

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	74278-09			Issued on Date	30/03/2023
Assessment Reference	001	Prop Type Ref	HT 2B3P (Top)		
Property	Flat 9, 32 Brookstone Close, MANCHESTER, M21 7AE				
SAP Rating	86 B	DER	27.70	TER	27.48
Environmental	82 B	% DER<TER	-0.81		
CO ₂ Emissions (t/year)	1.35	DFEE	37.00	TFEE	48.41
General Requirements Compliance	Fail	% DFEE<TFEE	23.57		
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

Top-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) 27.48 kgCO₂/m²
 Dwelling Carbon Dioxide Emission Rate (DER) 27.70 kgCO₂/m² Fail
 Excess emissions = 0.22 kgCO₂/m² (0.8%)

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 48.4 kWh/m²/yr
 Dwelling Fabric Energy Efficiency (DFEE) 37.0 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 (no floor)			
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	OK
Openings	1.35 (max. 2.00)	1.35 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified ψ -value of 0.044

3 Air permeability

Air permeability at 50 pascals:	3.13 (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

Hot water controls: Cylinderstat OK

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

Based on:

Overshading: Average
 Windows facing North East: 7.69 m², No overhang
 Windows facing South East: 0.90 m², No overhang
 Air change rate: 4.00 ach
 Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
 Air permeability 3.1 m³/m²h
 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 2.5000 (2b)	= 152.5500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 152.5500 (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					3.1300
Infiltration rate					0.1565 (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) =				0.1330 (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	0.1696	0.1663	0.1630	0.1463	0.1430	0.1264	0.1264	0.1230	0.1330	0.1430	0.1497	0.1563 (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 m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 1.35)			8.5900	1.2808	11.0024			(27)
Main	50.8500	8.5900	42.2600	0.1800	7.6068	110.0000	4648.6000	(29a)
Flat	61.0200		61.0200	0.1300	7.9326	9.0000	549.1800	(30)
Total net area of external elements Aum(A, m2)			111.8700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	26.5418				(33)
Party Wall 1			30.0000	0.0000	0.0000	45.0000	1350.0000	(32)
Party Floor 1			61.0200			40.0000	2440.8000	(32d)
Internal Wall 1			121.4300			9.0000	1092.8700	(32c)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =				10081.4500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							165.2155	(35)
Thermal bridges (User defined value 0.044 * total exposed area)							4.9223	(36)
Total fabric heat loss			(33) + (36) =				31.4641	(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	25.1708	25.1708	25.1708	25.1708	25.1708	25.1708	25.1708	25.1708	25.1708	25.1708	25.1708	25.1708 (38)
Heat transfer coeff	56.6348	56.6348	56.6348	56.6348	56.6348	56.6348	56.6348	56.6348	56.6348	56.6348	56.6348	56.6348 (39)
Average = Sum(39)m / 12 =												56.6348 (39)
HLP	0.9281	0.9281	0.9281	0.9281	0.9281	0.9281	0.9281	0.9281	0.9281	0.9281	0.9281	0.9281 (40)
HLP (average)												0.9281 (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
Energy conte	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 content (annual)	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)
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

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	(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)
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	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	16.7663	14.8917	12.1107	9.1686	6.8536	5.7861	6.2521	8.1267	10.9077	13.8498	16.1648	17.2323 (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	327.7733	325.8270	314.5257	296.4691	278.3511	260.8065	249.3762	254.7497	264.0105	282.2543	303.1484	318.6102 (73)

[Jan					Area	Solar flux	g		FF	Access		Gains
					m2	Table 6a	Table 6b		Table 6c	factor		W
						W/m2	or		or	Table 6d		
Northeast					7.6900	11.2829	0.6700		0.7000	0.7700		28.2004 (75)
Southeast					0.9000	36.7938	0.6700		0.7000	0.7700		10.7628 (77)

