

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	74278-04			Issued on Date	30/03/2023
Assessment Reference	001	Prop Type Ref	HT 2B3P (GF)		
Property	Flat 4, 32 Brookstone Close, MANCHESTER, M21 7AE				
SAP Rating	86 B	DER	27.72	TER	26.99
Environmental	82 B	% DER<TER	-2.69		
CO ₂ Emissions (t/year)	1.36	DFEE	38.20	TFEE	47.76
General Requirements Compliance	Fail	% DFEE<TFEE	20.02		
Assessor Details	Mr. Paul Goddard, Anderson Goddard Limited, Tel: 01925 733 942, paul.goddard@andersongoddard.com			Assessor ID	B342-0001
Client					

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

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DWELLING AS BUILT

Ground-floor flat, total floor area 61 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: Electricity
Fuel factor: 1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 26.99 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 27.72 kgCO₂/m² Fail
Excess emissions = 0.73 kgCO₂/m² (2.7%)

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 47.8 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 38.2 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.14 (max. 0.25)	0.14 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.35 (max. 2.00)	1.35 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified ψ -value of 0.058

3 Air permeability

Air permeability at 50 pascals:	3.45 (measured in this dwelling)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Electric storage heaters with radiators or underfloor - Electric
High heat retention storage heaters

Secondary heating system: None

5 Cylinder insulation

Hot water storage	Measured store loss: 1.13 kWh/day
Permitted by DBSCG 2.10	OK
Primary pipework insulated:	No primary pipework

6 Controls

Space heating controls:	Controls for high heat retention storage heaters	OK
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Hot water controls:	Cylinderstat	OK
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7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system		
Specific fan power:	0.32	
Maximum	0.7	OK

9 Summertime temperature

Overheating risk (West Pennines (England)):	Not significant	OK
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Based on:

Overshading:	Average
Windows facing North East:	4.74 m ² , No overhang
Windows facing South West:	5.19 m ² , No overhang
Windows facing North West:	2.02 m ² , No overhang
Air change rate:	4.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Air permeability	3.5 m ³ /m ² h
Photovoltaic array	488.00 kWh/Year

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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	61.0200 (1b)	x 2.4000 (2b)	= 146.4480 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 146.4480 (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					3.4500
Infiltration rate					0.1725 (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) =				0.1466 (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	0.1869	0.1833	0.1796	0.1613	0.1576	0.1393	0.1393	0.1356	0.1466	0.1576	0.1650	0.1723 (22b)
Mechanical extract ventilation - centralised												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
Window (Uw = 1.35)			11.9500	1.2808	15.3060		(27)
GF			61.0200	0.1400	8.5428	75.0000	4576.5000 (28a)
Main	53.2100	11.9500	41.2600	0.1800	7.4268	110.0000	4538.6000 (29a)
Total net area of external elements Aum(A, m ²)			114.2300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =			31.2756	(33)
Party Wall 1			25.4300	0.0000	0.0000	45.0000	1144.3500 (32)
Party Ceilings 1			60.0200			30.0000	1800.6000 (32b)
Internal Wall 1			121.4300			9.0000	1092.8700 (32c)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (User defined value 0.058 * total exposed area)
Total fabric heat loss

(28)...(30) + (32) + (32a)...(32e) =	13152.9200 (34)
	215.5510 (35)
	6.6253 (36)
(33) + (36) =	37.9009 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	
(38)m	24.1639
Heat transfer coeff	62.0648
Average = Sum(39)m / 12 =	62.0648 (39)
HLP	1.0171
HLP (average)	1.0171 (40)
Days in month	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0103 (42)
Average daily hot water use (litres/day)												81.9452 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	90.1397	86.8619	83.5841	80.3063	77.0284	73.7506	73.7506	77.0284	80.3063	83.5841	86.8619	90.1397 (44)
Energy conte	133.6745	116.9126	120.6433	105.1798	100.9225	87.0884	80.7002	92.6047	93.7107	109.2108	119.2121	129.4566 (45)
Energy content (annual)												Total = Sum(45)m = 1289.3164 (45)
Distribution loss (46)m = 0.15 x (45)m	20.0512	17.5369	18.0965	15.7770	15.1384	13.0633	12.1050	13.8907	14.0566	16.3816	17.8818	19.4185 (46)

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Independent Energy Specialists, SAP, SBEM, EPC's, U-Value & Condensation Risk, 2D & 3D Thermal Modelling

[illegible]

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.7940	14.0281	11.4084	8.6369	6.4562	5.4506	5.8896	7.6555	10.2752	13.0467	15.2274	16.2330 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	175.5119	177.3331	172.7436	162.9731	150.6395	139.0477	131.3036	129.4823	134.0719	143.8424	156.1760	167.7678 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516 (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)	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129 (71)
Water heating gains (Table 5)	82.3403	80.4474	76.5165	71.1726	67.7031	62.8179	58.6656	63.9858	65.8761	71.4072	77.6528	80.4553 (72)
Total internal gains	326.8010	324.9635	313.8234	295.9374	277.9536	260.4710	249.0136	254.2785	263.3780	281.4512	302.2110	317.6109 (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			
Northeast											4.7400		11.2829		0.6700		0.7000		0.7700		17.3823 (75)	
Southwest											5.1900		36.7938		0.6700		0.7000		0.7700		62.0652 (79)	
Northwest											2.0200		11.2829		0.6700		0.7000		0.7700		7.4076 (81)	
Solar gains	86.8552	156.1807	235.5648	328.5362	401.4495	413.2650	392.3064	335.6596	267.4063	178.5100	105.5320	73.3596 (83)										
Total gains	413.6562	481.1441	549.3882	624.4736	679.4031	673.7361	641.3200	589.9381	530.7843	459.9612	407.7430	390.9705 (84)										

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n _{li,m} (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	58.8673	58.8673	58.8673	58.8673	58.8673	58.8673	58.8673	58.8673	58.8673	58.8673	58.8673	58.8673
alpha	4.9245	4.9245	4.9245	4.9245	4.9245	4.9245	4.9245	4.9245	4.9245	4.9245	4.9245	4.9245
util living area												
	0.9935	0.9856	0.9638	0.8978	0.7571	0.5708	0.4221	0.4768	0.7316	0.9374	0.9867	0.9950 (86)
MIT	20.0674	20.2102	20.4297	20.6856	20.8667	20.9380	20.9526	20.9500	20.8992	20.6515	20.3020	20.0275 (87)
Th 2	20.0691	20.0691	20.0691	20.0691	20.0691	20.0691	20.0691	20.0691	20.0691	20.0691	20.0691	20.0691 (88)
util rest of house												
	0.9916	0.9817	0.9539	0.8715	0.7043	0.4951	0.3347	0.3838	0.6573	0.9151	0.9824	0.9936 (89)
MIT 2	18.8218	19.0286	19.3428	19.6946	19.9193	19.9923	20.0031	20.0018	19.9596	19.6576	19.1633	18.7637 (90)
Living area fraction												
MIT	19.3215	19.5026	19.7788	20.0922	20.2994	20.3717	20.3840	20.3822	20.3365	20.0563	19.6201	19.2707 (91)
Temperature adjustment												
adjusted MIT	19.3215	19.5026	19.7788	20.0922	20.2994	20.3717	20.3840	20.3822	20.3365	20.0563	19.6201	19.2707 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9897	0.9787	0.9502	0.8722	0.7181	0.5203	0.3646	0.4156	0.6799	0.9147	0.9797	0.9920 (94)
Useful gains	409.4145	470.9198	522.0555	544.6698	487.8794	350.5622	233.7955	245.1645	360.9039	420.7481	399.4681	387.8517 (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	932.3090	906.3101	824.1492	694.6393	533.7207	358.2202	234.8558	247.1554	387.0688	586.9051	777.0587	935.3604 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	389.0336	292.5823	224.7577	107.9780	34.1059	0.0000	0.0000	0.0000	0.0000	123.6208	271.8653	407.3464 (98)
Space heating												1851.2900 (98)
Space heating per m2												30.3391 (99)
										(98) / (4) =		

