

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



Property Reference	SECPMW026t_132_As_Built				Issued on Date	17/09/2021
Assessment Reference	001	Prop Type Ref	MFF			
Property						
SAP Rating	85 B	DER	13.91	TER	15.70	
Environmental	90 B	% DER<TER	11.40			
CO ₂ Emissions (t/year)	0.86	DFEE	29.03	TFEE	34.30	
General Requirements Compliance	Pass	% DFEE<TFEE	15.37			
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

Mid-floor flat, total floor area 71 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 15.70 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.91 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)34.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)29.0 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.16 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.15 (max. 0.20)	0.15 (max. 0.35)	OK
Openings	1.25 (max. 2.00)	1.30 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.26 (measured in this dwelling)
Maximum 10.0 OK

4 Heating efficiency

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

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls:

No cylinder

Boiler interlock

Yes

OK

7 Low energy lights

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

8 Mechanical ventilation

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

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing South: 10.22 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.3 m³/m²h

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	71.1200 (1b)	x 2.4000 (2b)	= 170.6880 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.1200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.6880 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.2600
Infiltration rate					0.1630 (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) =				0.1386 (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	0.1767	0.1732	0.1697	0.1524	0.1489	0.1316	0.1316	0.1282	0.1386	0.1489	0.1559	0.1628 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			10.2200	1.2357	12.6293		(27)
WT-E-03	41.2400	10.2200	31.0200	0.1600	4.9632		(29a)
WT-I-02	7.4800	2.1200	5.3600	0.1584	0.8491		(29a)
Flat	20.4000		20.4000	0.1500	3.0600		(30)
Total net area of external elements Aum(A, m ²)			69.1200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	23.6216	(33)
Party Wall 1					33.8400	0.0000	(32)
Party Floor 1					71.1200		(32d)
Party Ceilings 1					50.8000		(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.6088 (36)
Total fabric heat loss							(33) + (36) = 34.2304 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635 (38)
Heat transfer coeff	62.3939	62.3939	62.3939	62.3939	62.3939	62.3939	62.3939	62.3939	62.3939	62.3939	62.3939	62.3939 (39)
Average = Sum(39)m / 12 =												62.3939 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8773	0.8773	0.8773	0.8773	0.8773	0.8773	0.8773	0.8773	0.8773	0.8773	0.8773	0.8773 (40)
HLP (average)												0.8773 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2730 (42)
Average daily hot water use (litres/day)												88.1839 (43)

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

Regs Region: England

Elmhurst Energy Systems
 SAP2012 Calculator (Design
 System) version 4.14r16

Southern Energy
Consultants
Energy & Sustainability Solutions

	21.5777	18.8720	19.4742	16.9781	16.2909	14.0578	13.0266	14.9482	15.1268	17.6288	19.2432	20.8969 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	14.0915	12.7075	14.0368	13.5476	13.9726	13.4913	13.9220	13.9548	13.5220	14.0103	13.6006	14.0809 (61)
Total heat required for water heating calculated for each month	157.9430	138.5210	143.8651	126.7350	122.5787	107.2101	100.7662	113.6098	114.3671	131.5356	141.8887	153.3935 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h								Solar input (sum of months) = Sum(63)m =				0.0000 (63)
	157.9430	138.5210	143.8651	126.7350	122.5787	107.2101	100.7662	113.6098	114.3671	131.5356	141.8887	153.3935 (64)
								Total per year (kWh/year) = Sum(64)m =				1552.4138 (64)
Heat gains from water heating, kWh/month												
	51.3535	45.0099	46.6771	41.0217	39.6047	34.5343	32.3562	36.6240	36.9115	42.5797	46.0559	49.8417 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.0110	16.8854	13.7321	10.3961	7.7712	6.5608	7.0891	9.2147	12.3680	15.7040	18.3289	19.5393 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.8968	201.9711	196.7439	185.6159	171.5687	158.3664	149.5464	147.4721	152.6993	163.8273	177.8745	191.0768 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202 (71)
Water heating gains (Table 5)	69.0235	66.9790	62.7380	56.9746	53.2321	47.9643	43.4895	49.2258	51.2660	57.2308	63.9666	66.9915 (72)
Total internal gains	348.0264	345.9306	333.3092	313.0817	292.6671	272.9866	260.2202	266.0077	276.4284	296.8573	320.2651	337.7027 (73)