Solar gains	38.9631	75.7356	128.5053	200.9278	263.1209	277.9617	261.0168	212.0582	153.1811	90.4124	48.3747	32.2405 (83)
Total gains	366.7364	401.5626	443.0310	497.3969	541.4720	538.7682	510.3930	466.8079	417.1916	372.6667	351.5231	350.8507 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil/m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	49.4467	49.4467	49.4467	49.4467	49.4467	49.4467	49.4467	49.4467	49.4467	49.4467	49.4467	49.4467
alpha	4.2964	4.2964	4.2964	4.2964	4.2964	4.2964	4.2964	4.2964	4.2964	4.2964	4.2964	4.2964
util living area	0.9895	0.9833	0.9662	0.9153	0.7998	0.6271	0.4765	0.5370	0.7838	0.9436	0.9824	0.9913 (86)
MIT	19.9116	20.0290	20.2495	20.5400	20.7829	20.9057	20.9389	20.9320	20.8360	20.5270	20.1628	19.8747 (87)
Th 2	20.1437	20.1437	20.1437	20.1437	20.1437	20.1437	20.1437	20.1437	20.1437	20.1437	20.1437	20.1437 (88)
util rest of house	0.9872	0.9797	0.9587	0.8962	0.7577	0.5574	0.3889	0.4457	0.7235	0.9270	0.9780	0.9894 (89)
MIT 2	18.6739	18.8443	19.1623	19.5717	19.8926	20.0342	20.0640	20.0595	19.9643	19.5611	19.0398	18.6202 (90)
Living area fraction	19.1704	19.3196	19.5985	19.9601	20.2497	20.3838	20.4150	20.4095	20.3140	19.9486	19.4903	19.1235 (91)
MIT	19.1704	19.3196	19.5985	19.9601	20.2497	20.3838	20.4150	20.4095	20.3140	19.9486	19.4903	19.1235 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1704	19.3196	19.5985	19.9601	20.2497	20.3838	20.4150	20.4095	20.3140	19.9486	19.4903	19.1235 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9839	0.9753	0.9530	0.8916	0.7633	0.5777	0.4172	0.4749	0.7366	0.9224	0.9737	0.9865 (94)
Useful gains	360.8459	391.6641	422.1888	443.4591	413.3074	311.2574	212.9273	221.6866	307.2931	343.7561	342.2853	346.1102 (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	842.1839	816.6499	741.8311	626.3888	484.2134	327.5664	216.0615	227.0793	351.9300	529.4547	701.7233	845.1870 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	358.1155	285.5905	237.8139	131.7094	52.7540	0.0000	0.0000	0.0000	0.0000	138.1598	258.7953	371.3131 (98)
Space heating												1834.2516 (99)
Space heating per m2												30.0598 (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	1834.2516 (211)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	358.1155	285.5905	237.8139	131.7094	52.7540	0.0000	0.0000	0.0000	0.0000	138.1598	258.7953	371.3131 (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)	358.1155	285.5905	237.8139	131.7094	52.7540	0.0000	0.0000	0.0000	0.0000	138.1598	258.7953	371.3131 (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												1834.2516 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans: (MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.4160)												77.4222 (230a)
mechanical ventilation fans (SFP = 0.4160)												77.4222 (231)
Total electricity for the above, kWh/year												296.0977 (232)
Electricity for lighting (calculated in Appendix L)												
Energy saving/generation technologies (Appendices M,N and Q)												
Total delivered energy for all uses												3744.5578 (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	1834.2516	0.5190	951.9766 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating	1536.7864	0.5190	797.5921 (264)
Space and water heating			1749.5687 (265)
Pumps and fans	77.4222	0.5190	40.1821 (267)
Energy for lighting	296.0977	0.5190	153.6747 (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			1690.1535 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			27.7000 (273)

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

DER		27.7000 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		47.4852 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		47.4852 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 2.5000 (2b)	= 152.5500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 152.5500 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				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) =	0.1311 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3811 (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) =		0.3239 (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	0.4130	0.4049	0.3968	0.3563	0.3482	0.3077	0.3077	0.2996	0.3239	0.3482	0.3644	0.3806 (22b)
Effective ac	0.5853	0.5820	0.5787	0.5635	0.5606	0.5474	0.5474	0.5449	0.5525	0.5606	0.5664	0.5724 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opening Type (Uw = 1.40)			8.5900	1.3258	11.3883		(27)					
Main	50.8500	8.5900	42.2600	0.1800	7.6068		(29a)					
Flat	61.0200		61.0200	0.1300	7.9326		(30)					
Total net area of external elements Aum(A, m2)			111.8700				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		26.9277		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.4455 (36)					
Total fabric heat loss						(33) + (36) =	34.3732 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 29.4646	Feb 29.2978	Mar 29.1344	Apr 28.3668	May 28.2231	Jun 27.5545	Jul 27.5545	Aug 27.4307	Sep 27.8121	Oct 28.2231	Nov 28.5137	Dec 28.8174 (38)
Heat transfer coeff	63.8377	63.6710	63.5075	62.7399	62.5963	61.9277	61.9277	61.8039	62.1852	62.5963	62.8868	63.1906 (39)
Average = Sum(39)m / 12 =												62.7392 (39)
HLP	Jan 1.0462	Feb 1.0434	Mar 1.0408	Apr 1.0282	May 1.0258	Jun 1.0149	Jul 1.0149	Aug 1.0128	Sep 1.0191	Oct 1.0258	Nov 1.0306	Dec 1.0356 (40)
HLP (average)												1.0282 (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)
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)