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1851.2900 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	389.0336	292.5823	224.7577	107.9780	34.1059	0.0000	0.0000	0.0000	0.0000	123.6208	271.8653	407.3464	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	389.0336	292.5823	224.7577	107.9780	34.1059	0.0000	0.0000	0.0000	0.0000	123.6208	271.8653	407.3464	(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	154.6925	135.8966	141.6613	125.5198	121.9405	107.4284	101.7182	113.6227	114.0507	130.2288	139.5521	150.4746	(64)
Efficiency of water heater	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)
Fuel for water heating, kWh/month	154.6925	135.8966	141.6613	125.5198	121.9405	107.4284	101.7182	113.6227	114.0507	130.2288	139.5521	150.4746	(219)
Water heating fuel used													1536.7864 (219)
Annual totals kWh/year													
Space heating fuel - main system													1851.2900 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
(MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.4480)													
mechanical ventilation fans (SFP = 0.4480)													80.0426 (230a)
Total electricity for the above, kWh/year													80.0426 (231)
Electricity for lighting (calculated in Appendix L)													278.9274 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													3747.0463 (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	1851.2900	0.5190	960.8195	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating	1536.7864	0.5190	797.5921	(264)
Space and water heating			1758.4116	(265)
Pumps and fans	80.0426	0.5190	41.5421	(267)
Energy for lighting	278.9274	0.5190	144.7633	(268)
Energy saving/generation technologies				
PV Unit (0.90*43.39 + 0.10*12.14)	-488.0000	0.5190	-253.2720	(269)
Total CO2, kg/year			1691.4450	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			27.7200	(273)

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

DER			27.7200	ZC1
Total Floor Area		TFA	61.0200	
Assumed number of occupants		N	2.0103	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			17.0444	ZC2
CO2 emissions from cooking, equation (L16)			2.7409	ZC3
Total CO2 emissions			47.5052	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			47.5052	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	61.0200 (1b)	x 2.4000 (2b)	= 146.4480 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 146.4480 (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					2 * 10 = 20.0000 (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) =				20.0000 / (5) = 0.1366 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3866 (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) =				0.3286 (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	0.4189	0.4107	0.4025	0.3614	0.3532	0.3122	0.3122	0.3039	0.3286	0.3532	0.3697	0.3861 (22b)
Effective ac	0.5878	0.5843	0.5810	0.5653	0.5624	0.5487	0.5487	0.5462	0.5540	0.5624	0.5683	0.5745 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opening Type (Uw = 1.40)			11.9500	1.3258	15.8428		(27)
GF			61.0200	0.1300	7.9326		(28a)
Main	53.2100	11.9500	41.2600	0.1800	7.4268		(29a)
Total net area of external elements Aum(A, m ²)			114.2300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.2022		(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)							8.3802 (36)
Total fabric heat loss						(33) + (36) =	39.5824 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	28.4050	28.2403	28.0789	27.3207	27.1788	26.5184	26.5184
Heat transfer coeff	67.9874	67.8227	67.6613	66.9031	66.7612	66.1008	66.1008
Average = Sum(39)m / 12 =						65.9786	66.3552
	66.7612	67.0482	67.3482 (39)	66.9024 (39)			
HLP	1.1142	1.1115	1.1088	1.0964	1.0941	1.0833	1.0833
HLP (average)						1.0813	1.0874
Days in month	31	28	31	30	31	30	31
						30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0103 (42)
Average daily hot water use (litres/day)												81.9452 (43)
Daily hot water use	90.1397	86.8619	83.5841	80.3063	77.0284	73.7506	73.7506	77.0284	80.3063	83.5841	86.8619	90.1397 (44)
Energy conte	133.6745	116.9126	120.6433	105.1798	100.9225	87.0884	80.7002	92.6047	93.7107	109.2108	119.2121	129.4566 (45)
Energy content (annual)										Total = Sum(45)m =		1289.3164 (45)
Distribution loss (46)m = 0.15 x (45)m	20.0512	17.5369	18.0965	15.7770	15.1384	13.0633	12.1050	13.8907	14.0566	16.3816	17.8818	19.4185 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	180.2694	158.9983	167.2382	150.2716	147.5174	132.1803	127.2951	139.1996	138.8025	155.8057	164.3040	176.0515 (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	180.2694	158.9983	167.2382	150.2716	147.5174	132.1803	127.2951	139.1996	138.8025	155.8057	164.3040	176.0515 (64)
Heat gains from water heating, kWh/month	81.7227	72.5420	77.3898	71.0457	70.8327	65.0304	64.1088	68.0670	67.2323	73.5885	75.7115	80.3203 (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	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.7940	14.0281	11.4084	8.6369	6.4562	5.4506	5.8896	7.6555	10.2752	13.0467	15.2274	16.2330 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	175.5119	177.3331	172.7436	162.9731	150.6395	139.0477	131.3036	129.4823	134.0719	143.8424	156.1760	167.7678 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516 (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)	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129 (71)
Water heating gains (Table 5)	109.8423	107.9494	104.0186	98.6746	95.2052	90.3200	86.1677	91.4879	93.3782	98.9093	105.1549	107.9573 (72)
Total internal gains	357.3031	355.4655	344.3255	326.4395	308.4557	290.9731	279.5157	284.7805	293.8800	311.9532	332.7131	348.1130 (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						
Northeast				4.7400	11.2829	0.6300	0.7000	0.7700	16.3445 (75)						
Southwest				5.1900	36.7938	0.6300	0.7000	0.7700	58.3599 (79)						
Northwest				2.0200	11.2829	0.6300	0.7000	0.7700	6.9654 (81)						
Solar gains				81.6698	146.8565	221.5012	308.9221	377.4824	388.5925	368.8851	315.6202	251.4417	167.8527	99.2316	68.9799 (83)
Total gains				438.9729	502.3220	565.8267	635.3615	685.9380	679.5656	648.4008	600.4007	545.3218	479.8059	431.9447	417.0929 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)											
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	62.3277	62.4791	62.6281	63.3379	63.4725	64.1066	64.1066	64.2254	63.8608	63.4725	63.2008	62.9193
alpha	5.1552	5.1653	5.1752	5.2225	5.2315	5.2738	5.2738	5.2817	5.2574	5.2315	5.2134	5.1946
util living area	0.9954	0.9901	0.9746	0.9220	0.7950	0.6022	0.4449	0.4986	0.7588	0.9503	0.9902	0.9965 (86)
MIT	19.9180	20.0784	20.3338	20.6523	20.8825	20.9785	20.9963	20.9935	20.9314	20.6294	20.2166	19.8889 (87)
Th 2	19.9893	19.9915	19.9936	20.0038	20.0057	20.0145	20.0145	20.0162	20.0111	20.0057	20.0018	19.9978 (88)
util rest of house	0.9939	0.9869	0.9663	0.8972	0.7391	0.5180	0.3472	0.3955	0.6784	0.9290	0.9864	0.9953 (89)
MIT 2	18.5589	18.7933	19.1618	19.6103	19.8974	20.0011	20.0132	20.0137	19.9602	19.5907	19.0030	18.5228 (90)
Living area fraction	19.1042	19.3089	19.6320	20.0283	20.2926	20.3932	20.4076	20.4068	20.3499	20.0074	19.4898	19.0708 (92)
Temperature adjustment	19.1042	19.3089	19.6320	20.0283	20.2926	20.3932	20.4076	20.4068	20.3499	20.0074	19.4898	19.0708 (93)
adjusted MIT	19.1042	19.3089	19.6320	20.0283	20.2926	20.3932	20.4076	20.4068	20.3499	20.0074	19.4898	19.0708 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9921	0.9841	0.9625	0.8979	0.7563	0.5512	0.3865	0.4371	0.7078	0.9290	0.9839	0.9938 (94)
Ext temp.	435.5178	494.3428	544.6350	570.4619	518.7821	374.5918	250.6378	262.4057	385.9855	445.7546	424.9704	414.5104 (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	1006.4963	977.2490	888.5248	744.5175	573.6510	382.9371	251.6879	264.3604	414.7108	628.0504	830.7166	1001.5236 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating per m2	424.8080	324.5130	255.8539	125.3200	40.8225	0.0000	0.0000	0.0000	0.0000	135.6281	292.1373	436.7378 (98)
												2035.8205 (98)
												33.3632 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 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 %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2177.3482 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	424.8080	324.5130	255.8539	125.3200	40.8225	0.0000	0.0000	0.0000	0.0000	135.6281	292.1373	436.7378	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	454.3401	347.0727	273.6406	134.0321	43.6604	0.0000	0.0000	0.0000	0.0000	145.0568	312.4463	467.0992	(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	180.2694	158.9983	167.2382	150.2716	147.5174	132.1803	127.2951	139.1996	138.8025	155.8057	164.3040	176.0515	(64)
Efficiency of water heater (217)m	87.0236	86.6781	85.9449	84.3341	81.8988	79.8000	79.8000	79.8000	79.8000	84.4465	86.3330	87.1431	(217)
Fuel for water heating, kWh/month	207.1500	183.4353	194.5878	178.1860	180.1216	165.6395	159.5177	174.4356	173.9380	184.5022	190.3141	202.0259	(219)
Water heating fuel used												2193.8538	(219)
Annual totals kWh/year													
Space heating fuel - main system												2177.3482	(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)												278.9274	(232)
Total delivered energy for all uses												4725.1294	(238)

