4407	438.0286	472.0046	497.5931	(73)

6. Solar gains

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

Northwest				11.6600	12.9236	0.4500		0.0000		0.7700	52.2136 (81)		

Solar gains	52.2136	96.1420	171.7296	290.2663	378.7266	431.1226	399.3537	326.7213	226.8338	125.6894	67.4212	42.1524	(83)
Total gains	563.6731	603.4958	659.4357	747.5855	805.0572	829.6262	781.5528	716.7107	634.2745	563.7180	539.4258	539.7454	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	64.1016	64.1016	64.1016	64.1016	64.1016	64.1016	64.1016	64.1016	64.1016	64.1016	64.1016	64.1016	
alpha	5.2734	5.2734	5.2734	5.2734	5.2734	5.2734	5.2734	5.2734	5.2734	5.2734	5.2734	5.2734	
util living area	0.9908	0.9856	0.9653	0.8900	0.7094	0.4581	0.3039	0.3418	0.6654	0.9243	0.9817	0.9924	(86)
MIT	20.1121	20.2124	20.4538	20.7499	20.9427	20.9952	20.9996	20.9992	20.9692	20.7313	20.3719	20.0814	(87)
Th 2	20.0145	20.0145	20.0145	20.0145	20.0145	20.0145	20.0145	20.0145	20.0145	20.0145	20.0145	20.0145	(88)
util rest of house	0.9877	0.9809	0.9537	0.8559	0.6397	0.3700	0.2075	0.2370	0.5678	0.8917	0.9745	0.9899	(89)
MIT 2	19.2258	19.3246	19.5595	19.8316	19.9833	20.0131	20.0144	20.0144	20.0021	19.8226	19.4827	19.1956	(90)
Living area fraction	19.5543	19.6536	19.8910	20.1720	20.3389	20.3771	20.3796	20.3794	20.3605	20.1594	19.8123	19.5239	(91)
MIT	19.5543	19.6536	19.8910	20.1720	20.3389	20.3771	20.3796	20.3794	20.3605	20.1594	19.8123	19.5239	(92)
Temperature adjustment													-0.1500
adjusted MIT	19.4043	19.5036	19.7410	20.0220	20.1889	20.2271	20.2296	20.2294	20.2105	20.0094	19.6623	19.3739	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	555.3791	590.1224	626.2991	640.0467	525.4845	322.9165	178.6738	186.2781	373.1347	502.5684	523.9223	533.1071	(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	1097.4646	1066.7267	946.8348	776.5884	551.5558	324.3152	178.7314	186.3917	384.4221	645.1957	894.7657	1095.1361	(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	403.3116	320.2780	238.4786	98.3100	19.3970	0.0000	0.0000	0.0000	0.0000	106.1147	267.0073	418.1496	(98)
Space heating												1871.0468	(98)
Space heating per m2												26.4198	(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													2067.4551 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	403.3116	320.2780	238.4786	98.3100	19.3970	0.0000	0.0000	0.0000	0.0000	106.1147	267.0073	418.1496	(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)	445.6482	353.8984	263.5122	108.6298	21.4332	0.0000	0.0000	0.0000	0.0000	117.2538	295.0357	462.0438	(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	157.6652	138.2781	143.6144	126.5165	122.3690	107.0292	100.5986	113.4174	114.1724	131.3087	141.6409	153.1244	(64)
Efficiency of water heater													87.3000 (216)
(217)m	89.5772	89.5106	89.2701	88.6710	87.7244	87.3000	87.3000	87.3000	87.3000	88.7018	89.3646	89.6195	(217)
Fuel for water heating, kWh/month													
	176.0104	154.4823	160.8763	142.6808	139.4925	122.5993	115.2332	129.9169	130.7817	148.0338	158.4978	170.8606	(219)
Water heating fuel used													1749.4656 (219)
Annual totals kWh/year													
Space heating fuel - main system													2067.4551 (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)													38.1544 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													113.1544 (231)
Electricity for lighting (calculated in Appendix L)													325.3965 (232)
Total delivered energy for all uses													4255.4716 (238)

10a. Fuel costs - using BEDF prices (486)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2067.4551	3.7400	77.3228	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1749.4656	3.7400	65.4300	(247)
Mechanical ventilation fans	38.1544	19.1200	7.2951	(249)
Pumps and fans for heating	75.0000	19.1200	14.3400	(249)
Energy for lighting	325.3965	19.1200	62.2158	(250)
Additional standing charges			94.0000	(251)
Total energy cost			320.6038	(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	2067.4551	0.2160	446.5703	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1749.4656	0.2160	377.8846	(264)
Space and water heating			824.4549	(265)
Pumps and fans	113.1544	0.5190	58.7271	(267)
Energy for lighting	325.3965	0.5190	168.8808	(268)
Total kg/year			1052.0628	(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	2067.4551	1.2200	2522.2952	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1749.4656	1.2200	2134.3480	(264)
Space and water heating			4656.6432	(265)
Pumps and fans	113.1544	3.0700	347.3841	(267)
Energy for lighting	325.3965	3.0700	998.9673	(268)
Primary energy kWh/year			6002.9946	(272)
Primary energy kWh/m2/year			84.7641	(273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 84
Current environmental impact rating: B 87

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

(For testing purposes):

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

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

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

Potential energy efficiency rating: B 84
Potential environmental impact rating: B 87

Fuel prices for cost data on this page from database revision number 486 TEST (30 Nov 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	£84	£84	£0
Mains gas	£237	£237	£0
Space heating	£193	£193	£0
Water heating	£65	£65	£0
Lighting	£62	£62	£0
Total cost of fuels	£321	£321	£0
Total cost of uses	£320	£320	£0
Delivered energy	60 kWh/m²	60 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.1 tonnes	1.1 tonnes	0.0 tonnes
CO2 emissions per m²	15 kg/m²	15 kg/m²	0 kg/m²
Primary energy	85 kWh/m²	85 kWh/m²	0 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



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

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

No improvements selected / applicable

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

Overheating Calculation Input Data

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

Overheating Calculation

Summer ventilation heat loss coefficient	336.54 (P1)
Transmission heat loss coefficient	48.68 (37)
Summer heat loss coefficient	385.21 (P2)

Overhangs	Ratio	Z_overhangs	Overhang type	
Orientation				
North West	0.000	1.000	None	
Solar shading				
Orientation	Z blinds	Solar access	Z overhangs	Z summer
North 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
North West	11.6600	98.8453	0.4500	0.0000
total:				466.7770

Solar gains	Jun	Jul	Aug	
Internal gains	504	467	382	(P4)
Total summer gains	396	379	387	
	899	846	769	(P5)
Summer gain/loss ratio	2.33	2.20	2.00	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 250.0)	0.25	0.25	0.25	
Threshold temperature	18.58	20.35	20.05	(P7)
Likelihood of high internal temperature	Not significant	Not significant	Not significant	
Assessment of likelihood of high internal temperature:	Not significant			