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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	16.7663	14.8917	12.1107	9.1686	6.8536	5.7861	6.2521	8.1267	10.9077	13.8498	16.1648	17.2323	(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	358.2753	356.3291	345.0277	326.9711	308.8531	291.3086	279.8782	285.2518	294.5125	312.7563	333.6505	349.1123	(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					7.6900	11.2829	0.6300	0.7000			0.7700	26.5168 (75)
Southeast					0.9000	36.7938	0.6300	0.7000			0.7700	10.1202 (77)
Solar gains	36.6370	71.2141	120.8333	188.9321	247.4122	261.3669	245.4337	199.3980	144.0360	85.0147	45.4866	30.3157 (83)
Total gains	394.9123	427.5431	465.8611	515.9032	556.2653	552.6755	525.3119	484.6498	438.5485	397.7710	379.1371	379.4280 (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	66.3793	66.5531	66.7244	67.5407	67.6957	68.4266	68.4266	68.5636	68.1432	67.6957	67.3829	67.0590		
alpha	5.4253	5.4369	5.4483	5.5027	5.5130	5.5618	5.5618	5.5709	5.5429	5.5130	5.4922	5.4706		
util living area	0.9971	0.9950	0.9878	0.9584	0.8650	0.6811	0.5121	0.5738	0.8378	0.9732	0.9942	0.9977	(86)	
MIT	19.9453	20.0587	20.2766	20.5833	20.8410	20.9686	20.9946	20.9902	20.9028	20.5844	20.2178	19.9263	(87)	
Th 2	20.0450	20.0473	20.0495	20.0599	20.0619	20.0710	20.0710	20.0726	20.0675	20.0619	20.0579	20.0538	(88)	
util rest of house	0.9962	0.9933	0.9835	0.9432	0.8196	0.5968	0.4075	0.4647	0.7686	0.9605	0.9919	0.9969	(89)	
MIT 2	18.6395	18.8064	19.1241	19.5675	19.9061	20.0502	20.0689	20.0685	19.9889	19.5770	19.0468	18.6182	(90)	
Living area fraction	19.1633	19.3088	19.5865	19.9750	20.2812	20.4186	20.4403	20.4383	20.3555	19.9812	19.5165	19.1430	(91)	
MIT	19.1633	19.3088	19.5865	19.9750	20.2812	20.4186	20.4403	20.4383	20.3555	19.9812	19.5165	19.1430	(92)	
Temperature adjustment												0.0000		
adjusted MIT	19.1633	19.3088	19.5865	19.9750	20.2812	20.4186	20.4403	20.4383	20.3555	19.9812	19.5165	19.1430	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	392.9218	423.9217	456.9066	485.7438	462.4137	347.9705	236.2239	246.5416	347.4035	381.4980	375.4141	377.8756	(94)	
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)	
Heat loss rate W	948.8417	917.4237	831.0896	694.8470	537.1507	360.3355	237.8185	249.5821	389.0003	587.2253	780.8375	944.2587	(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	413.6044	331.6334	278.3922	150.5543	55.6043	0.0000	0.0000	0.0000	0.0000	153.0612	291.9048	421.3891	(98)	
Space heating												2096.1436	(98)	
Space heating per m2												34.3517	(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													2241.8649 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	413.6044	331.6334	278.3922	150.5543	55.6043	0.0000	0.0000	0.0000	0.0000	153.0612	291.9048	421.3891	(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)	442.3576	354.6881	297.7456	161.0207	59.4699	0.0000	0.0000	0.0000	0.0000	163.7018	312.1977	450.6835	(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	86.9606	86.7313	86.1642	84.8189	82.4692	79.8000	79.8000	79.8000	79.8000	84.7665	86.3310	87.0601	(216)
Fuel for water heating, kWh/month	207.3002	183.3229	194.0925	177.1677	178.8758	165.6395	159.5177	174.4356	173.9380	183.8057	190.3186	202.2184	(219)
Water heating fuel used												2190.6324	(219)
Annual totals kWh/year													
Space heating fuel - main system												2241.8649	(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)												296.0977	(232)
Total delivered energy for all uses												4803.5950	(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	2241.8649	0.2160	484.2428 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2190.6324	0.2160	473.1766 (264)
Space and water heating			957.4194 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	296.0977	0.5190	153.6747 (268)
Total CO2, kg/m2/year			1150.0191 (272)
Emissions per m2 for space and water heating			15.6903 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.5184 (272b)
Emissions per m2 for pumps and fans			0.6379 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.6903 * 1.55) + 2.5184 + 0.6379, rounded to 2 d.p.			27.4800 (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 2.5000 (2b)	= 152.5500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 152.5500 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				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) = 0.1311 (8)
Measured/design AP50					Yes
Infiltration rate					3.1300
Number of sides sheltered					0.2876 (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) =				0.2445 (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	0.3117	0.3056	0.2995	0.2689	0.2628	0.2322	0.2322	0.2261	0.2445	0.2628	0.2750	0.2872 (22b)
	0.5486	0.5467	0.5448	0.5362	0.5345	0.5270	0.5270	0.5256	0.5299	0.5345	0.5378	0.5413 (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)			8.5900	1.2808	11.0024		(27)
Main	50.8500	8.5900	42.2600	0.1800	7.6068	110.0000	4648.6000 (29a)
Flat	61.0200		61.0200	0.1300	7.9326	9.0000	549.1800 (30)
Total net area of external elements Aum(A, m ²)			111.8700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	26.5418			(33)
Party Wall 1			30.0000	0.0000	0.0000	45.0000	1350.0000 (32)
Party Floor 1			61.0200			40.0000	2440.8000 (32d)
Internal Wall 1			121.4300			9.0000	1092.8700 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	10081.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							165.2155 (35)
Thermal bridges (User defined value 0.044 * total exposed area)							4.9223 (36)
Total fabric heat loss						(33) + (36) =	31.4641 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	27.6161	27.5212	27.4281	26.9909	26.9091	26.5284	26.5284	26.4578	26.6750	26.9091	27.0746	27.2476 (38)
Heat transfer coeff	59.0802	58.9852	58.8921	58.4550	58.3732	57.9924	57.9924	57.9219	58.1391	58.3732	58.5386	58.7116 (39)
Average = Sum(39)m / 12 =												58.4546 (39)
HLP	0.9682	0.9667	0.9651	0.9580	0.9566	0.9504	0.9504	0.9492	0.9528	0.9566	0.9593	0.9622 (40)