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

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Space heating - main system 1	2177.3482	0.2160	470.3072 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2193.8538	0.2160	473.8724 (264)
Space and water heating			944.1796 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	278.9274	0.5190	144.7633 (268)
Total CO ₂ , kg/m ² /year			1127.8679 (272)
Emissions per m ² for space and water heating			15.4733 (272a)
Fuel factor (electricity)			1.5500
Emissions per m ² for lighting			2.3724 (272b)
Emissions per m ² for pumps and fans			0.6379 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.4733 * 1.55) + 2.3724 + 0.6379, rounded to 2 d.p.			26.9900 (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	61.0200 (1b)	x 2.4000 (2b)	= 146.4480 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 146.4480 (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					2 * 10 = 20.0000 (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					20.0000 / (5) = 0.1366 (8)
Measured/design AP50					Yes
Infiltration rate					3.4500
Number of sides sheltered					0.3091 (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) =				0.2627 (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	0.3350	0.3284	0.3218	0.2890	0.2824	0.2496	0.2496	0.2430	0.2627	0.2824	0.2955	0.3087 (22b)
Effective ac	0.5561	0.5539	0.5518	0.5418	0.5399	0.5311	0.5311	0.5295	0.5345	0.5399	0.5437	0.5476 (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
Window (Uw = 1.35)			11.9500	1.2808	15.3060		(27)
GF			61.0200	0.1400	8.5428	75.0000	4576.5000 (28a)
Main	53.2100	11.9500	41.2600	0.1800	7.4268	110.0000	4538.6000 (29a)
Total net area of external elements Aum(A, m ²)			114.2300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.2756		(33)
Party Wall 1			25.4300	0.0000	0.0000	45.0000	1144.3500 (32)
Party Ceilings 1			60.0200			20.0000	1200.4000 (32b)
Internal Wall 1			121.4300			9.0000	1092.8700 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 12552.7200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							205.7148 (35)
Thermal bridges (User defined value 0.058 * total exposed area)							6.6253 (36)
Total fabric heat loss							(33) + (36) = 37.9009 (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	26.8749	26.7697	26.6665	26.1818	26.0911	25.6690	25.6690	25.5908	25.8316	26.0911	26.2746	26.4664 (38)
Heat transfer coeff	64.7759	64.6706	64.5674	64.0827	63.9920	63.5699	63.5699	63.4917	63.7325	63.9920	64.1755	64.3673 (39)
Average = Sum(39)m / 12 =												64.0823 (39)
HLP	1.0616	1.0598	1.0581	1.0502	1.0487	1.0418	1.0418	1.0405	1.0445	1.0487	1.0517	1.0549 (40)
HLP (average)												1.0502 (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												2.0103 (42)
Average daily hot water use (litres/day)												81.9452 (43)
Daily hot water use	90.1397	86.8619	83.5841	80.3063	77.0284	73.7506	73.7506	77.0284	80.3063	83.5841	86.8619	90.1397 (44)
Energy conte	133.6745	116.9126	120.6433	105.1798	100.9225	87.0884	80.7002	92.6047	93.7107	109.2108	119.2121	129.4566 (45)
Energy content (annual)										Total = Sum(45)m =		1289.3164 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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	(59)
Heat gains from water heating, kWh/month	28.4058	24.8439	25.6367	22.3507	21.4460	18.5063	17.1488	19.6785	19.9135	23.2073	25.3326	(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	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.7940	14.0281	11.4084	8.6369	6.4562	5.4506	5.8896	7.6555	10.2752	13.0467	15.2274	16.2330	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	175.5119	177.3331	172.7436	162.9731	150.6395	139.0477	131.3036	129.4823	134.0719	143.8424	156.1760	167.7678	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	(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)	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	(71)
Water heating gains (Table 5)	38.1799	36.9701	34.4579	31.0426	28.8253	25.7032	23.0495	26.4496	27.6577	31.1926	35.1841	36.9752	(72)
Total internal gains	282.6406	281.4862	271.7648	255.8074	239.0758	223.3563	213.3975	216.7422	225.1595	241.2365	259.7424	274.1308	(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		
Northeast				4.7400	11.2829	0.6700	0.7000		0.7700	17.3823 (75)		
Southwest				5.1900	36.7938	0.6700	0.7000		0.7700	62.0652 (79)		
Northwest				2.0200	11.2829	0.6700	0.7000		0.7700	7.4076 (81)		
Solar gains	86.8552	156.1807	235.5648	328.5362	401.4495	413.2650	392.3064	335.6596	267.4063	178.5100	105.5320	73.3596 (83)
Total gains	369.4958	437.6669	507.3296	584.3436	640.5253	636.6213	605.7038	552.4018	492.5658	419.7466	365.2743	347.4904 (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	53.8297	53.9174	54.0035	54.4120	54.4891	54.8509	54.8509	54.9184	54.7110	54.4891	54.3333	54.1714		
alpha	4.5886	4.5945	4.6002	4.6275	4.6326	4.6567	4.6567	4.6612	4.6474	4.6326	4.6222	4.6114		
util living area	0.9952	0.9891	0.9717	0.9165	0.7910	0.6079	0.4549	0.5156	0.7733	0.9528	0.9904	0.9964	(86)	
MIT	19.6977	19.8901	20.1910	20.5614	20.8381	20.9637	20.9924	20.9867	20.8923	20.5143	20.0308	19.6572	(87)	
Th 2	20.0324	20.0338	20.0352	20.0417	20.0429	20.0487	20.0487	20.0497	20.0465	20.0429	20.0405	20.0379	(88)	
util rest of house	0.9939	0.9861	0.9639	0.8938	0.7405	0.5290	0.3599	0.4152	0.7015	0.9352	0.9873	0.9954	(89)	
MIT 2	18.8435	19.0355	19.3326	19.6912	19.9339	20.0311	20.0464	20.0454	19.9852	19.6557	19.1817	18.8076	(90)	
Living area fraction										fLA = Living area / (4) =		0.4012	(91)	
MIT	19.1862	19.3784	19.6770	20.0403	20.2967	20.4052	20.4259	20.4230	20.3491	20.0002	19.5224	19.1485	(92)	
Temperature adjustment												0.0000		
adjusted MIT	19.1862	19.3784	19.6770	20.0403	20.2967	20.4052	20.4259	20.4230	20.3491	20.0002	19.5224	19.1485	(93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9924	0.9836	0.9604	0.8937	0.7548	0.5595	0.3981	0.4555	0.7261	0.9343	0.9851	0.9942	(94)
Useful gains	366.6888	430.4848	487.2332	522.2402	483.4545	356.2080	241.1216	251.6109	357.6312	392.1601	359.8396	345.4578	(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	964.2648	936.3250	850.8031	713.9000	550.1192	369.0380	243.2117	255.4289	398.2707	601.5351	797.2105	962.1915	(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	444.5965	339.9246	270.4960	137.9951	49.5985	0.0000	0.0000	0.0000	0.0000	155.7750	314.9070	458.8498	(98)
Space heating												2172.1425	(98)
Space heating per m2												(98) / (4) =	35.5972 (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	597.5572	470.4174	482.5372	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9252	0.9603	0.9431	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	552.8410	451.7510	455.0996	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	819.1792	781.5675	720.4536	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	191.7636	245.3835	197.4233	0.0000	0.0000	0.0000	0.0000	(104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling												634.5704 (104)
Cooled Fraction												1.0000 (105)
Intermittency factor (Table 10b)												
	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)	
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	47.9409	61.3459	49.3558	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												158.6426 (107)
Space cooling per m2												2.5998 (108)
Energy for space heating												35.5972 (99)
Energy for space cooling												2.5998 (108)
Total												38.1971 (109)
Dwelling Fabric Energy Efficiency (DFEE)												38.2 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.0200 (1b)	x 2.4000 (2b)	= 146.4480 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 146.4480 (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					2 * 10 = 20.0000 (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 20.0000 / (5) = 0.1366 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3866 (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) =	0.3286 (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	0.4189	0.4107	0.4025	0.3614	0.3532	0.3122	0.3122	0.3039	0.3286	0.3532	0.3697	0.3861 (22b)
Effective ac	0.5878	0.5843	0.5810	0.5653	0.5624	0.5487	0.5487	0.5462	0.5540	0.5624	0.5683	0.5745 (25)

