

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



Property Reference	SECPMW025a_049_As_Built				Issued on Date	01/03/2022
Assessment Reference	001	Prop Type Ref	GFF			
Property						
SAP Rating	83 B	DER	18.72	TER	21.44	
Environmental	88 B	% DER<TER	12.68			
CO ₂ Emissions (t/year)	0.78	DFEE	47.74	TFEE	56.65	
General Requirements Compliance	Pass	% DFEE<TFEE	15.72			
Assessor Details	Mr. Stephen Smith, Southern Energy Consultants Limited, Tel: 01635261582, info@southernenergyconsultants.co.uk				Assessor ID	d168-0001
Client	Bellway Homes Thames Valley					

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

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DWELLING AS BUILT

Ground-floor flat, total floor area 49 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 21.44 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 18.72 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)56.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)47.7 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof (no roof)			
Openings	1.30 (max. 2.00)	1.30 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 4.50 (measured in this dwelling)
Maximum 10.0 OK

4 Heating efficiency

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

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls: No cylinder

Boiler interlock

Yes OK

7 Low energy lights

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

8 Mechanical ventilation

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

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading: Average
Windows facing East: 8.57 m², No overhang
Windows facing South: 9.04 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

10 Key features

Floor U-value 0.10 W/m²K
Door U-value 1.00 W/m²K

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	48.6900 (1b)	x 2.4000 (2b)	= 116.8560 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.6900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 116.8560 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.5000
Infiltration rate					0.2250 (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) =				0.1913 (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	0.2438	0.2391	0.2343	0.2104	0.2056	0.1817	0.1817	0.1769	0.1913	0.2056	0.2152	0.2247 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Opening Type 2 (Uw = 1.30)			17.6100	1.2357	21.7614		(27)
Heat Loss Floor			48.6900	0.1000	4.8690		(28a)
WT-E-01	51.4700	17.6100	33.8600	0.2000	6.7720		(29a)
WT-E-01	23.1700		23.1700	0.1876	4.3471		(29a)
Total net area of external elements Aum(A, m2)			123.3300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		37.7495		(33)
Party Ceilings 1			48.6900				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.0012 (36)
Total fabric heat loss							(33) + (36) = 48.7507 (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	19.2812	19.2812	19.2812	19.2812	19.2812	19.2812	19.2812	19.2812	19.2812	19.2812	19.2812	19.2812 (38)
Average = Sum(39)m / 12 =	68.0320	68.0320	68.0320	68.0320	68.0320	68.0320	68.0320	68.0320	68.0320	68.0320	68.0320	68.0320 (39)
HLP	1.3972	1.3972	1.3972	1.3972	1.3972	1.3972	1.3972	1.3972	1.3972	1.3972	1.3972	1.3972 (40)
HLP (average)												1.3972 (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												1.6516 (42)
Average daily hot water use (litres/day)												73.4257 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	80.7683	77.8312	74.8942	71.9572	69.0202	66.0831	66.0831	69.0202	71.9572	74.8942	77.8312	80.7683 (44)
Energy content (annual)	119.7770	104.7577	108.1006	94.2447	90.4301	78.0343	72.3102	82.9770	83.9680	97.8567	106.8182	115.9976 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1155.2721 (45)
Water storage loss:	17.9666	15.7137	16.2151	14.1367	13.5645	11.7051	10.8465	12.4466	12.5952	14.6785	16.0227	17.3996 (46)
Total storage loss												

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
Combi loss	13.9887	12.6210	13.9509	13.4756	13.9064	13.4366	13.8712	13.8940	13.4578	13.9325	13.5123	13.9814 (61)
Total heat required for water heating calculated for each month	133.7657	117.3787	122.0515	107.7203	104.3364	91.4708	86.1815	96.8710	97.4258	111.7891	120.3305	129.9790 (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	133.7657	117.3787	122.0515	107.7203	104.3364	91.4708	86.1815	96.8710	97.4258	111.7891	120.3305	129.9790 (64)
Heat gains from water heating, kWh/month	43.3230	37.9872	39.4312	34.7053	33.5446	29.3055	27.5110	31.0634	31.2838	36.0204	38.8951	42.0646 (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	82.5804	82.5804	82.5804	82.5804	82.5804	82.5804	82.5804	82.5804	82.5804	82.5804	82.5804	82.5804	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	12.8227	11.3890	9.2622	7.0121	5.2416	4.4252	4.7816	6.2153	8.3421	10.5922	12.3627	13.1791	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	143.8321	145.3247	141.5636	133.5566	123.4492	113.9497	107.6034	106.1109	109.8720	117.8790	127.9864	137.4859	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.2580	31.2580	31.2580	31.2580	31.2580	31.2580	31.2580	31.2580	31.2580	31.2580	31.2580	31.2580	(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)	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	(71)
Water heating gains (Table 5)	58.2299	56.5286	52.9989	48.2017	45.0868	40.7021	36.9771	41.7518	43.4498	48.4146	54.0210	56.5384	(72)
Total internal gains	265.6589	264.0164	254.5987	239.5445	224.5517	209.8511	200.1362	204.8521	212.4380	227.6599	245.1442	257.9775	(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
East					8.5700	19.6403		0.4500		0.0000	0.7700	58.3219 (76)
South					9.0400	46.7521		0.4500		0.0000	0.7700	146.4443 (78)
Solar gains	204.7662	353.9280	493.4010	619.3200	695.6469	690.0566	665.6258	609.7078	537.6661	394.0651	246.3069	174.5024 (83)
Total gains	470.4251	617.9444	747.9997	858.8646	920.1987	899.9077	865.7620	814.5599	750.1041	621.7251	491.4512	432.4800 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	49.7009	49.7009	49.7009	49.7009	49.7009	49.7009	49.7009	49.7009	49.7009	49.7009	49.7009	49.7009	
alpha	4.3134	4.3134	4.3134	4.3134	4.3134	4.3134	4.3134	4.3134	4.3134	4.3134	4.3134	4.3134	
util living area	0.9868	0.9612	0.9049	0.7942	0.6381	0.4727	0.3434	0.3803	0.5920	0.8603	0.9706	0.9905	(86)
MIT	19.7598	20.0747	20.4285	20.7396	20.9160	20.9815	20.9963	20.9942	20.9532	20.6813	20.1350	19.6811	(87)
Th 2	19.7654	19.7654	19.7654	19.7654	19.7654	19.7654	19.7654	19.7654	19.7654	19.7654	19.7654	19.7654	(88)
util rest of house	0.9826	0.9499	0.8793	0.7464	0.5686	0.3864	0.2483	0.2802	0.4993	0.8130	0.9598	0.9875	(89)
MIT 2	18.6766	18.9822	19.3137	19.5843	19.7185	19.7586	19.7647	19.7642	19.7453	19.5475	19.0457	18.5991	(90)
Living area fraction	19.2617	19.5723	19.9159	20.2083	20.3653	20.4191	20.4299	20.4286	20.3977	20.1599	19.6341	19.1836	(91)
MIT	19.2617	19.5723	19.9159	20.2083	20.3653	20.4191	20.4299	20.4286	20.3977	20.1599	19.6341	19.1836	(92)
Temperature adjustment	19.1117	19.4223	19.7659	20.0583	20.2153	20.2691	20.2799	20.2786	20.2477	20.0099	19.4841	19.0336	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	460.8750	584.6145	657.7536	651.5183	547.4266	379.9166	249.5092	262.4845	402.6498	511.9720	470.2166	426.0162	(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	1007.6703	987.9816	902.5039	759.1235	579.3144	385.6821	250.3538	263.8677	418.2426	640.1734	842.5130	1009.1578	(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	406.8157	271.0627	182.0942	77.4757	23.7246	0.0000	0.0000	0.0000	0.0000	95.3818	268.0534	433.8573	(98)
Space heating												1758.4655	(98)
Space heating per m ²												36.1155	(99)