HLP (average)												0.9580 (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												
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	(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	16.7663	14.8917	12.1107	9.1686	6.8536	5.7861	6.2521	8.1267	10.9077	13.8498	16.1648	17.2323	(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	283.6129	282.3498	272.4671	256.3391	239.4732	223.6918	213.7600	217.2135	225.7920	242.0397	260.6797	275.1301	(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					7.6900	11.2829	0.6700	0.7000			0.7700			28.2004 (75)
Southeast					0.9000	36.7938	0.6700	0.7000			0.7700			10.7628 (77)
Solar gains	38.9631	75.7356	128.5053	200.9278	263.1209	277.9617	261.0168	212.0582	153.1811	90.4124	48.3747	32.2405 (83)		
Total gains	322.5760	358.0854	400.9724	457.2669	502.5941	501.6535	474.7768	429.2717	378.9732	332.4521	309.0544	307.3706 (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	47.4000	47.4763	47.5514	47.9070	47.9741	48.2891	48.2891	48.3479	48.1673	47.9741	47.8385	47.6976		
alpha	4.1600	4.1651	4.1701	4.1938	4.1983	4.2193	4.2193	4.2232	4.2112	4.1983	4.1892	4.1798		
util living area	0.9935	0.9892	0.9769	0.9367	0.8374	0.6717	0.5186	0.5864	0.8304	0.9622	0.9892	0.9947	(86)	
MIT	19.5328	19.6880	19.9811	20.3839	20.7305	20.9244	20.9802	20.9675	20.8088	20.3656	19.8786	19.4986	(87)	
Th 2	20.1099	20.1112	20.1125	20.1185	20.1196	20.1249	20.1249	20.1259	20.1229	20.1196	20.1174	20.1150	(88)	
util rest of house	0.9921	0.9868	0.9714	0.9211	0.7985	0.6002	0.4235	0.4886	0.7749	0.9501	0.9863	0.9935	(89)	
MIT 2	18.7575	18.9128	19.2040	19.6005	19.9204	20.0821	20.1174	20.1125	19.9979	19.5898	19.1080	18.7274	(90)	
Living area fraction									fLA = Living area / (4) =			0.4012	(91)	
MIT	19.0685	19.2238	19.5157	19.9148	20.2454	20.4200	20.4636	20.4555	20.3232	19.9010	19.4172	19.0368	(92)	
Temperature adjustment												0.0000		
adjusted MIT	19.0685	19.2238	19.5157	19.9148	20.2454	20.4200	20.4636	20.4555	20.3232	19.9010	19.4172	19.0368	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	0.9899	0.9837	0.9669	0.9170	0.8046	0.6255	0.4612	0.5269	0.7889	0.9464	0.9834	0.9916	(94)	
Ext temp.	319.3176	352.2386	387.6820	419.2996	404.3749	313.7702	218.9788	226.1915	298.9833	314.6193	303.9135	304.8022	(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	872.5278	844.8922	766.5238	643.8675	498.8236	337.5173	224.0573	234.9009	361.8117	542.9292	721.0299	871.0910	(97)	
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	(97a)	
Space heating kWh	411.5884	331.0633	281.8583	161.6889	70.2698	0.0000	0.0000	0.0000	0.0000	169.8625	300.3238	421.3189	(98)	
Space heating												2147.9740	(98)	
Space heating per m2										(98) / (4) =		35.2011	(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	545.1286	429.1438	440.2064	0.0000	0.0000	0.0000	0.0000	(100)	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8779	0.9267	0.9002	0.0000	0.0000	0.0000	0.0000	(101)	
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	478.5437	397.7034	396.2526	0.0000	0.0000	0.0000	0.0000	(102)	
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	661.8713	629.0185	577.1625	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	131.9958	172.0985	134.5970	0.0000	0.0000	0.0000	0.0000	(104)	
Space cooling												438.6913	(104)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Cooled Fraction											FC = cooled area / (4) =	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	32.9990	43.0246	33.6493	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												109.6728 (107)
Space cooling per m2												1.7973 (108)
Energy for space heating												35.2011 (99)
Energy for space cooling												1.7973 (108)
Total												36.9985 (109)
Dwelling Fabric Energy Efficiency (DFEE)												37.0 (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 2.5000 (2b)	= 152.5500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 152.5500 (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) = 0.1311 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3811 (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) =		0.3239 (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	0.4130	0.4049	0.3968	0.3563	0.3482	0.3077	0.3077	0.2996	0.3239	0.3482	0.3644	0.3806 (22b)
Effective ac	0.5853	0.5820	0.5787	0.5635	0.5606	0.5474	0.5474	0.5449	0.5525	0.5606	0.5664	0.5724 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opening Type (Uw = 1.40)			8.5900	1.3258	11.3883		(27)					
Main	50.8500	8.5900	42.2600	0.1800	7.6068		(29a)					
Flat	61.0200		61.0200	0.1300	7.9326		(30)					
Total net area of external elements Aum(A, m2)			111.8700				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		26.9277		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.4455 (36)					
Total fabric heat loss						(33) + (36) =	34.3732 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 29.4646	Feb 29.2978	Mar 29.1344	Apr 28.3668	May 28.2231	Jun 27.5545	Jul 27.5545	Aug 27.4307	Sep 27.8121	Oct 28.2231	Nov 28.5137	Dec 28.8174 (38)
Heat transfer coeff	63.8377	63.6710	63.5075	62.7399	62.5963	61.9277	61.9277	61.8039	62.1852	62.5963	62.8868	63.1906 (39)
Average = Sum(39)m / 12 =												62.7392 (39)
HLP	Jan 1.0462	Feb 1.0434	Mar 1.0408	Apr 1.0282	May 1.0258	Jun 1.0149	Jul 1.0149	Aug 1.0128	Sep 1.0191	Oct 1.0258	Nov 1.0306	Dec 1.0356 (40)
HLP (average)												1.0282 (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	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	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	16.7663	14.8917	12.1107	9.1686	6.8536	5.7861	6.2521	8.1267	10.9077	13.8498	16.1648	17.2323	(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	283.6129	282.3498	272.4671	256.3391	239.4732	223.6918	213.7600	217.2135	225.7920	242.0397	260.6797	275.1301	(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			7.6900	11.2829	0.6300	0.7000	0.7700	26.5168 (75)				
Southeast			0.9000	36.7938	0.6300	0.7000	0.7700	10.1202 (77)				