3. Heat losses and heat loss parameter

Element	Gross			Openings		NetArea		U-value		A x U		K-value		A x K	
	m2			m2		m2		W/m2K		W/K		kJ/m2K		kJ/K	
TER Opening Type (Uw = 1.40)						11.9500		1.3258		15.8428				(27)	
GF						61.0200		0.1300		7.9326				(28a)	
Main	53.2100			11.9500		41.2600		0.1800		7.4268				(29a)	
Total net area of external elements Aum(A, m2)						114.2300								(31)	
Fabric heat loss, W/K = Sum (A x U)						(26) ... (30) + (32) =				31.2022				(33)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K														250.0000 (35)	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)														8.3802 (36)	
Total fabric heat loss												(33) + (36) =		39.5824 (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	28.4050	28.2403	28.0789	27.3207	27.1788	26.5184	26.5184	26.3961	26.7728	27.1788	27.4658	27.7658	(38)		
Average = Sum(39)m / 12 =	67.9874	67.8227	67.6613	66.9031	66.7612	66.1008	66.1008	65.9786	66.3552	66.7612	67.0482	67.3482	(39)		
												66.9024	(39)		
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
HLP (average)	1.1142	1.1115	1.1088	1.0964	1.0941	1.0833	1.0833	1.0813	1.0874	1.0941	1.0988	1.1037	(40)		
Days in month												1.0964	(40)		
	31	28	31	30	31	30	31	31	30	31	30	31	(41)		

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0103 (42)
Average daily hot water use (litres/day)												81.9452 (43)
Daily hot water use	Jan 90.1397	Feb 86.8619	Mar 83.5841	Apr 80.3063	May 77.0284	Jun 73.7506	Jul 73.7506	Aug 77.0284	Sep 80.3063	Oct 83.5841	Nov 86.8619	Dec 90.1397 (44)
Energy conte	133.6745	116.9126	120.6433	105.1798	100.9225	87.0884	80.7002	92.6047	93.7107	109.2108	119.2121	129.4566 (45)
Energy content (annual)										Total = Sum(45)m =		1289.3164 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