8c. Space cooling requirement

Not applicable

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1943.0558 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	406.8157	271.0627	182.0942	77.4757	23.7246	0.0000	0.0000	0.0000	0.0000	95.3818	268.0534	433.8573	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	449.5201	299.5168	201.2091	85.6085	26.2150	0.0000	0.0000	0.0000	0.0000	105.3943	296.1916	479.4004	(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	133.7657	117.3787	122.0515	107.7203	104.3364	91.4708	86.1815	96.8710	97.4258	111.7891	120.3305	129.9790	(64)
Efficiency of water heater (217)m	89.6865	89.5086	89.1881	88.6108	87.8756	87.3000	87.3000	87.3000	87.3000	88.7447	89.4838	89.7417	(216)
Fuel for water heating, kWh/month	149.1481	131.1368	136.8473	121.5657	118.7319	104.7776	98.7187	110.9634	111.5989	125.9671	134.4719	144.8369	(219)
Water heating fuel used												1488.7642	(219)
Annual totals kWh/year													
Space heating fuel - main system												1943.0558	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 3.8640, total flow = 21.0000, SFP = 0.1840)													
mechanical ventilation fans (SFP = 0.1840)													26.2318 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													101.2318 (231)
Electricity for lighting (calculated in Appendix L)													226.4536 (232)
Total delivered energy for all uses													3759.5054 (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	1943.0558	0.2160	419.7000 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1488.7642	0.2160	321.5731 (264)
Space and water heating			741.2731 (265)
Pumps and fans	101.2318	0.5190	52.5393 (267)
Energy for lighting	226.4536	0.5190	117.5294 (268)
Total CO2, kg/year			911.3419 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			18.7200 (273)

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

DER		18.7200	ZC1
Total Floor Area	TFA	48.6900	
Assumed number of occupants	N	1.6516	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.5050	ZC2
CO2 emissions from cooking, equation (L16)		3.2581	ZC3
Total CO2 emissions		39.4831	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		39.4831	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	48.6900 (1b)	x 2.4000 (2b)	= 116.8560 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.6900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 116.8560 (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) = 0.1712 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4212 (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) =	0.3580 (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												
	0.4564	0.4475	0.4385	0.3938	0.3848	0.3401	0.3401	0.3311	0.3580	0.3848	0.4027	0.4206 (22b)
Effective ac	0.6042	0.6001	0.5962	0.5775	0.5740	0.5578	0.5578	0.5548	0.5641	0.5740	0.5811	0.5885 (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)			12.1800	1.3258	16.1477		(27)
Heat Loss Floor			48.6900	0.1300	6.3297		(28a)
WT-E-01	51.4700	12.1800	39.2900	0.1800	7.0722		(29a)
WT-E-01	23.1700		23.1700	0.1800	4.1706		(29a)
Total net area of external elements Aum(A, m ²)			123.3300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.7202		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.6840 (36)
Total fabric heat loss						(33) + (36) =	43.4042 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	23.2979	23.1420	22.9891	22.2710	22.1366	21.5112	21.5112
Heat transfer coeff	66.7022	66.5462	66.3933	65.6752	65.5409	64.9154	64.9154
Average = Sum(39)m / 12 =							
	66.7022	66.5462	66.3933	65.6752	65.5409	64.9154	64.9154
HLP	1.3699	1.3667	1.3636	1.3488	1.3461	1.3332	1.3332
HLP (average)							
Days in month	31	28	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6516 (42)
Average daily hot water use (litres/day)												73.4257 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	80.7683	77.8312	74.8942	71.9572	69.0202	66.0831	66.0831	69.0202	71.9572	74.8942	77.8312	80.7683 (44)
Energy conte	119.7770	104.7577	108.1006	94.2447	90.4301	78.0343	72.3102	82.9770	83.9680	97.8567	106.8182	115.9976 (45)
Energy content (annual)											Total = Sum(45)m =	1155.2721 (45)
Distribution loss (46)m = 0.15 x (45)m												
	17.9666	15.7137	16.2151	14.1367	13.5645	11.7051	10.8465	12.4466	12.5952	14.6785	16.0227	17.3996 (46)
Water storage loss:												
Total storage loss												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	41.1586	35.8237	38.1653	35.4857	35.1719	32.5889	33.6752	35.1719	35.4857	38.1653	38.3825	41.1586 (61)

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Total heat required for water heating calculated for each month												
	160.9356	140.5814	146.2659	129.7305	125.6020	110.6232	105.9855	118.1489	119.4538	136.0219	145.2007	157.1563 (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	160.9356	140.5814	146.2659	129.7305	125.6020	110.6232	105.9855	118.1489	119.4538	136.0219	145.2007	157.1563 (64)
Total per year (kWh/year) = Sum(64)m = 1595.7056 (64)												
Heat gains from water heating, kWh/month												
	50.1155	43.7879	45.4848	40.2078	38.8610	34.0936	32.4620	36.3828	36.7908	42.0787	45.1127	48.8589 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	82.5804	82.5804	82.5804	82.5804	82.5804	82.5804	82.5804	82.5804	82.5804	82.5804	82.5804	82.5804 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	12.8227	11.3890	9.2622	7.0121	5.2416	4.4252	4.7816	6.2153	8.3421	10.5922	12.3627	13.1791 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	143.8321	145.3247	141.5636	133.5566	123.4492	113.9497	107.6034	106.1109	109.8720	117.8790	127.9864	137.4859 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.2580	31.2580	31.2580	31.2580	31.2580	31.2580	31.2580	31.2580	31.2580	31.2580	31.2580	31.2580 (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)	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643 (71)
Water heating gains (Table 5)	67.3596	65.1605	61.1354	55.8442	52.2325	47.3523	43.6317	48.9017	51.0983	56.5573	62.6565	65.6705 (72)
Total internal gains	274.7886	272.6484	262.7353	247.1869	231.6974	216.5013	206.7908	212.0020	220.0866	235.8027	253.7797	267.1097 (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

East	5.9300	19.6403	0.6300	0.7000	0.7700	35.5938 (76)
South	6.2500	46.7521	0.6300	0.7000	0.7700	89.3002 (78)