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W	
South					10.2200	46.7521	0.4500	0.0000			0.7700	165.5598 (78)	
Solar gains	165.5598	271.1443	345.3898	390.3654	406.7849	391.4751	382.4950	371.4557	360.8004	292.4546	196.2448	143.0589	(83)
Total gains	513.5862	617.0749	678.6989	703.4471	699.4520	664.4617	642.7152	637.4634	637.2288	589.3119	516.5099	480.7617	(84)

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	31.6626	31.6626	31.6626	31.6626	31.6626	31.6626	31.6626	31.6626	31.6626	31.6626	31.6626	31.6626
alpha	3.1108	3.1108	3.1108	3.1108	3.1108	3.1108	3.1108	3.1108	3.1108	3.1108	3.1108	3.1108
util living area	0.9406	0.9021	0.8526	0.7828	0.6821	0.5449	0.4092	0.4288	0.5948	0.7919	0.9085	0.9501 (86)
MIT	19.4495	19.7575	20.0955	20.4332	20.7138	20.8966	20.9681	20.9620	20.8571	20.4944	19.8958	19.3592 (87)
Th 2	20.1868	20.1868	20.1868	20.1868	20.1868	20.1868	20.1868	20.1868	20.1868	20.1868	20.1868	20.1868 (88)
util rest of house	0.9332	0.8907	0.8356	0.7572	0.6435	0.4885	0.3396	0.3598	0.5413	0.7623	0.8957	0.9437 (89)
MIT 2	18.7666	19.0655	19.3911	19.7108	19.9665	20.1204	20.1714	20.1677	20.0902	19.7738	19.2051	18.6783 (90)
Living area fraction									fLA = Living area / (4) =			0.3346 (91)
MIT	18.9951	19.2971	19.6268	19.9525	20.2166	20.3801	20.4380	20.4335	20.3469	20.0149	19.4362	18.9061 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.8451	19.1471	19.4768	19.8025	20.0666	20.2301	20.2880	20.2835	20.1969	19.8649	19.2862	18.7561 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9183	0.8736	0.8189	0.7439	0.6374	0.4917	0.3485	0.3683	0.5420	0.7494	0.8790	0.9298 (94)
Useful gains	471.6089	539.0511	555.7764	523.2999	445.8525	326.6987	223.9706	234.7549	345.4047	441.6352	454.0147	447.0148 (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	907.5275	888.9302	809.6758	680.2511	522.0247	351.2846	230.1107	242.3071	380.4074	578.0756	760.3464	908.2149 (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	324.3234	235.1188	188.9011	113.0049	56.6721	0.0000	0.0000	0.0000	0.0000	101.5117	220.5588	343.1329 (98)
Space heating												1583.2236 (98)
Space heating per m2												22.2613 (99)
										(98) / (4) =		

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													1749.4184	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	324.3234	235.1188	188.9011	113.0049	56.6721	0.0000	0.0000	0.0000	0.0000	101.5117	220.5588	343.1329	(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)	358.3684	259.7997	208.7305	124.8673	62.6212	0.0000	0.0000	0.0000	0.0000	112.1676	243.7114	379.1523	(211)	
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating requirement	157.9430	138.5210	143.8651	126.7350	122.5787	107.2101	100.7662	113.6098	114.3671	131.5356	141.8887	153.3935	(64)	
Efficiency of water heater (217)m	89.4265	89.2867	89.0882	88.7797	88.2870	87.3000	87.3000	87.3000	87.3000	88.6656	89.2197	89.4867	(216)	
Fuel for water heating, kWh/month	176.6178	155.1419	161.4861	142.7522	138.8412	122.8065	115.4252	130.1372	131.0047	148.3502	159.0329	171.4149	(219)	
Water heating fuel used												1753.0108	(219)	
Annual totals kWh/year														
Space heating fuel - main system													1749.4184	(211)
Space heating fuel - secondary													0.0000	(215)
Electricity for pumps and fans:														
(MEV)Decentralised, Database: total watage = 5.3360, total flow = 29.0000, SFP = 0.1840)														
mechanical ventilation fans (SFP = 0.1840)													38.3160	(230a)
central heating pump													30.0000	(230c)
main heating flue fan													45.0000	(230e)
Total electricity for the above, kWh/year													113.3160	(231)
Electricity for lighting (calculated in Appendix L)													335.7397	(232)
Total delivered energy for all uses													3951.4849	(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	1749.4184	0.2160	377.8744	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1753.0108	0.2160	378.6503	(264)
Space and water heating			756.5247	(265)
Pumps and fans	113.3160	0.5190	58.8110	(267)
Energy for lighting	335.7397	0.5190	174.2489	(268)
Total CO2, kg/year			989.5846	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			13.9100	(273)