28.4058 24.8439 25.6367 22.3507 21.4460 18.5063 17.1488 19.6785 19.9135 23.2073 25.3326 27.5095 (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	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.7940	14.0281	11.4084	8.6369	6.4562	5.4506	5.8896	7.6555	10.2752	13.0467	15.2274	16.2330	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	175.5119	177.3331	172.7436	162.9731	150.6395	139.0477	131.3036	129.4823	134.0719	143.8424	156.1760	167.7678	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	(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)	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	(71)
Water heating gains (Table 5)	38.1799	36.9701	34.4579	31.0426	28.8253	25.7032	23.0495	26.4496	27.6577	31.1926	35.1841	36.9752	(72)
Total internal gains	282.6406	281.4862	271.7648	255.8074	239.0758	223.3563	213.3975	216.7422	225.1595	241.2365	259.7424	274.1308	(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
Northeast				4.7400	11.2829	0.6300		0.7000		0.7700		16.3445 (75)
Southwest				5.1900	36.7938	0.6300		0.7000		0.7700		58.3599 (79)
Northwest				2.0200	11.2829	0.6300		0.7000		0.7700		6.9654 (81)
Solar gains	81.6698	146.8565	221.5012	308.9221	377.4824	388.5925	368.8851	315.6202	251.4417	167.8527	99.2316	68.9799 (83)
Total gains	364.3104	428.3427	493.2660	564.7295	616.5582	611.9488	582.2826	532.3624	476.6013	409.0893	358.9739	343.1108 (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	62.3277	62.4791	62.6281	63.3379	63.4725	64.1066	64.1066	64.2254	63.8608	63.4725	63.2008	62.9193	
alpha	5.1552	5.1653	5.1752	5.2225	5.2315	5.2738	5.2738	5.2817	5.2574	5.2315	5.2134	5.1946	
util living area	0.9981	0.9951	0.9856	0.9484	0.8424	0.6575	0.4930	0.5571	0.8229	0.9732	0.9957	0.9986	(86)
MIT	19.8043	19.9682	20.2325	20.5742	20.8422	20.9678	20.9941	20.9892	20.8978	20.5394	20.1074	19.7756	(87)
Th 2	19.9893	19.9915	19.9936	20.0038	20.0057	20.0145	20.0145	20.0162	20.0111	20.0057	20.0018	19.9978	(88)
util rest of house	0.9974	0.9935	0.9806	0.9300	0.7919	0.5700	0.3860	0.4446	0.7487	0.9602	0.9940	0.9981	(89)
MIT 2	18.8997	19.0646	19.3279	19.6654	19.9027	20.0004	20.0131	20.0132	19.9560	19.6401	19.2123	18.8779	(90)
Living area fraction	19.2626	19.4271	19.6908	20.0300	20.2796	20.3885	20.4066	20.4048	fLA = Living area / (4) =	20.3338	20.0009	19.5714	0.4012 (91)
MIT	19.2626	19.4271	19.6908	20.0300	20.2796	20.3885	20.4066	20.4048	20.3338	20.0009	19.5714	19.2380	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2626	19.4271	19.6908	20.0300	20.2796	20.3885	20.4066	20.4048	20.3338	20.0009	19.5714	19.2380	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9968	0.9923	0.9787	0.9306	0.8071	0.6045	0.4292	0.4901	0.7753	0.9601	0.9930	0.9976	(94)
Useful gains	363.1337	425.0466	482.7407	525.5266	497.6164	369.9054	249.9016	260.8965	369.5161	392.7780	356.4667	342.2896	(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	1017.2698	985.2683	892.5066	744.6333	572.7846	382.6227	251.6217	264.2280	413.6466	627.6139	836.1832	1012.7854	(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	486.6773	376.4690	304.8658	157.7568	55.9251	0.0000	0.0000	0.0000	0.0000	174.7179	345.3959	498.8488	(98)
Space heating												2400.6566	(98)
Space heating per m2												39.3421	(99)
												(98) / (4) =	

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	621.3479	489.1462	501.4370	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9228	0.9616	0.9436	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	573.3873	470.3840	473.1557	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	790.3412	754.1920	697.0309	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	156.2068	211.1531	166.5632	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												533.9231	(104)
Cooled fraction												1.0000	(105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	39.0517	52.7883	41.6408	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling													133.4808 (107)
Space cooling per m2													2.1875 (108)
Energy for space heating													39.3421 (99)
Energy for space cooling													2.1875 (108)
Total													41.5296 (109)
Target Fabric Energy Efficiency (TFEE)													47.8 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.0200 (1b)	x 2.4000 (2b)	= 146.4480 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 146.4480 (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					3.4500
Infiltration rate					0.1725 (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) =		0.1466 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.3000	4.2000	4.2000	3.9000	4.0000	3.4000	3.3000	3.3000	3.4000	3.8000	3.8000	3.9000 (22)
Wind factor	1.0750	1.0500	1.0500	0.9750	1.0000	0.8500	0.8250	0.8250	0.8500	0.9500	0.9500	0.9750 (22a)
Adj infilt rate	0.1576	0.1540	0.1540	0.1430	0.1466	0.1246	0.1210	0.1210	0.1246	0.1393	0.1393	0.1430 (22b)
Mechanical extract ventilation - centralised												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
Window (Uw = 1.35)			11.9500	1.2808	15.3060		(27)
GF			61.0200	0.1400	8.5428	75.0000	4576.5000 (28a)
Main	53.2100	11.9500	41.2600	0.1800	7.4268	110.0000	4538.6000 (29a)
Total net area of external elements Aum(A, m ²)			114.2300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.2756		(33)
Party Wall 1			25.4300	0.0000	0.0000	45.0000	1144.3500 (32)
Party Ceilings 1			60.0200			30.0000	1800.6000 (32b)
Internal Wall 1			121.4300			9.0000	1092.8700 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		13152.9200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							215.5510 (35)
Thermal bridges (User defined value 0.058 * total exposed area)							6.6253 (36)
Total fabric heat loss					(33) + (36) =		37.9009 (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	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639 (38)
Heat transfer coeff	62.0648	62.0648	62.0648	62.0648	62.0648	62.0648	62.0648	62.0648	62.0648	62.0648	62.0648	62.0648 (39)
Average = Sum(39)m / 12 =												62.0648 (39)
HLP	1.0171	1.0171	1.0171	1.0171	1.0171	1.0171	1.0171	1.0171	1.0171	1.0171	1.0171	1.0171 (40)
HLP (average)												1.0171 (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												2.0103 (42)
Average daily hot water use (litres/day)												81.9452 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
90.1397	86.8619	83.5841	80.3063	77.0284	73.7506	73.7506	77.0284	80.3063	83.5841	86.8619	90.1397	(44)
Energy conte	133.6745	116.9126	120.6433	105.1798	100.9225	87.0884	80.7002	92.6047	93.7107	109.2108	119.2121	129.4566 (45)
Energy content (annual)										Total = Sum(45)m =		1289.3164 (45)
Distribution loss (46)m = 0.15 x (45)m	20.0512	17.5369	18.0965	15.7770	15.1384	13.0633	12.1050	13.8907	14.0566	16.3816	17.8818	19.4185 (46)

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Water storage loss:													
Store volume												150.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.1300 (48)	
Temperature factor from Table 2b												0.6000 (49)	
Enter (49) or (54) in (55)												0.6780 (55)	
Total storage loss													
	21.0180	18.9840	21.0180	20.3400	21.0180	20.3400	21.0180	20.3400	21.0180	20.3400	21.0180	(56)	
If cylinder contains dedicated solar storage													
	21.0180	18.9840	21.0180	20.3400	21.0180	20.3400	21.0180	20.3400	21.0180	20.3400	21.0180	(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	(59)	
Total heat required for water heating calculated for each month													
	154.6925	135.8966	141.6613	125.5198	121.9405	107.4284	101.7182	113.6227	114.0507	130.2288	139.5521	150.4746 (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	(63)	
								Solar input (sum of months) = Sum(63)m =					0.0000 (63)
Output from w/h													
	154.6925	135.8966	141.6613	125.5198	121.9405	107.4284	101.7182	113.6227	114.0507	130.2288	139.5521	150.4746 (64)	
								Total per year (kWh/year) = Sum(64)m =					1536.7864 (64)
												1537 (64)	
RHI water heating demand													
Heat gains from water heating, kWh/month													
	61.2612	54.0606	56.9283	51.2443	50.3711	45.2289	43.6472	47.6055	47.4308	53.1270	55.9100	59.8587 (65)	

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	39.4851	35.0703	28.5211	21.5923	16.1405	13.6265	14.7239	19.1387	25.6879	32.6167	38.0685	40.5825 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	261.9580	264.6763	257.8263	243.2434	224.8350	207.5338	195.9755	193.2572	200.1073	214.6902	233.0985	250.3997 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.0723	49.0723	49.0723	49.0723	49.0723	49.0723	49.0723	49.0723	49.0723	49.0723	49.0723	49.0723 (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)	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129 (71)
Water heating gains (Table 5)	82.3403	80.4474	76.5165	71.1726	67.7031	62.8179	58.6656	63.9858	65.8761	71.4072	77.6528	80.4553 (72)
Total internal gains	473.0621	469.4727	452.1426	425.2870	397.9574	373.2569	358.6438	365.6604	380.9500	407.9928	438.0985	460.7162 (73)