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	50.6918	50.8106	50.9276	51.4844	51.5900	52.0870	52.0870	52.1801	51.8944	51.5900	51.3769	51.1560
alpha	4.3795	4.3874	4.3952	4.4323	4.4393	4.4725	4.4725	4.4787	4.4596	4.4393	4.4251	4.4104
util living area	0.9928	0.9824	0.9582	0.8990	0.7849	0.6147	0.4578	0.4978	0.7281	0.9285	0.9848	0.9946 (86)
MIT	19.6700	19.9025	20.2155	20.5666	20.8239	20.9560	20.9905	20.9862	20.9058	20.5540	20.0383	19.6266 (87)
Th 2	19.7865	19.7889	19.7914	19.8028	19.8049	19.8149	19.8149	19.8167	19.8110	19.8049	19.8006	19.7961 (88)
util rest of house	0.9904	0.9767	0.9447	0.8668	0.7213	0.5159	0.3387	0.3761	0.6349	0.8982	0.9789	0.9927 (89)
MIT 2	18.0558	18.3929	18.8398	19.3275	19.6467	19.7885	19.8118	19.8118	19.7450	19.3259	18.6006	17.7993 (90)
Living area fraction									fLA = Living area / (4) =			0.5402 (91)
MIT	18.9277	19.2083	19.5829	19.9968	20.2826	20.4191	20.4485	20.4462	20.3720	19.9893	19.3771	18.8783 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9277	19.2083	19.5829	19.9968	20.2826	20.4191	20.4485	20.4462	20.3720	19.9893	19.3771	18.8783 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9881	0.9732	0.9419	0.8726	0.7485	0.5679	0.4033	0.4421	0.6815	0.9037	0.9762	0.9908 (94)
Useful gains	394.9079	475.4396	530.9370	545.3860	491.0433	362.0315	247.1320	258.1389	373.5027	430.3004	394.3837	370.1121 (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	975.7004	952.1632	868.6155	728.7843	562.5088	377.7489	249.8263	262.1917	408.6606	615.3801	807.9910	970.1906 (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	432.1096	320.3582	251.2328	132.0467	53.1704	0.0000	0.0000	0.0000	0.0000	137.6993	297.7973	446.4583 (98)
Space heating												2070.8726 (99)
Space heating per m2										(98) / (4) =		42.5318 (99)

Not applicable

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2217.2084 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	432.1096	320.3582	251.2328	132.0467	53.1704	0.0000	0.0000	0.0000	0.0000	137.6993	297.7973	446.4583	(98)
Space heating efficiency (main heating system 1)	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)	462.6441	342.9959	268.9859	141.3776	56.9276	0.0000	0.0000	0.0000	0.0000	147.4297	318.8407	478.0068	(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	160.9356	140.5814	146.2659	129.7305	125.6020	110.6232	105.9855	118.1489	119.4538	136.0219	145.2007	157.1563	(64)
Efficiency of water heater (217)m	87.4163	87.0603	86.4012	85.0958	83.0600	80.3000	80.3000	80.3000	80.3000	85.0821	86.8207	87.5335	(216)
Fuel for water heating, kWh/month	184.1026	161.4760	169.2869	152.4523	151.2183	137.7624	131.9869	147.1344	148.7594	159.8715	167.2420	179.5384	(219)
Water heating fuel used												1890.8311	(219)
Annual totals kWh/year													
Space heating fuel - main system												2217.2084	(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)												226.4536	(232)
Total delivered energy for all uses												4409.4931	(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	2217.2084	0.2160	478.9170 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1890.8311	0.2160	408.4195 (264)
Space and water heating			887.3365 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	226.4536	0.5190	117.5294 (268)
Total CO2, kg/m2/year			1043.7909 (272)
Emissions per m2 for space and water heating			18.2242 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4138 (272b)
Emissions per m2 for pumps and fans			0.7994 (272c)
Target Carbon Dioxide Emission Rate (TER) = (18.2242 * 1.00) + 2.4138 + 0.7994, rounded to 2 d.p.			21.4400 (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	48.6900 (1b)	x 2.4000 (2b)	= 116.8560 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.6900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 116.8560 (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					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) = 0.1712 (8)
Measured/design AP50					Yes
Infiltration rate					4.5000
Number of sides sheltered					0.3962 (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) =				0.3367 (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												
	0.4293	0.4209	0.4125	0.3704	0.3620	0.3199	0.3199	0.3115	0.3367	0.3620	0.3788	0.3957 (22b)
Effective ac	0.5922	0.5886	0.5851	0.5686	0.5655	0.5512	0.5512	0.5485	0.5567	0.5655	0.5718	0.5783 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Opening Type 2 (Uw = 1.30)			17.6100	1.2357	21.7614		(27)
Heat Loss Floor			48.6900	0.1000	4.8690		(28a)
WT-E-01	51.4700	17.6100	33.8600	0.2000	6.7720		(29a)
WT-E-01	23.1700		23.1700	0.1876	4.3471		(29a)
Total net area of external elements Aum(A, m ²)			123.3300				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	37.7495	(33)
Party Ceilings 1			48.6900				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.0012 (36)
Total fabric heat loss						(33) + (36) =	48.7507 (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	22.8352	22.6972	22.5619	21.9266	21.8077	21.2543	21.2543	21.1518	21.4675	21.8077	22.0482	22.2996 (38)
Heat transfer coeff	71.5859	71.4479	71.3127	70.6773	70.5584	70.0050	70.0050	69.9025	70.2182	70.5584	70.7989	71.0503 (39)
Average = Sum(39)m / 12 =												70.6767 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.4702	1.4674	1.4646	1.4516	1.4491	1.4378	1.4378	1.4357	1.4421	1.4491	1.4541	1.4592 (40)
HLP (average)												1.4516 (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												1.6516 (42)
Average daily hot water use (litres/day)												73.4257 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	80.7683	77.8312	74.8942	71.9572	69.0202	66.0831	66.0831	69.0202	71.9572	74.8942	77.8312	80.7683 (44)
Energy conte	119.7770	104.7577	108.1006	94.2447	90.4301	78.0343	72.3102	82.9770	83.9680	97.8567	106.8182	115.9976 (45)
Energy content (annual)												Total = Sum(45)m = 1155.2721 (45)
Distribution loss (46)m = 0.15 x (45)m												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Heat gains from water heating, kWh/month	25.4526	22.2610	22.9714	20.0270	19.2164	16.5823	15.3659	17.6326	17.8432	20.7945	22.6989	24.6495 (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	82.5804	82.5804	82.5804	82.5804	82.5804	82.5804	82.5804	82.5804	82.5804	82.5804	82.5804	82.5804 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	12.8227	11.3890	9.2622	7.0121	5.2416	4.4252	4.7816	6.2153	8.3421	10.5922	12.3627	13.1791 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	143.8321	145.3247	141.5636	133.5566	123.4492	113.9497	107.6034	106.1109	109.8720	117.8790	127.9864	137.4859 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.2580	31.2580	31.2580	31.2580	31.2580	31.2580	31.2580	31.2580	31.2580	31.2580	31.2580	31.2580 (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)	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643 (71)
Water heating gains (Table 5)	34.2105	33.1265	30.8755	27.8153	25.8285	23.0309	20.6531	23.6998	24.7822	27.9496	31.5262	33.1310 (72)
Total internal gains	238.6395	237.6144	229.4754	216.1581	202.2934	189.1799	180.8122	183.8000	190.7705	204.1950	219.6494	231.5702 (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	
East					8.5700	19.6403	0.4500	0.0000	0.7700		58.3219 (76)	
South					9.0400	46.7521	0.4500	0.0000	0.7700		146.4443 (78)	
Solar gains	204.7662	353.9280	493.4010	619.3200	695.6469	690.0566	665.6258	609.7078	537.6661	394.0651	246.3069	174.5024 (83)
Total gains	443.4057	591.5423	722.8763	835.4781	897.9403	879.2365	846.4381	793.5079	728.4366	598.2601	465.9563	406.0726 (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	47.2334	47.3247	47.4144	47.8407	47.9213	48.3001	48.3001	48.3709	48.1535	47.9213	47.7585	47.5895
alpha	4.1489	4.1550	4.1610	4.1894	4.1948	4.2200	4.2200	4.2247	4.2102	4.1948	4.1839	4.1726
util living area	0.9897	0.9683	0.9195	0.8166	0.6651	0.4946	0.3606	0.3999	0.6197	0.8801	0.9764	0.9926 (86)
MIT	19.6209	19.9470	20.3261	20.6838	20.8922	20.9759	20.9949	20.9922	20.9394	20.6208	20.0330	19.5564 (87)
Th 2	19.7099	19.7120	19.7141	19.7240	19.7259	19.7345	19.7345	19.7361	19.7312	19.7259	19.7221	19.7182 (88)
util rest of house	0.9862	0.9586	0.8963	0.7702	0.5936	0.4032	0.2586	0.2927	0.5231	0.8360	0.9675	0.9902 (89)
MIT 2	18.4964	18.8163	19.1771	19.5018	19.6650	19.7255	19.7335	19.7344	19.7048	19.4629	18.9128	18.4391 (90)
Living area fraction									fLA = Living area / (4) =			0.5402 (91)
MIT	19.1038	19.4270	19.7977	20.1402	20.3278	20.4009	20.4149	20.4138	20.3717	20.0883	19.5179	19.0426 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1038	19.4270	19.7977	20.1402	20.3278	20.4009	20.4149	20.4138	20.3717	20.0883	19.5179	19.0426 (93)