Solar gains	36.6370	71.2141	120.8333	188.9321	247.4122	261.3669	245.4337	199.3980	144.0360	85.0147	45.4866	30.3157 (83)
Total gains	320.2498	353.5639	393.3004	445.2712	486.8854	485.0587	459.1937	416.6115	369.8280	327.0543	306.1664	305.4458 (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)													21.0000 (85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	66.3793	66.5531	66.7244	67.5407	67.6957	68.4266	68.4266	68.5636	68.1432	67.6957	67.3829	67.0590	
alpha	5.4253	5.4369	5.4483	5.5027	5.5130	5.5618	5.5618	5.5709	5.5429	5.5130	5.4922	5.4706	
util living area	0.9990	0.9980	0.9944	0.9773	0.9112	0.7509	0.5797	0.6543	0.9025	0.9887	0.9980	0.9992	(86)
MIT	19.8294	19.9449	20.1681	20.4901	20.7819	20.9494	20.9901	20.9815	20.8498	20.4840	20.1054	19.8111	(87)
Th 2	20.0450	20.0473	20.0495	20.0599	20.0619	20.0710	20.0710	20.0726	20.0675	20.0619	20.0579	20.0538	(88)
util rest of house	0.9986	0.9973	0.9923	0.9682	0.8754	0.6669	0.4644	0.5363	0.8486	0.9827	0.9971	0.9990	(89)
MIT 2	18.9699	19.0870	19.3111	19.6364	19.9088	20.0468	20.0683	20.0670	19.9772	19.6353	19.2562	18.9587	(90)
Living area fraction									fLA = Living area / (4) =			0.4012	(91)
MIT	19.3147	19.4311	19.6549	19.9789	20.2590	20.4089	20.4381	20.4339	20.3272	19.9758	19.5969	19.3006	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3147	19.4311	19.6549	19.9789	20.2590	20.4089	20.4381	20.4339	20.3272	19.9758	19.5969	19.3006	(93)