[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
Northeast	4.7400	9.9768	0.6700	0.7000	0.7700	15.3701 (75)
Southwest	5.1900	32.4665	0.6700	0.7000	0.7700	54.7658 (79)
Northwest	2.0200	9.9768	0.6700	0.7000	0.7700	6.5501 (81)

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	58.8673	58.8673	58.8673	58.8673	58.8673	58.8673	58.8673	58.8673	58.8673	58.8673	58.8673	58.8673
alpha	4.9245	4.9245	4.9245	4.9245	4.9245	4.9245	4.9245	4.9245	4.9245	4.9245	4.9245	4.9245
util living area	0.9737	0.9551	0.9092	0.7985	0.6185	0.4224	0.3147	0.3558	0.5879	0.8476	0.9528	0.9788 (86)
MIT	20.3234	20.4448	20.6289	20.8197	20.9239	20.9519	20.9552	20.9545	20.9359	20.7968	20.5236	20.2780 (87)
Th 2	20.0691	20.0691	20.0691	20.0691	20.0691	20.0691	20.0691	20.0691	20.0691	20.0691	20.0691	20.0691 (88)
util rest of house	0.9669	0.9440	0.8878	0.7573	0.5568	0.3499	0.2359	0.2716	0.5096	0.8052	0.9391	0.9732 (89)
MIT 2	19.1905	19.3619	19.6157	19.8615	19.9781	20.0024	20.0043	20.0041	19.9910	19.8407	19.4763	19.1258 (90)
Living area fraction	19.6450	19.7963	20.0221	20.2459	20.3575	20.3833	20.3858	20.3854	20.3701	20.2243	19.8964	19.5880 (92)
MIT	19.6450	19.7963	20.0221	20.2459	20.3575	20.3833	20.3858	20.3854	20.3701	20.2243	19.8964	19.5880 (93)
Temperature adjustment												0.0000
adjusted MIT	19.6450	19.7963	20.0221	20.2459	20.3575	20.3833	20.3858	20.3854	20.3701	20.2243	19.8964	19.5880 (93)

[illegible]

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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	61.0200 (1b)	x 2.4000 (2b)	= 146.4480 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 146.4480 (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					3.4500
Infiltration rate					0.1725 (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) =				0.1466 (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	0.1869	0.1833	0.1796	0.1613	0.1576	0.1393	0.1393	0.1356	0.1466	0.1576	0.1650	0.1723 (22b)
Mechanical extract ventilation - centralised												0.5000 (23a)
If mechanical ventilation:												
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
Window (Uw = 1.35)			11.9500	1.2808	15.3060		(27)
GF			61.0200	0.1400	8.5428	75.0000	4576.5000 (28a)
Main	53.2100	11.9500	41.2600	0.1800	7.4268	110.0000	4538.6000 (29a)
Total net area of external elements Aum(A, m ²)			114.2300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =			31.2756	(33)
Party Wall 1			25.4300	0.0000	0.0000	45.0000	1144.3500 (32)
Party Ceilings 1			60.0200			30.0000	1800.6000 (32b)
Internal Wall 1			121.4300			9.0000	1092.8700 (32c)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =			13152.9200	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K						215.5510	(35)
Thermal bridges (User defined value 0.058 * total exposed area)						6.6253	(36)
Total fabric heat loss			(33) + (36) =			37.9009	(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	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639 (38)
Heat transfer coeff	62.0648	62.0648	62.0648	62.0648	62.0648	62.0648	62.0648	62.0648	62.0648	62.0648	62.0648	62.0648 (39)
Average = Sum(39)m / 12 =												62.0648 (39)
HLP	1.0171	1.0171	1.0171	1.0171	1.0171	1.0171	1.0171	1.0171	1.0171	1.0171	1.0171	1.0171 (40)
HLP (average)												1.0171 (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												2.0103 (42)
Average daily hot water use (litres/day)												81.9452 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
90.1397	86.8619	83.5841	80.3063	77.0284	73.7506	73.7506	77.0284	80.3063	83.5841	86.8619	90.1397	(44)
Energy conte	133.6745	116.9126	120.6433	105.1798	100.9225	87.0884	80.7002	92.6047	93.7107	109.2108	119.2121	129.4566 (45)
Energy content (annual)												Total = Sum(45)m = 1289.3164 (45)
Distribution loss (46)m = 0.15 x (45)m	20.0512	17.5369	18.0965	15.7770	15.1384	13.0633	12.1050	13.8907	14.0566	16.3816	17.8818	19.4185 (46)

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8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9679	0.9467	0.9008	0.7998	0.6364	0.4507	0.3121	0.3513	0.5791	0.8370	0.9445	0.9735 (94)
Useful gains	541.9446	592.3104	619.5177	602.8747	508.7442	354.5157	234.3943	246.3387	375.4611	490.9214	513.4410	519.9194 (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	947.4739	920.2582	835.3382	701.1616	535.9481	358.6357	234.9229	247.2847	388.6136	594.8559	790.1479	950.4470 (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	301.7138	220.3809	160.5705	70.7666	20.2397	0.0000	0.0000	0.0000	0.0000	77.3273	199.2290	320.3126 (98)
Space heating												1370.5403 (98)
Space heating per m2										(98) / (4) =		22.4605 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)
Space heating requirement	1370.5403 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	301.7138	220.3809	160.5705	70.7666	20.2397	0.0000	0.0000	0.0000	0.0000	77.3273	199.2290	320.3126	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	301.7138	220.3809	160.5705	70.7666	20.2397	0.0000	0.0000	0.0000	0.0000	77.3273	199.2290	320.3126	(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	154.6925	135.8966	141.6613	125.5198	121.9405	107.4284	101.7182	113.6227	114.0507	130.2288	139.5521	150.4746	(64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)
Fuel for water heating, kWh/month	154.6925	135.8966	141.6613	125.5198	121.9405	107.4284	101.7182	113.6227	114.0507	130.2288	139.5521	150.4746	(219)
Water heating fuel used												1536.7864	(219)
Annual totals kWh/year													
Space heating fuel - main system												1370.5403	(211)
Space heating fuel - secondary												0.0000	(215)

Electricity for pumps and fans:

(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.4480)

mechanical ventilation fans (SFP = 0.4480)

Total electricity for the above, kWh/year

Electricity for lighting (calculated in Appendix L)

Energy saving/generation technologies (Appendices M ,N and Q)

Total delivered energy for all uses

80.0426 (230a)

80.0426 (231)

278.9274 (232)

3266.2967 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1 (0.00*15.29 + 1.00*5.50)	1370.5403	5.5000	75.3797	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (electric off-peak tariff)				
High-rate fraction			0.0993	(243)
Low-rate fraction			0.9007	(244)
High-rate cost	152.6495	15.2900	23.3401	(245)
Low-rate cost	1384.1369	5.5000	76.1275	(246)
Mechanical ventilation fans (0.71*15.29 + 0.29*5.50)	80.0426	12.4509	9.9660	(249)
Pumps and fans for heating (0.90*15.29 + 0.10*5.50)	0.0000	0.0000	0.0000	(249)
Energy for lighting (0.90*15.29 + 0.10*5.50)	278.9274	14.3110	39.9173	(250)
Additional standing charges			24.0000	(251)
Energy saving/generation technologies				
PV Unit (0.90*43.39 + 0.10*12.14)	0.0000	13.7505	0.0000	(252)
Total energy cost			248.7307	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):