8. Space heating requirement

Utilisation	0.9842	0.9560	0.8980	0.7864	0.6287	0.4522	0.3138	0.3507	0.5736	0.8500	0.9657	0.9885 (94)
Useful gains	436.3847	565.5058	649.1757	657.0509	564.4904	397.5492	265.6507	278.3208	417.8171	508.5295	449.9866	401.3831 (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	1059.7455	1037.9255	948.2970	794.4291	608.7671	406.0909	267.0595	280.5750	440.3845	669.4810	879.1709	1054.5732 (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	463.7804	317.4661	222.5462	98.9123	32.9419	0.0000	0.0000	0.0000	0.0000	119.7479	309.0126	485.9734 (98)
Space heating												2050.3809 (98)
Space heating per m2										(98) / (4) =		42.1109 (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	658.0472	518.0372	531.2593	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9493	0.9737	0.9652	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	624.6802	504.4192	512.7869	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1090.3211	1050.8068	989.8513	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	335.2615	406.5124	354.9359	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												1096.7098 (104)
Cooled fraction												fC = cooled area / (4) =
Intermittency factor (Table 10b)												1.0000 (105)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	83.8154	101.6281	88.7340	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												274.1775 (107)
Energy for space heating												5.6311 (108)
Energy for space cooling												42.1109 (99)
Total												5.6311 (108)
Dwelling Fabric Energy Efficiency (DFEE)												47.7420 (109)
												47.7 (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	48.6900 (1b)	x 2.4000 (2b)	= 116.8560 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.6900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 116.8560 (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) = 0.1712 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4212 (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) =	0.3580 (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												
	0.4564	0.4475	0.4385	0.3938	0.3848	0.3401	0.3401	0.3311	0.3580	0.3848	0.4027	0.4206 (22b)
Effective ac	0.6042	0.6001	0.5962	0.5775	0.5740	0.5578	0.5578	0.5548	0.5641	0.5740	0.5811	0.5885 (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)			12.1800	1.3258	16.1477			(27)								
Heat Loss Floor			48.6900	0.1300	6.3297			(28a)								
WT-E-01	51.4700	12.1800	39.2900	0.1800	7.0722			(29a)								
WT-E-01	23.1700		23.1700	0.1800	4.1706			(29a)								
Total net area of external elements Aum(A, m2)			123.3300					(31)								
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.7202			(33)								
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)								
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								9.6840 (36)								
Total fabric heat loss						(33) + (36) =		43.4042 (37)								
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)																
(38)m	23.2979	23.1420	22.9891	22.2710	22.1366	21.5112	21.5112	21.3954	Sep	21.7521	Oct	22.1366	Nov	22.4084	Dec	22.6926 (38)
Heat transfer coeff	66.7022	66.5462	66.3933	65.6752	65.5409	64.9154	64.9154	64.7996	65.1563	65.5409	65.8126				66.0968 (39)	
Average = Sum(39)m / 12 =															65.6746 (39)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
HLP	1.3699	1.3667	1.3636	1.3488	1.3461	1.3332	1.3332	1.3309	1.3382	1.3461	1.3517	1.3575 (40)				
HLP (average)												1.3488 (40)				
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	31	30	31 (41)	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6516 (42)
Average daily hot water use (litres/day)												73.4257 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	80.7683	77.8312	74.8942	71.9572	69.0202	66.0831	66.0831	69.0202	71.9572	74.8942	77.8312	80.7683 (44)
Energy conte	119.7770	104.7577	108.1006	94.2447	90.4301	78.0343	72.3102	82.9770	83.9680	97.8567	106.8182	115.9976 (45)
Energy content (annual)	Total = Sum(45)m =											1155.2721 (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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Heat gains from water heating, kWh/month
25.4526 22.2610 22.9714 20.0270 19.2164 16.5823 15.3659 17.6326 17.8432 20.7945 22.6989 24.6495 (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	82.5804	82.5804	82.5804	82.5804	82.5804	82.5804	82.5804	82.5804	82.5804	82.5804	82.5804	82.5804	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	12.8227	11.3890	9.2622	7.0121	5.2416	4.4252	4.7816	6.2153	8.3421	10.5922	12.3627	13.1791	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	143.8321	145.3247	141.5636	133.5566	123.4492	113.9497	107.6034	106.1109	109.8720	117.8790	127.9864	137.4859	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.2580	31.2580	31.2580	31.2580	31.2580	31.2580	31.2580	31.2580	31.2580	31.2580	31.2580	31.2580	(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)	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	(71)
Water heating gains (Table 5)	34.2105	33.1265	30.8755	27.8153	25.8285	23.0309	20.6531	23.6998	24.7822	27.9496	31.5262	33.1310	(72)
Total internal gains	238.6395	237.6144	229.4754	216.1581	202.2934	189.1799	180.8122	183.8000	190.7705	204.1950	219.6494	231.5702	(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
East					5.9300	19.6403	0.6300		0.7000		0.7700		35.5938
South					6.2500	46.7521	0.6300		0.7000		0.7700		89.3002 (76)