8. Space heating requirement

Utilisation	0.9983	0.9967	0.9912	0.9672	0.8839	0.6993	0.5111	0.5842	0.8660	0.9820	0.9965	0.9987	(94)
Useful gains	319.6923	352.3920	389.8400	430.6635	430.3551	339.2153	234.7020	243.3761	320.2547	321.1586	305.1095	305.0372	(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	958.5069	925.2118	835.4363	695.0867	535.7640	359.7292	237.6844	249.3106	387.2424	586.8901	785.8883	954.2188	(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	475.2781	384.9349	331.5237	190.3846	78.4242	0.0000	0.0000	0.0000	0.0000	197.7043	346.1607	482.9911	(98)
Space heating												2487.4016	(98)
Space heating per m2												40.7637	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

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	582.1204	458.2650	469.7096	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8861	0.9404	0.9129	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	515.8272	430.9718	428.7870	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	642.4748	610.8045	562.3649	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	91.1863	133.7955	99.3820	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												324.3638	(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)
Space cooling kWh													

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

	0.0000	0.0000	0.0000	0.0000	0.0000	22.7966	33.4489	24.8455	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												81.0910 (107)
Space cooling per m2												1.3289 (108)
Energy for space heating												40.7637 (99)
Energy for space cooling												1.3289 (108)
Total												42.0926 (109)
Target Fabric Energy Efficiency (TFEE)												48.4 (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 2.5000 (2b)	= 152.5500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 152.5500 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.1300
Infiltration rate					0.1565 (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) =				0.1330 (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	0.1430	0.1397	0.1397	0.1297	0.1330	0.1131	0.1097	0.1097	0.1131	0.1264	0.1264	0.1297 (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 m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 1.35)			8.5900	1.2808	11.0024			(27)
Main	50.8500	8.5900	42.2600	0.1800	7.6068	110.0000	4648.6000	(29a)
Flat	61.0200		61.0200	0.1300	7.9326	9.0000	549.1800	(30)
Total net area of external elements Aum(A, m2)			111.8700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.5418			(33)
Party Wall 1			30.0000	0.0000	0.0000	45.0000	1350.0000	(32)
Party Floor 1			61.0200			40.0000	2440.8000	(32d)
Internal Wall 1			121.4300			9.0000	1092.8700	(32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			10081.4500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							165.2155	(35)
Thermal bridges (User defined value 0.044 * total exposed area)							4.9223	(36)
Total fabric heat loss						(33) + (36) =	31.4641	(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	25.1708	25.1708	25.1708	25.1708	25.1708	25.1708	25.1708	25.1708	25.1708	25.1708	25.1708	25.1708 (38)
Heat transfer coeff	56.6348	56.6348	56.6348	56.6348	56.6348	56.6348	56.6348	56.6348	56.6348	56.6348	56.6348	56.6348 (39)
Average = Sum(39)m / 12 =												56.6348 (39)
HLP	0.9281	0.9281	0.9281	0.9281	0.9281	0.9281	0.9281	0.9281	0.9281	0.9281	0.9281	0.9281 (40)
HLP (average)												0.9281 (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	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	41.9157	37.2291	30.2768	22.9215	17.1341	14.4653	15.6303	20.3168	27.2692	34.6245	40.4119	43.0807 (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	475.4927	471.6316	453.8983	426.6161	398.9509	374.0957	359.5501	366.8386	382.5313	410.0006	440.4419	463.2144 (73)

[Jan											Area	Solar flux	g	FF	Access	Gains	
											m2	Table 6a	or Table 6b	Specific data	Specific data	factor	W
												W/m2		or Table 6c	Table 6d		
Northeast											7.6900	9.9768	0.6700	0.7000	0.7700	24.9358	
Southeast											0.9000	32.4665	0.6700	0.7000	0.7700	(75)	
Solar gains	34.4328	68.6775	121.7891	194.2639	248.1240	268.3232	245.9063	197.2499	149.1821	86.2613	43.9370	29.1381	(83)				
Total gains	509.9255	540.3090	575.6874	620.8801	647.0749	642.4190	605.4565	564.0885	531.7134	496.2619	484.3789	492.3525	(84)				