Energy cost factor (ECF)

SAP value

SAP rating (Section 12)

SAP band

0.4200 (256)

[(255) x (256)] / [(4) + 45.0] = 0.9854 (257)

86.2544

86 (258)

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	1370.5403	0.5190	711.3104	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating	1536.7864	0.5190	797.5921	(264)
Space and water heating			1508.9025	(265)
Pumps and fans	80.0426	0.5190	41.5421	(267)
Energy for lighting	278.9274	0.5190	144.7633	(268)
Energy saving/generation technologies				
PV Unit (0.90*43.39 + 0.10*12.14)	-488.0000	0.5190	-253.2720	(269)
Total kg/year			1441.9360	(272)
CO2 emissions per m2			23.6300	(273)
EI value			81.7752	
EI rating			82	(274)
EI band			B	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Calculation of stars for heating and DHW

Main heating energy efficiency	$5.50 \times (1 + 0.29 \times 0.20) / 1.0000 = 5.819$, stars = 3
Main heating environmental impact	$0.519 \times (1 + 0.29 \times 0.20) / 1.0000 = 0.5491$, stars = 2
Water heating energy efficiency	$6.47 / 1.0000 = 6.472$, stars = 3
Water heating environmental impact	$0.519 / 1.0000 = 0.5190$, stars = 2

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	61.0200 (1b)	x 2.4000 (2b)	= 146.4480 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 146.4480 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					0.0000 / (5) = 0.0000 (8)
Measured/design AP50					Yes
Infiltration rate					3.4500
Number of sides sheltered					0.1725 (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) =	0.1466 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.3000	4.2000	4.2000	3.9000	4.0000	3.4000	3.3000	3.3000	3.4000	3.8000	3.8000	3.9000 (22)
Wind factor	1.0750	1.0500	1.0500	0.9750	1.0000	0.8500	0.8250	0.8250	0.8500	0.9500	0.9500	0.9750 (22a)
Adj infilt rate	0.1576	0.1540	0.1540	0.1430	0.1466	0.1246	0.1210	0.1210	0.1246	0.1393	0.1393	0.1430 (22b)
Mechanical extract ventilation - centralised												
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
Window (Uw = 1.35)			11.9500	1.2808	15.3060		(27)
GF			61.0200	0.1400	8.5428	75.0000	4576.5000 (28a)
Main	53.2100	11.9500	41.2600	0.1800	7.4268	110.0000	4538.6000 (29a)
Total net area of external elements Aum(A, m ²)			114.2300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.2756		(33)
Party Wall 1			25.4300	0.0000	0.0000	45.0000	1144.3500 (32)
Party Ceilings 1			60.0200			30.0000	1800.6000 (32b)
Internal Wall 1			121.4300			9.0000	1092.8700 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13152.9200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							215.5510 (35)
Thermal bridges (User defined value 0.058 * total exposed area)							6.6253 (36)
Total fabric heat loss						(33) + (36) =	37.9009 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639 (38)
Heat transfer coeff	62.0648	62.0648	62.0648	62.0648	62.0648	62.0648	62.0648	62.0648	62.0648	62.0648	62.0648	62.0648 (39)
Average = Sum(39)m / 12 =												62.0648 (39)
HLP	1.0171	1.0171	1.0171	1.0171	1.0171	1.0171	1.0171	1.0171	1.0171	1.0171	1.0171	1.0171 (40)
HLP (average)												1.0171 (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												2.0103 (42)
Average daily hot water use (litres/day)												81.9452 (43)
Daily hot water use	90.1397	86.8619	83.5841	80.3063	77.0284	73.7506	73.7506	77.0284	80.3063	83.5841	86.8619	90.1397 (44)
Energy conte	133.6745	116.9126	120.6433	105.1798	100.9225	87.0884	80.7002	92.6047	93.7107	109.2108	119.2121	129.4566 (45)
Energy content (annual)										Total = Sum(45)m =		1289.3164 (45)
Distribution loss (46)m = 0.15 x (45)m	20.0512	17.5369	18.0965	15.7770	15.1384	13.0633	12.1050	13.8907	14.0566	16.3816	17.8818	19.4185 (46)

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Water storage loss:														
Store volume												150.0000 (47)		
a) If manufacturer declared loss factor is known (kWh/day):												1.1300 (48)		
Temperature factor from Table 2b												0.6000 (49)		
Enter (49) or (54) in (55)												0.6780 (55)		
Total storage loss														
	21.0180	18.9840	21.0180	20.3400	21.0180	20.3400	21.0180	21.0180	20.3400	21.0180	20.3400	21.0180	(56)	
If cylinder contains dedicated solar storage														
	21.0180	18.9840	21.0180	20.3400	21.0180	20.3400	21.0180	21.0180	20.3400	21.0180	20.3400	21.0180	(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)	
Total heat required for water heating calculated for each month														
	154.6925	135.8966	141.6613	125.5198	121.9405	107.4284	101.7182	113.6227	114.0507	130.2288	139.5521	150.4746	(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	(64)
Output from w/h														
	154.6925	135.8966	141.6613	125.5198	121.9405	107.4284	101.7182	113.6227	114.0507	130.2288	139.5521	150.4746	(64)	
												Total per year (kWh/year) = Sum(64)m =	1536.7864	(65)
Heat gains from water heating, kWh/month														
	61.2612	54.0606	56.9283	51.2443	50.3711	45.2289	43.6472	47.6055	47.4308	53.1270	55.9100	59.8587	(65)	

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	39.4851	35.0703	28.5211	21.5923	16.1405	13.6265	14.7239	19.1387	25.6879	32.6167	38.0685	40.5825 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	261.9580	264.6763	257.8263	243.2434	224.8350	207.5338	195.9755	193.2572	200.1073	214.6902	233.0985	250.3997 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.0723	49.0723	49.0723	49.0723	49.0723	49.0723	49.0723	49.0723	49.0723	49.0723	49.0723	49.0723 (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)	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129 (71)
Water heating gains (Table 5)	82.3403	80.4474	76.5165	71.1726	67.7031	62.8179	58.6656	63.9858	65.8761	71.4072	77.6528	80.4553 (72)
Total internal gains	473.0621	469.4727	452.1426	425.2870	397.9574	373.2569	358.6438	365.6604	380.9500	407.9928	438.0985	460.7162 (73)