Solar gains	124.8940	215.8797	300.9665	377.7945	424.3693	420.9644	406.0584	371.9367	327.9745	240.3658	150.2325		106.4342 (83)
Total gains	363.5335	453.4941	530.4419	593.9526	626.6627	610.1444	586.8707	555.7367	518.7450	444.5608	369.8819		338.0044 (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	50.6918	50.8106	50.9276	51.4844	51.5900	52.0870	52.0870	52.1801	51.8944	51.5900	51.3769	51.1560	
alpha	4.3795	4.3874	4.3952	4.4323	4.4393	4.4725	4.4725	4.4787	4.4596	4.4393	4.4251	4.4104	
util living area	0.9950	0.9866	0.9659	0.9125	0.8047	0.6366	0.4765	0.5206	0.7541	0.9422	0.9891	0.9963	(86)
MIT	19.6050	19.8421	20.1639	20.5296	20.8039	20.9495	20.9889	20.9836	20.8911	20.5106	19.9787	19.5621	(87)
Th 2	19.7865	19.7889	19.7914	19.8028	19.8049	19.8149	19.8149	19.8167	19.8110	19.8049	19.8006	19.7961	(88)
util rest of house	0.9933	0.9822	0.9545	0.8833	0.7431	0.5364	0.3534	0.3945	0.6623	0.9162	0.9847	0.9951	(89)
MIT 2	18.5404	18.7769	19.0930	19.4464	19.6829	19.7939	19.8124	19.8127	19.7578	19.4399	18.9231	18.5052	(90)
Living area fraction	19.1154	19.3523	19.6714	20.0315	20.2884	20.4181	20.4479	20.4452	20.3699	20.0183	19.4933	19.0761	(92)
MIT	19.1154	19.3523	19.6714	20.0315	20.2884	20.4181	20.4479	20.4452	20.3699	20.0183	19.4933	19.0761	(93)
Temperature adjustment													
adjusted MIT	19.1154	19.3523	19.6714	20.0315	20.2884	20.4181	20.4479	20.4452	20.3699	20.0183	19.4933	19.0761	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9920	0.9801	0.9531	0.8896	0.7699	0.5892	0.4202	0.4629	0.7084	0.9217	0.9833	0.9941	(94)
Useful gains	360.6407	444.4826	505.5803	528.3615	482.4504	359.5245	246.6118	257.2619	367.4646	409.7519	363.6886	335.9998	(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	988.2212	961.7446	874.4954	731.0656	562.8929	377.6825	249.7863	262.1247	408.5257	617.2824	815.6336	983.2615	(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	466.9199	347.6001	274.4728	145.9470	59.8492	0.0000	0.0000	0.0000	0.0000	154.4027	325.4005	481.5627	(98)
Space heating												2256.1548	(98)
Space heating per m2												46.3371	(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	610.2049	480.3741	492.4769	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9003	0.9457	0.9318	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	549.3418	454.2862	458.8777	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	775.7978	747.4163	711.9370	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	163.0483	218.0889	188.2761	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												569.4133	(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	40.7621	54.5222	47.0690	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling													142.3533 (107)
Space cooling per m2													2.9237 (108)
Energy for space heating													46.3371 (99)
Energy for space cooling													2.9237 (108)
Total													49.2608 (109)
Target Fabric Energy Efficiency (TFEE)													56.6 (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	48.6900 (1b)	x 2.4000 (2b)	= 116.8560 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.6900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 116.8560 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.5000
Infiltration rate					0.2250 (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) =				0.1913 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.2008	0.1913	0.1913	0.1769	0.1769	0.1578	0.1626	0.1530	0.1578	0.1673	0.1673	0.1817 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Opening Type 2 (Uw = 1.30)			17.6100	1.2357	21.7614		(27)
Heat Loss Floor			48.6900	0.1000	4.8690		(28a)
WT-E-01	51.4700	17.6100	33.8600	0.2000	6.7720		(29a)
WT-E-01	23.1700		23.1700	0.1876	4.3471		(29a)
Total net area of external elements Aum(A, m2)			123.3300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		37.7495		(33)
Party Ceilings 1			48.6900				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.0012 (36)
Total fabric heat loss							(33) + (36) = 48.7507 (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	19.2812	19.2812	19.2812	19.2812	19.2812	19.2812	19.2812	19.2812	19.2812	19.2812	19.2812	19.2812 (38)
Average = Sum(39)m / 12 =	68.0320	68.0320	68.0320	68.0320	68.0320	68.0320	68.0320	68.0320	68.0320	68.0320	68.0320	68.0320 (39)
HLP	1.3972	1.3972	1.3972	1.3972	1.3972	1.3972	1.3972	1.3972	1.3972	1.3972	1.3972	1.3972 (40)
HLP (average)												1.3972 (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													1.6516 (42)
Average daily hot water use (litres/day)													73.4257 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
80.7683	77.8312	74.8942	71.9572	69.0202	66.0831	66.0831	69.0202	71.9572	74.8942	77.8312	80.7683 (44)		
Energy conte	119.7770	104.7577	108.1006	94.2447	90.4301	78.0343	72.3102	82.9770	83.9680	97.8567	106.8182	115.9976 (45)	
Energy content (annual)												Total = Sum(45)m = 1155.2721 (45)	
Distribution loss (46)m = 0.15 x (45)m													
17.9666	15.7137	16.2151	14.1367	13.5645	11.7051	10.8465	12.4466	12.5952	14.6785	16.0227	17.3996 (46)		
Water storage loss:													
Total storage loss													

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF HEAT DEMAND 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
Combi loss	13.9887	12.6210	13.9509	13.4756	13.9064	13.4366	13.8712	13.8940	13.4578	13.9325	13.5123	13.9814 (61)
Total heat required for water heating calculated for each month	133.7657	117.3787	122.0515	107.7203	104.3364	91.4708	86.1815	96.8710	97.4258	111.7891	120.3305	129.9790 (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	133.7657	117.3787	122.0515	107.7203	104.3364	91.4708	86.1815	96.8710	97.4258	111.7891	120.3305	129.9790 (64)
RHI water heating demand	43.3230	37.9872	39.4312	34.7053	33.5446	29.3055	27.5110	31.0634	31.2838	36.0204	38.8951	42.0646 (65)
Heat gains from water heating, kWh/month												
	43.3230	37.9872	39.4312	34.7053	33.5446	29.3055	27.5110	31.0634	31.2838	36.0204	38.8951	42.0646 (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	99.0965	99.0965	99.0965	99.0965	99.0965	99.0965	99.0965	99.0965	99.0965	99.0965	99.0965	99.0965	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	32.0569	28.4726	23.1555	17.5302	13.1040	11.0630	11.9539	15.5382	20.8553	26.4806	30.9068	32.9478	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	214.6748	216.9025	211.2889	199.3382	184.2525	170.0742	160.6021	158.3745	163.9881	175.9388	191.0245	205.2028	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.5613	46.5613	46.5613	46.5613	46.5613	46.5613	46.5613	46.5613	46.5613	46.5613	46.5613	46.5613	(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)	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	(71)
Water heating gains (Table 5)	58.2299	56.5286	52.9989	48.2017	45.0868	40.7021	36.9771	41.7518	43.4498	48.4146	54.0210	56.5384	(72)
Total internal gains	387.5550	384.4971	370.0367	347.6635	325.0368	304.4327	292.1266	298.2579	310.8866	333.4274	358.5456	377.2825	(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			
East	8.5700				22.3313	0.4500	0.0000	0.7700	66.3130 (76)			
South	9.0400				50.9848	0.4500	0.0000	0.7700	159.7028 (78)			
Solar gains	226.0158	351.4144	484.3558	628.6204	690.6714	734.7333	700.4074	653.7551	572.7088	417.8019	278.4790	190.7882 (83)
Total gains	613.5708	735.9115	854.3925	976.2839	1015.7081	1039.1660	992.5340	952.0130	883.5954	751.2293	637.0246	568.0706 (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	49.7009	49.7009	49.7009	49.7009	49.7009	49.7009	49.7009	49.7009	49.7009	49.7009	49.7009	49.7009	
alpha	4.3134	4.3134	4.3134	4.3134	4.3134	4.3134	4.3134	4.3134	4.3134	4.3134	4.3134	4.3134	
util living area	0.9606	0.9234	0.8426	0.6958	0.5183	0.3256	0.2123	0.2284	0.4388	0.7413	0.9177	0.9695	(86)
MIT	20.0913	20.3205	20.6211	20.8600	20.9672	20.9966	20.9996	20.9995	20.9874	20.8476	20.4466	20.0200	(87)
Th 2	19.7654	19.7654	19.7654	19.7654	19.7654	19.7654	19.7654	19.7654	19.7654	19.7654	19.7654	19.7654	(88)
util rest of house	0.9488	0.9030	0.8054	0.6380	0.4449	0.2461	0.1278	0.1404	0.3490	0.6739	0.8915	0.9601	(89)
MIT 2	18.9985	19.2132	19.4829	19.6764	19.7499	19.7646	19.7654	19.7654	19.7613	19.6745	19.3363	18.9306	(90)
Living area fraction	19.5888	19.8113	20.0977	20.3157	20.4074	20.4301	20.4321	20.4320	20.4236	20.3081	19.9360	19.5190	(91)
MIT	19.5888	19.8113	20.0977	20.3157	20.4074	20.4301	20.4321	20.4320	20.4236	20.3081	19.9360	19.5190	(92)
Temperature adjustment	19.4388	19.6613	19.9477	20.1657	20.2574	20.2801	20.2821	20.2820	20.2736	20.1581	19.7860	19.3690	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	579.8922	663.0625	693.2888	642.0144	482.1869	290.3121	162.0024	168.7742	341.4929	523.4091	568.2353	543.2699	(94)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Heat loss rate W	975.4935	956.6206	853.6445	698.3952	493.7377	291.1803	162.0570	168.8542	345.1659	582.2256	801.8256	970.7482	(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	294.3274	197.2710	119.3046	40.5942	8.5938	0.0000	0.0000	0.0000	0.0000	43.7595	168.1850	318.0439	(98)
Space heating												1190.0793	(98)
RHI space heating demand												1190	(98)