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil/m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	49.4467	49.4467	49.4467	49.4467	49.4467	49.4467	49.4467	49.4467	49.4467	49.4467	49.4467	49.4467
alpha	4.2964	4.2964	4.2964	4.2964	4.2964	4.2964	4.2964	4.2964	4.2964	4.2964	4.2964	4.2964
util living area	0.9595	0.9450	0.9080	0.8162	0.6528	0.4576	0.3437	0.3873	0.6258	0.8500	0.9379	0.9654 (86)
MIT	20.2275	20.3259	20.5089	20.7325	20.8849	20.9386	20.9470	20.9453	20.9067	20.7225	20.4375	20.1824 (87)
Th 2	20.1437	20.1437	20.1437	20.1437	20.1437	20.1437	20.1437	20.1437	20.1437	20.1437	20.1437	20.1437 (88)
util rest of house	0.9516	0.9344	0.8903	0.7827	0.5980	0.3875	0.2653	0.3043	0.5550	0.8149	0.9241	0.9586 (89)
MIT 2	19.1281	19.2678	19.5242	19.8242	20.0091	20.0626	20.0688	20.0679	20.0354	19.8183	19.4288	19.0639 (90)
Living area fraction									fLA = Living area / (4) =			0.4012 (91)
MIT	19.5692	19.6923	19.9192	20.1886	20.3604	20.4140	20.4211	20.4199	20.3850	20.1810	19.8334	19.5126 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5692	19.6923	19.9192	20.1886	20.3604	20.4140	20.4211	20.4199	20.3850	20.1810	19.8334	19.5126 (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 2.5000 (2b)	= 152.5500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 152.5500 (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					3.1300
Infiltration rate					0.1565 (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) =				0.1330 (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	0.1696	0.1663	0.1630	0.1463	0.1430	0.1264	0.1264	0.1230	0.1330	0.1430	0.1497	0.1563 (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 m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 1.35)			8.5900	1.2808	11.0024			(27)
Main	50.8500	8.5900	42.2600	0.1800	7.6068	110.0000	4648.6000	(29a)
Flat	61.0200		61.0200	0.1300	7.9326	9.0000	549.1800	(30)
Total net area of external elements Aum(A, m2)			111.8700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.5418			(33)
Party Wall 1			30.0000	0.0000	0.0000	45.0000	1350.0000	(32)
Party Floor 1			61.0200			40.0000	2440.8000	(32d)
Internal Wall 1			121.4300			9.0000	1092.8700	(32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			10081.4500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							165.2155	(35)
Thermal bridges (User defined value 0.044 * total exposed area)							4.9223	(36)
Total fabric heat loss						(33) + (36) =	31.4641	(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	25.1708	25.1708	25.1708	25.1708	25.1708	25.1708	25.1708	25.1708	25.1708	25.1708	25.1708	25.1708 (38)
Heat transfer coeff	56.6348	56.6348	56.6348	56.6348	56.6348	56.6348	56.6348	56.6348	56.6348	56.6348	56.6348	56.6348 (39)
Average = Sum(39)m / 12 =												56.6348 (39)
HLP	0.9281	0.9281	0.9281	0.9281	0.9281	0.9281	0.9281	0.9281	0.9281	0.9281	0.9281	0.9281 (40)
HLP (average)												0.9281 (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
Energy conte	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 content (annual)	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)
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	0.9526	0.9366	0.8998	0.8162	0.6720	0.4904	0.3461	0.3886	0.6196	0.8404	0.9292	0.9584 (94)
Useful gains	490.0529	512.6764	524.0377	512.1846	444.9254	319.7745	214.7588	224.9637	331.9302	420.5484	454.2074	474.8539 (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	859.1960	832.6314	755.3009	635.3491	488.1552	328.5869	216.2857	227.4776	354.9700	539.5309	716.5083	862.1133 (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	274.6425	215.0098	172.0598	88.6784	32.1630	0.0000	0.0000	0.0000	0.0000	88.5229	188.8566	288.1210 (98)
Space heating												1348.0540 (98)
Space heating per m2												22.0920 (99)
										(98) / (4) =		

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												1348.0540	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	274.6425	215.0098	172.0598	88.6784	32.1630	0.0000	0.0000	0.0000	0.0000	88.5229	188.8566	288.1210	(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)	274.6425	215.0098	172.0598	88.6784	32.1630	0.0000	0.0000	0.0000	0.0000	88.5229	188.8566	288.1210	(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	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)
(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	(217)
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												1348.0540	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.3000, SFP = 0.4160)													
mechanical ventilation fans (SFP = 0.4160)												77.4222	(230a)
Total electricity for the above, kWh/year												77.4222	(231)
Electricity for lighting (calculated in Appendix L)												296.0977	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses												3258.3602	(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)	1348.0540	5.5000	74.1430 (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)	77.4222	12.4509	9.6398 (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)	296.0977	14.3110	42.3745 (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			249.6249 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.4200 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] = 0.9889 (257)
SAP value	86.2049
SAP rating (Section 12)	86 (258)
SAP band	B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1348.0540	0.5190	699.6400 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating	1536.7864	0.5190	797.5921 (264)
Space and water heating			1497.2322 (265)
Pumps and fans	77.4222	0.5190	40.1821 (267)
Energy for lighting	296.0977	0.5190	153.6747 (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			1437.8169 (272)
CO2 emissions per m2			23.5600 (273)
EI value			81.8273
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 2.5000 (2b)	= 152.5500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 152.5500 (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					3.1300
Infiltration rate					0.1565 (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) =				0.1330 (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	0.1430	0.1397	0.1397	0.1297	0.1330	0.1131	0.1097	0.1097	0.1131	0.1264	0.1264	0.1297 (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 m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 1.35)			8.5900	1.2808	11.0024			(27)
Main	50.8500	8.5900	42.2600	0.1800	7.6068	110.0000	4648.6000	(29a)
Flat	61.0200		61.0200	0.1300	7.9326	9.0000	549.1800	(30)
Total net area of external elements Aum(A, m2)			111.8700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.5418			(33)
Party Wall 1			30.0000	0.0000	0.0000	45.0000	1350.0000	(32)
Party Floor 1			61.0200			40.0000	2440.8000	(32d)
Internal Wall 1			121.4300			9.0000	1092.8700	(32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			10081.4500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							165.2155	(35)
Thermal bridges (User defined value 0.044 * total exposed area)							4.9223	(36)
Total fabric heat loss						(33) + (36) =	31.4641	(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	25.1708	25.1708	25.1708	25.1708	25.1708	25.1708	25.1708	25.1708	25.1708	25.1708	25.1708	25.1708 (38)
Heat transfer coeff	56.6348	56.6348	56.6348	56.6348	56.6348	56.6348	56.6348	56.6348	56.6348	56.6348	56.6348	56.6348 (39)
Average = Sum(39)m / 12 =												56.6348 (39)
HLP	0.9281	0.9281	0.9281	0.9281	0.9281	0.9281	0.9281	0.9281	0.9281	0.9281	0.9281	0.9281 (40)
HLP (average)												0.9281 (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	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 (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)
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											
	41.9157	37.2291	30.2768	22.9215	17.1341	14.4653	15.6303	20.3168	27.2692	34.6245	40.4119	43.0807 (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	475.4927	471.6316	453.8983	426.6161	398.9509	374.0957	359.5501	366.8386	382.5313	410.0006	440.4419	463.2144 (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	7.6900	9.9768	0.6700	0.7000	0.7700	24.9358 (75)
Southeast	0.9000	32.4665	0.6700	0.7000	0.7700	9.4970 (77)