[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			
Northeast				4.7400	9.9768	0.6700	0.7000	0.7700	15.3701 (75)			
Southwest				5.1900	32.4665	0.6700	0.7000	0.7700	54.7658 (79)			
Northwest				2.0200	9.9768	0.6700	0.7000	0.7700	6.5501 (81)			
Solar gains	76.6860	141.4778	223.0159	317.3617	378.3206	398.7170	369.3761	311.9754	260.1625	170.1311	95.7590	66.2428 (83)
Total gains	549.7480	610.9505	675.1585	742.6487	776.2779	771.9739	728.0198	677.6358	641.1125	578.1239	533.8575	526.9590 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n _{li,m} (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	58.8673	58.8673	58.8673	58.8673	58.8673	58.8673	58.8673	58.8673	58.8673	58.8673	58.8673	58.8673
alpha	4.9245	4.9245	4.9245	4.9245	4.9245	4.9245	4.9245	4.9245	4.9245	4.9245	4.9245	4.9245
util living area	0.9737	0.9551	0.9092	0.7985	0.6185	0.4224	0.3147	0.3558	0.5879	0.8476	0.9528	0.9788 (86)
MIT	20.3234	20.4448	20.6289	20.8197	20.9239	20.9519	20.9552	20.9545	20.9359	20.7968	20.5236	20.2780 (87)
Th 2	20.0691	20.0691	20.0691	20.0691	20.0691	20.0691	20.0691	20.0691	20.0691	20.0691	20.0691	20.0691 (88)
util rest of house	0.9669	0.9440	0.8878	0.7573	0.5568	0.3499	0.2359	0.2716	0.5096	0.8052	0.9391	0.9732 (89)
MIT 2	19.1905	19.3619	19.6157	19.8615	19.9781	20.0024	20.0043	20.0041	19.9910	19.8407	19.4763	19.1258 (90)
Living area fraction									f _{LA} = Living area / (4) =			0.4012 (91)
MIT	19.6450	19.7963	20.0221	20.2459	20.3575	20.3833	20.3858	20.3854	20.3701	20.2243	19.8964	19.5880 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6450	19.7963	20.0221	20.2459	20.3575	20.3833	20.3858	20.3854	20.3701	20.2243	19.8964	19.5880 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9632	0.9401	0.8866	0.7656	0.5765	0.3746	0.2628	0.3003	0.5356	0.8129	0.9361	0.9697 (94)
Useful gains	529.5022	574.3723	598.5619	568.5895	447.4877	289.1882	191.3211	203.5210	343.3902	469.9694	499.7456	510.9888 (95)
Ext temp.	5.2000	5.8000	7.4000	9.9000	12.9000	15.7000	17.3000	17.1000	14.7000	11.3000	7.9000	5.0000 (96)
Heat loss rate W	896.5271	868.6797	783.3910	642.1179	462.8482	290.6693	191.5178	203.9064	351.9108	553.8824	744.5571	905.4034 (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	273.0665	197.7746	137.5128	52.9405	11.4282	0.0000	0.0000	0.0000	0.0000	62.4313	176.2643	293.4445 (98)
Space heating												1204.8627 (98)
Space heating per m2												19.7454 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1204.8627 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	273.0665	197.7746	137.5128	52.9405	11.4282	0.0000	0.0000	0.0000	0.0000	62.4313	176.2643	293.4445	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	273.0665	197.7746	137.5128	52.9405	11.4282	0.0000	0.0000	0.0000	0.0000	62.4313	176.2643	293.4445	(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	154.6925	135.8966	141.6613	125.5198	121.9405	107.4284	101.7182	113.6227	114.0507	130.2288	139.5521	150.4746	(64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)
Fuel for water heating, kWh/month	154.6925	135.8966	141.6613	125.5198	121.9405	107.4284	101.7182	113.6227	114.0507	130.2288	139.5521	150.4746	(219)
Water heating fuel used												1536.7864	(219)
Annual totals kWh/year													
Space heating fuel - main system												1204.8627	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.4480)													
mechanical ventilation fans (SFP = 0.4480)													80.0426 (230a)
Total electricity for the above, kWh/year													80.0426 (231)
Electricity for lighting (calculated in Appendix L)													278.9274 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													3100.6190 (238)

10a. Fuel costs - using BEDF prices (513)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1 (0.00*43.39 + 1.00*12.14)	1204.8627	12.1400	146.2703 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (electric off-peak tariff)			
High-rate fraction			0.0993 (243)
Low-rate fraction			0.9007 (244)
High-rate cost	152.6495	43.3900	66.2346 (245)
Low-rate cost	1384.1369	12.1400	168.0342 (246)
Mechanical ventilation fans (0.71*43.39 + 0.29*12.14)	80.0426	34.3275	27.4766 (249)
Pumps and fans for heating (0.90*43.39 + 0.10*12.14)	0.0000	0.0000	0.0000 (249)
Energy for lighting (0.90*43.39 + 0.10*12.14)	278.9274	40.2650	112.3101 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit (0.90*43.39 + 0.10*12.14)	0.0000	38.5575	0.0000 (252)
Total energy cost			520.3259 (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	1204.8627	0.5190	625.3237 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating	1536.7864	0.5190	797.5921 (264)
Space and water heating			1422.9158 (265)
Pumps and fans	80.0426	0.5190	41.5421 (267)
Energy for lighting	278.9274	0.5190	144.7633 (268)
Energy saving/generation technologies			
PV Unit (0.90*43.39 + 0.10*12.14)	-488.0000	0.5190	-253.2720 (269)
Total kg/year			1355.9493 (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	1204.8627	3.0700	3698.9284 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating	1536.7864	3.0700	4717.9341 (264)
Space and water heating			8416.8625 (265)
Pumps and fans	80.0426	3.0700	245.7308 (267)
Energy for lighting	278.9274	3.0700	856.3071 (268)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Energy saving/generation technologies			
PV Unit (0.90*43.39 + 0.10*12.14)	-488.0000	3.0700	-1498.1600 (269)
Primary energy kWh/year			8020.7404 (272)
Primary energy kWh/m ² /year			131.4445 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	B 86
Current environmental impact rating:	B 82

(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/m ²

Potential energy efficiency rating:	B 86
Potential environmental impact rating:	B 82

Fuel prices for cost data on this page from database revision number 513 TEST (28 Feb 2023)
Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, West Pennines (England)):

	Current £520	Potential £520	Saving £0
Electricity			
Space heating	£174	£174	£0
Water heating	£234	£234	£0
Lighting	£112	£112	£0
Total cost of fuels	£520	£520	£0
Total cost of uses	£520	£520	£0
Delivered energy	51 kWh/m ²	51 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	1.4 tonnes	1.4 tonnes	0.0 tonnes
CO2 emissions per m ²	22 kg/m ²	22 kg/m ²	0 kg/m ²
Primary energy	131 kWh/m ²	131 kWh/m ²	0 kWh/m ²

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	No
SAP Region	West Pennines
Front of dwelling faces	South West
Overshading	Average or unknown
Thermal mass parameter	215.6 (calculated from construction elements)
Night ventilation	No
Ventilation rate during hot weather (ach)	4.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient	193.31 (P1)
Transmission heat loss coefficient	37.90 (37)
Summer heat loss coefficient	231.21 (P2)

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

Solar shading	Z blinds	Solar access	Z overhangs	Z summer
Orientation				
North East	1.000	0.90	1.000	0.900 (P8)
South West	1.000	0.90	1.000	0.900 (P8)
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	Shading	Gains W
North East	4.7400	89.6552	0.6700	0.7000	0.9000	161.4401
South West	5.1900	112.1012	0.6700	0.7000	0.9000	221.0220
North West	2.0200	89.6552	0.6700	0.7000	0.9000	68.7994
total:						451.2615

	Jun	Jul	Aug	
Solar gains	490	451	380	(P3)
Internal gains	373	359	366	
Total summer gains	864	810	745	(P5)

Summer gain/loss ratio	3.73	3.50	3.22	(P6)
Summer external temperature	14.70	16.40	16.30	
Thermal mass temperature increment (TMP = 215.6)	0.49	0.49	0.49	
Threshold temperature	18.93	20.39	20.02	(P7)
Likelihood of high internal temperature	Not significant	Not significant	Not significant	

Assessment of likelihood of high internal temperature: Not significant