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	48.6900 (1b)	x 2.4000 (2b)	= 116.8560 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.6900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 116.8560 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.5000
Infiltration rate					0.2250 (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) =				0.1913 (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	0.2438	0.2391	0.2343	0.2104	0.2056	0.1817	0.1817	0.1769	0.1913	0.2056	0.2152	0.2247 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Opening Type 2 (Uw = 1.30)			17.6100	1.2357	21.7614		(27)
Heat Loss Floor			48.6900	0.1000	4.8690		(28a)
WT-E-01	51.4700	17.6100	33.8600	0.2000	6.7720		(29a)
WT-E-01	23.1700		23.1700	0.1876	4.3471		(29a)
Total net area of external elements Aum(A, m2)			123.3300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	37.7495		(33)
Party Ceilings 1			48.6900				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.0012 (36)
Total fabric heat loss							(33) + (36) = 48.7507 (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	19.2812	19.2812	19.2812	19.2812	19.2812	19.2812	19.2812	19.2812	19.2812	19.2812	19.2812	19.2812 (38)
Heat transfer coeff	68.0320	68.0320	68.0320	68.0320	68.0320	68.0320	68.0320	68.0320	68.0320	68.0320	68.0320	68.0320 (39)
Average = Sum(39)m / 12 =	68.0320	68.0320	68.0320	68.0320	68.0320	68.0320	68.0320	68.0320	68.0320	68.0320	68.0320	68.0320 (39)
HLP	1.3972	1.3972	1.3972	1.3972	1.3972	1.3972	1.3972	1.3972	1.3972	1.3972	1.3972	1.3972 (40)
HLP (average)	1.3972	1.3972	1.3972	1.3972	1.3972	1.3972	1.3972	1.3972	1.3972	1.3972	1.3972	1.3972 (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												1.6516 (42)
Average daily hot water use (litres/day)												73.4257 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
80.7683	77.8312	74.8942	71.9572	69.0202	66.0831	66.0831	69.0202	71.9572	74.8942	77.8312	80.7683	(44)
Energy conte	119.7770	104.7577	108.1006	94.2447	90.4301	78.0343	72.3102	82.9770	83.9680	97.8567	106.8182	115.9976 (45)
Energy content (annual)												Total = Sum(45)m = 1155.2721 (45)
Distribution loss (46)m = 0.15 x (45)m	17.9666	15.7137	16.2151	14.1367	13.5645	11.7051	10.8465	12.4466	12.5952	14.6785	16.0227	17.3996 (46)
Water storage loss:												
Total storage loss												