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													1177.1148 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	246.8366	191.8450	148.4497	68.8007	19.5199	0.0000	0.0000	0.0000	0.0000	72.7078	166.3572	262.5979	(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)	246.8366	191.8450	148.4497	68.8007	19.5199	0.0000	0.0000	0.0000	0.0000	72.7078	166.3572	262.5979	(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												1177.1148	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.3000, SFP = 0.4160)													
mechanical ventilation fans (SFP = 0.4160)												77.4222	(230a)
Total electricity for the above, kWh/year												77.4222	(231)
Electricity for lighting (calculated in Appendix L)												296.0977	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses												3087.4210	(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)	1177.1148	12.1400	142.9017 (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)	77.4222	34.3275	26.5771 (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)	296.0977	40.2650	119.2237 (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			522.9714 (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	1177.1148	0.5190	610.9226 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating	1536.7864	0.5190	797.5921 (264)
Space and water heating			1408.5147 (265)
Pumps and fans	77.4222	0.5190	40.1821 (267)
Energy for lighting	296.0977	0.5190	153.6747 (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			1349.0995 (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	1177.1148	3.0700	3613.7425 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating	1536.7864	3.0700	4717.9341 (264)
Space and water heating			8331.6766 (265)
Pumps and fans	77.4222	3.0700	237.6861 (267)
Energy for lighting	296.0977	3.0700	909.0198 (268)
Energy saving/generation technologies			

FULL SAP CALCULATION PRINTOUT

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

PV Unit $(0.90 \times 43.39 + 0.10 \times 12.14)$ -488.0000 3.0700 -1498.1600 (269)
Primary energy kWh/year 7980.2225 (272)
Primary energy kWh/m²/year 130.7804 (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	Potential	Saving
Electricity	£523	£523	£0
Space heating	£169	£169	£0
Water heating	£234	£234	£0
Lighting	£119	£119	£0
Total cost of fuels	£523	£523	£0
Total cost of uses	£522	£522	£0
Delivered energy	51 kWh/m ²	51 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	1.3 tonnes	1.3 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	North East
Overshading	Average or unknown
Thermal mass parameter	165.2 (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	201.37 (P1)
Transmission heat loss coefficient	31.46 (37)
Summer heat loss coefficient	232.83 (P2)

Overhangs	Ratio	Z_overhangs	Overhang type
Orientation			
North East	0.000	1.000	None
South East	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 East	1.000	0.90	1.000	0.900 (P8)

[Jul]	Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	Specific data FF or Table 6c	Shading	Gains W
North East	7.6900	89.6552	0.6700	0.7000	0.9000	261.9145
South East	0.9000	112.1012	0.6700	0.7000	0.9000	38.3275
total:						300.2420

	Jun	Jul	Aug	
Solar gains	330	300	240	(P3)
Internal gains	374	360	367	
Total summer gains	704	660	607	(P5)
Summer gain/loss ratio	3.02	2.83	2.61	(P6)
Summer external temperature	14.70	16.40	16.30	
Thermal mass temperature increment (TMP = 165.2)	0.84	0.84	0.84	
Threshold temperature	18.57	20.08	19.75	(P7)
Likelihood of high internal temperature	Not significant	Not significant	Not significant	
Assessment of likelihood of high internal temperature:	Not significant			