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If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
Combi loss	13.9887	12.6210	13.9509	13.4756	13.9064	13.4366	13.8712	13.8940	13.4578	13.9325	13.5123	13.9814 (61)
Total heat required for water heating calculated for each month	133.7657	117.3787	122.0515	107.7203	104.3364	91.4708	86.1815	96.8710	97.4258	111.7891	120.3305	129.9790 (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	133.7657	117.3787	122.0515	107.7203	104.3364	91.4708	86.1815	96.8710	97.4258	111.7891	120.3305	129.9790 (64)
Heat gains from water heating, kWh/month	43.3230	37.9872	39.4312	34.7053	33.5446	29.3055	27.5110	31.0634	31.2838	36.0204	38.8951	42.0646 (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	99.0965	99.0965	99.0965	99.0965	99.0965	99.0965	99.0965	99.0965	99.0965	99.0965	99.0965	99.0965	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	32.0569	28.4726	23.1555	17.5302	13.1040	11.0630	11.9539	15.5382	20.8553	26.4806	30.9068	32.9478	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	214.6748	216.9025	211.2889	199.3382	184.2525	170.0742	160.6021	158.3745	163.9881	175.9388	191.0245	205.2028	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.5613	46.5613	46.5613	46.5613	46.5613	46.5613	46.5613	46.5613	46.5613	46.5613	46.5613	46.5613	(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)	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	(71)
Water heating gains (Table 5)	58.2299	56.5286	52.9989	48.2017	45.0868	40.7021	36.9771	41.7518	43.4498	48.4146	54.0210	56.5384	(72)
Total internal gains	387.5550	384.4971	370.0367	347.6635	325.0368	304.4327	292.1266	298.2579	310.8866	333.4274	358.5456	377.2825	(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	
East												8.5700	19.6403		0.4500		0.0000		0.7700		58.3219 (76)	
South												9.0400	46.7521		0.4500		0.0000		0.7700		146.4443 (78)	
Solar gains	204.7662	353.9280	493.4010	619.3200	695.6469	690.0566	665.6258	609.7078	537.6661	394.0651	246.3069	174.5024	(83)									
Total gains	592.3212	738.4250	863.4376	966.9836	1020.6837	994.4892	957.7524	907.9657	848.5527	727.4925	604.8526	551.7849	(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	49.7009	49.7009	49.7009	49.7009	49.7009	49.7009	49.7009	49.7009	49.7009	49.7009	49.7009	49.7009
alpha	4.3134	4.3134	4.3134	4.3134	4.3134	4.3134	4.3134	4.3134	4.3134	4.3134	4.3134	4.3134
util living area	0.9702	0.9322	0.8616	0.7413	0.5874	0.4307	0.3111	0.3424	0.5331	0.8003	0.9422	0.9772 (86)
MIT	19.9637	20.2488	20.5524	20.8038	20.9388	20.9870	20.9975	20.9962	20.9685	20.7687	20.3064	19.8856 (87)
Th 2	19.7654	19.7654	19.7654	19.7654	19.7654	19.7654	19.7654	19.7654	19.7654	19.7654	19.7654	19.7654 (88)
util rest of house	0.9615	0.9144	0.8293	0.6901	0.5198	0.3508	0.2246	0.2517	0.4459	0.7445	0.9236	0.9703 (89)
MIT 2	18.8747	19.1451	19.4213	19.6327	19.7320	19.7607	19.7650	19.7646	19.7523	19.6142	19.2061	18.7991 (90)
Living area fraction	19.4629	19.7413	20.0323	20.2652	20.3838	20.4231	20.4307	20.4298	20.4093	20.2378	19.8005	19.3860 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.3129	19.5913	19.8823	20.1152	20.2338	20.2731	20.2807	20.2798	20.2593	20.0878	19.6505	19.2360 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9576	0.9115	0.8327	0.7054	0.5462	0.3841	0.2609	0.2897	0.4816	0.7603	0.9215	0.9666 (94)
Useful gains	567.2057	673.0797	718.9443	682.0972	557.4621	381.9439	249.8374	263.0437	408.6729	553.1245	557.3834	533.3591 (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	1021.3583	999.4760	910.4213	762.9952	580.5736	385.9524	250.4054	263.9529	419.0270	645.4762	853.8328	1022.9277 (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	337.8896	219.3383	142.4589	58.2466	17.1949	0.0000	0.0000	0.0000	0.0000	68.7097	213.4436	364.2390 (98)
Space heating												1421.5206 (98)
Space heating per m2										(98) / (4) =		29.1953 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1570.7410 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	337.8896	219.3383	142.4589	58.2466	17.1949	0.0000	0.0000	0.0000	0.0000	68.7097	213.4436	364.2390	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	373.3586	242.3628	157.4131	64.3609	18.9999	0.0000	0.0000	0.0000	0.0000	75.9224	235.8493	402.4740	(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	133.7657	117.3787	122.0515	107.7203	104.3364	91.4708	86.1815	96.8710	97.4258	111.7891	120.3305	129.9790	(64)
Efficiency of water heater (217)m	89.5689	89.3582	88.9948	88.3970	87.7389	87.3000	87.3000	87.3000	87.3000	88.4911	89.3197	89.6359	(216)
Fuel for water heating, kWh/month	149.3440	131.3575	137.1445	121.8597	118.9169	104.7776	98.7187	110.9634	111.5989	126.3281	134.7190	145.0078	(219)
Water heating fuel used												1490.7361	(219)
Annual totals kWh/year													
Space heating fuel - main system												1570.7410	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 3.8640, total flow = 21.0000, SFP = 0.1840)													
mechanical ventilation fans (SFP = 0.1840)													26.2318 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													101.2318 (231)
Electricity for lighting (calculated in Appendix L)													226.4536 (232)
Total delivered energy for all uses													3389.1625 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1570.7410	3.4800	54.6618 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1490.7361	3.4800	51.8776 (247)
Mechanical ventilation fans	26.2318	13.1900	3.4600 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	226.4536	13.1900	29.8692 (250)
Additional standing charges			120.0000 (251)
Total energy cost			269.7611 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.2093 (257)
SAP value		83.1302
SAP rating (Section 12)		83 (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	1570.7410	0.2160	339.2800 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1490.7361	0.2160	321.9990 (264)
Space and water heating			661.2791 (265)
Pumps and fans	101.2318	0.5190	52.5393 (267)
Energy for lighting	226.4536	0.5190	117.5294 (268)
Total kg/year			831.3478 (272)
CO2 emissions per m2			17.0700 (273)
EI value			88.1097
EI rating			88 (274)
EI band			B

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9050 = 3.845$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9050 = 0.2387$, stars = 4
Water heating energy efficiency	$3.48 / 0.8839 = 3.937$, stars = 4
Water heating environmental impact	$0.216 / 0.8839 = 0.2444$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	48.6900 (1b)	x 2.4000 (2b)	= 116.8560 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.6900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 116.8560 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.5000
Infiltration rate					0.2250 (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) =				0.1913 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.2008	0.1913	0.1913	0.1769	0.1769	0.1578	0.1626	0.1530	0.1578	0.1673	0.1673	0.1817 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Opening Type 2 (Uw = 1.30)			17.6100	1.2357	21.7614		(27)
Heat Loss Floor			48.6900	0.1000	4.8690		(28a)
WT-E-01	51.4700	17.6100	33.8600	0.2000	6.7720		(29a)
WT-E-01	23.1700		23.1700	0.1876	4.3471		(29a)
Total net area of external elements Aum(A, m2)			123.3300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		37.7495		(33)
Party Ceilings 1			48.6900				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.0012 (36)
Total fabric heat loss							(33) + (36) = 48.7507 (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	19.2812	19.2812	19.2812	19.2812	19.2812	19.2812	19.2812	19.2812	19.2812	19.2812	19.2812	19.2812 (38)
Average = Sum(39)m / 12 =	68.0320	68.0320	68.0320	68.0320	68.0320	68.0320	68.0320	68.0320	68.0320	68.0320	68.0320	68.0320 (39)
HLP	1.3972	1.3972	1.3972	1.3972	1.3972	1.3972	1.3972	1.3972	1.3972	1.3972	1.3972	1.3972 (40)
HLP (average)												1.3972 (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												1.6516 (42)
Average daily hot water use (litres/day)												73.4257 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	80.7683	77.8312	74.8942	71.9572	69.0202	66.0831	66.0831	69.0202	71.9572	74.8942	77.8312	80.7683 (44)
Energy content (annual)	119.7770	104.7577	108.1006	94.2447	90.4301	78.0343	72.3102	82.9770	83.9680	97.8567	106.8182	115.9976 (45)
Distribution loss	Total = Sum(45)m = 1155.2721 (45)											
	17.9666	15.7137	16.2151	14.1367	13.5645	11.7051	10.8465	12.4466	12.5952	14.6785	16.0227	17.3996 (46)
Water storage loss:												
Total storage loss:												

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If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
Combi loss	13.9887	12.6210	13.9509	13.4756	13.9064	13.4366	13.8712	13.8940	13.4578	13.9325	13.5123	0.0000 (57)
Total heat required for water heating calculated for each month	133.7657	117.3787	122.0515	107.7203	104.3364	91.4708	86.1815	96.8710	97.4258	111.7891	120.3305	129.9790 (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	133.7657	117.3787	122.0515	107.7203	104.3364	91.4708	86.1815	96.8710	97.4258	111.7891	120.3305	129.9790 (64)
Heat gains from water heating, kWh/month	43.3230	37.9872	39.4312	34.7053	33.5446	29.3055	27.5110	31.0634	31.2838	36.0204	38.8951	42.0646 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	99.0965	99.0965	99.0965	99.0965	99.0965	99.0965	99.0965	99.0965	99.0965	99.0965	99.0965	99.0965	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	32.0569	28.4726	23.1555	17.5302	13.1040	11.0630	11.9539	15.5382	20.8553	26.4806	30.9068	32.9478	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	214.6748	216.9025	211.2889	199.3382	184.2525	170.0742	160.6021	158.3745	163.9881	175.9388	191.0245	205.2028	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.5613	46.5613	46.5613	46.5613	46.5613	46.5613	46.5613	46.5613	46.5613	46.5613	46.5613	46.5613	(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)	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	-66.0643	(71)
Water heating gains (Table 5)	58.2299	56.5286	52.9989	48.2017	45.0868	40.7021	36.9771	41.7518	43.4498	48.4146	54.0210	56.5384	(72)
Total internal gains	387.5550	384.4971	370.0367	347.6635	325.0368	304.4327	292.1266	298.2579	310.8866	333.4274	358.5456	377.2825	(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			
East	8.5700				22.3313	0.4500	0.0000	0.7700	66.3130 (76)			
South	9.0400				50.9848	0.4500	0.0000	0.7700	159.7028 (78)			
Solar gains	226.0158	351.4144	484.3558	628.6204	690.6714	734.7333	700.4074	653.7551	572.7088	417.8019	278.4790	190.7882 (83)
Total gains	613.5708	735.9115	854.3925	976.2839	1015.7081	1039.1660	992.5340	952.0130	883.5954	751.2293	637.0246	568.0706 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	49.7009	49.7009	49.7009	49.7009	49.7009	49.7009	49.7009	49.7009	49.7009	49.7009	49.7009	49.7009	
alpha	4.3134	4.3134	4.3134	4.3134	4.3134	4.3134	4.3134	4.3134	4.3134	4.3134	4.3134	4.3134	
util living area	0.9606	0.9234	0.8426	0.6958	0.5183	0.3256	0.2123	0.2284	0.4388	0.7413	0.9177	0.9695	(86)
MIT	20.0913	20.3205	20.6211	20.8600	20.9672	20.9966	20.9996	20.9995	20.9874	20.8476	20.4466	20.0200	(87)
Th 2	19.7654	19.7654	19.7654	19.7654	19.7654	19.7654	19.7654	19.7654	19.7654	19.7654	19.7654	19.7654	(88)
util rest of house	0.9488	0.9030	0.8054	0.6380	0.4449	0.2461	0.1278	0.1404	0.3490	0.6739	0.8915	0.9601	(89)
MIT 2	18.9985	19.2132	19.4829	19.6764	19.7499	19.7646	19.7654	19.7654	19.7613	19.6745	19.3363	18.9306	(90)
Living area fraction	19.5888	19.8113	20.0977	20.3157	20.4074	20.4301	20.4321	20.4320	20.4236	20.3081	19.9360	19.5190	(92)
Temperature adjustment	19.4388	19.6613	19.9477	20.1657	20.2574	20.2801	20.2821	20.2820	20.2736	20.1581	19.7860	19.3690	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	579.8922	663.0625	693.2888	642.0144	482.1869	290.3121	162.0024	168.7742	341.4929	523.4091	568.2353	543.2699	(94)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Heat loss rate W	975.4935	956.6206	853.6445	698.3952	493.7377	291.1803	162.0570	168.8542	345.1659	582.2256	801.8256	970.7482	(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	294.3274	197.2710	119.3046	40.5942	8.5938	0.0000	0.0000	0.0000	0.0000	43.7595	168.1850	318.0439	(98)
Space heating												1190.0793	(98)
Space heating per m2												24.4420	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1315.0048 (211)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	294.3274	197.2710	119.3046	40.5942	8.5938	0.0000	0.0000	0.0000	0.0000	43.7595	168.1850	318.0439	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	325.2236	217.9790	131.8283	44.8555	9.4959	0.0000	0.0000	0.0000	0.0000	48.3530	185.8397	351.4297	(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	133.7657	117.3787	122.0515	107.7203	104.3364	91.4708	86.1815	96.8710	97.4258	111.7891	120.3305	129.9790	(64)
Efficiency of water heater (217)m	89.4752	89.2792	88.8530	88.1531	87.5355	87.3000	87.3000	87.3000	87.3000	88.1771	89.1373	89.5477	(216)
Fuel for water heating, kWh/month	149.5004	131.4737	137.3634	122.1968	119.1932	104.7776	98.7187	110.9634	111.5989	126.7779	134.9946	145.1506	(219)
Water heating fuel used												1492.7091	(219)
Annual totals kWh/year													
Space heating fuel - main system												1315.0048	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 3.8640, total flow = 21.0000, SFP = 0.1840)													
mechanical ventilation fans (SFP = 0.1840)													26.2318 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													101.2318 (231)
Electricity for lighting (calculated in Appendix L)													226.4536 (232)
Total delivered energy for all uses													3135.3993 (238)

10a. Fuel costs - using BEDF prices (490)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1315.0048	3.6300	47.7347 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1492.7091	3.6300	54.1853 (247)
Mechanical ventilation fans	26.2318	19.4400	5.0995 (249)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	226.4536	19.4400	44.0226 (250)
Additional standing charges			95.0000 (251)
Total energy cost			260.6221 (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	1315.0048	0.2160	284.0410 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1492.7091	0.2160	322.4252 (264)
Space and water heating			606.4662 (265)
Pumps and fans	101.2318	0.5190	52.5393 (267)
Energy for lighting	226.4536	0.5190	117.5294 (268)
Total kg/year			776.5349 (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	1315.0048	1.2200	1604.3058 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1492.7091	1.2200	1821.1051 (264)
Space and water heating			3425.4109 (265)
Pumps and fans	101.2318	3.0700	310.7817 (267)
Energy for lighting	226.4536	3.0700	695.2126 (268)
Primary energy kWh/year			4431.4052 (272)
Primary energy kWh/m2/year			91.0126 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 83
Current environmental impact rating: B 88

(For testing purposes):

FULL SAP CALCULATION PRINTOUT

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

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

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0		0.00 kg/m²
Potential energy efficiency rating:		B 83	
Potential environmental impact rating:			B 88

Fuel prices for cost data on this page from database revision number 490 TEST (31 Jan 2022)
 Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£64	£64	£0
Mains gas	£197	£197	£0
Space heating	£162	£162	£0
Water heating	£54	£54	£0
Lighting	£44	£44	£0
Total cost of fuels	£261	£261	£0
Total cost of uses	£260	£260	£0
Delivered energy	64 kWh/m²	64 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.8 tonnes	0.8 tonnes	0.0 tonnes
CO2 emissions per m²	16 kg/m²	16 kg/m²	0 kg/m²
Primary energy	91 kWh/m²	91 kWh/m²	0 kWh/m²

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CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



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

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

No improvements selected / applicable

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

Overheating Calculation Input Data

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

Overheating Calculation

Summer ventilation heat loss coefficient 231.37 (P1)
 Transmission heat loss coefficient 48.75 (37)
 Summer heat loss coefficient 280.13 (P2)

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

Solar shading Orientation	Z blinds	Solar access	Z overhangs	Z summer
East	1.000	0.90	1.000	0.900 (P8)
South	1.000	0.90	1.000	0.900 (P8)

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
East	8.5700	117.5071	0.4500	0.0000	0.9000	407.8494
South	9.0400	112.2060	0.4500	0.0000	0.9000	410.8086
total:						818.6580

	Jun	Jul	Aug	
Solar gains	859	819	764	(P4)
Internal gains	301	289	295	
Total summer gains	1160	1108	1059	(P5)
Summer gain/loss ratio	4.14	3.95	3.78	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 250.0)	0.25	0.25	0.25	
Threshold temperature	20.39	22.10	21.83	(P7)
Likelihood of high internal temperature	Not significant	Medium	Slight	

Assessment of likelihood of high internal temperature: Medium