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

DER			13.9100	ZC1
Total Floor Area		TFA	71.1200	
Assumed number of occupants		N	2.2730	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			16.6556	ZC2
CO2 emissions from cooking, equation (L16)			2.4403	ZC3
Total CO2 emissions			33.0059	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			33.0059	ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	71.1200 (1b)	x 2.4000 (2b)	= 170.6880 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.1200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.6880 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
					Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1758 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4258 (18)
Number of sides sheltered					2 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3619 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4614	0.4524	0.4433	0.3981	0.3890	0.3438	0.3438	0.3348	0.3619	0.3890	0.4071	0.4252 (22b)
Effective ac	0.6065	0.6023	0.5983	0.5792	0.5757	0.5591	0.5591	0.5560	0.5655	0.5757	0.5829	0.5904 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.40)			10.2200	1.3258	13.5492		(27)
WT-E-03	41.2400	10.2200	31.0200	0.1800	5.5836		(29a)
WT-I-02	7.4800	2.1200	5.3600	0.1800	0.9648		(29a)
Flat	20.4000		20.4000	0.1300	2.6520		(30)
Total net area of external elements Aum(A, m ²)			69.1200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 24.8696		(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)							9.0435 (36)
Total fabric heat loss						(33) + (36) =	33.9131 (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	34.1597	33.9268	33.6986	32.6266	32.4261	31.4924	31.4924	31.3195	31.8520	32.4261	32.8318	33.2560 (38)
Heat transfer coeff	68.0728	67.8400	67.6118	66.5398	66.3392	65.4056	65.4056	65.2327	65.7652	66.3392	66.7450	67.1691 (39)
Average = Sum(39)m / 12 =												66.5388 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9572	0.9539	0.9507	0.9356	0.9328	0.9197	0.9197	0.9172	0.9247	0.9328	0.9385	0.9444 (40)
HLP (average)												0.9356 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2730 (42)
Average daily hot water use (litres/day)												88.1839 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	97.0023	93.4749	89.9476	86.4202	82.8929	79.3655	79.3655	82.8929	86.4202	89.9476	93.4749	97.0023 (44)
Energy conte	143.8516	125.8135	129.8283	113.1874	108.6060	93.7188	86.8442	99.6550	100.8452	117.5253	128.2881	139.3126 (45)
Energy content (annual)												Total = Sum(45)m = 1387.4760 (45)
Distribution loss (46)m = 0.15 x (45)m	21.5777	18.8720	19.4742	16.9781	16.2909	14.0578	13.0266	14.9482	15.1268	17.6288	19.2432	20.8969 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

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Combi loss	49.4313	43.0241	45.8363	42.6182	42.2413	39.1392	40.4438	42.2413	42.6182	45.8363	46.0972	49.4313 (61)
Total heat required for water heating calculated for each month	193.2829	168.8376	175.6646	155.8056	150.8473	132.8579	127.2880	141.8963	143.4634	163.3616	174.3853	188.7439 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	193.2829	168.8376	175.6646	155.8056	150.8473	132.8579	127.2880	141.8963	143.4634	163.3616	174.3853	188.7439 (64)
Heat gains from water heating, kWh/month	60.1885	52.5890	54.6270	48.2894	46.6718	40.9463	38.9866	43.6956	44.1856	50.5362	54.1801	58.6793 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.0110	16.8854	13.7321	10.3961	7.7712	6.5608	7.0891	9.2147	12.3680	15.7040	18.3289	19.5393 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.8968	201.9711	196.7439	185.6159	171.5687	158.3664	149.5464	147.4721	152.6993	163.8273	177.8745	191.0768 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202 (71)
Water heating gains (Table 5)	80.8985	78.2575	73.4234	67.0686	62.7310	56.8698	52.4014	58.7307	61.3688	67.9251	75.2501	78.8700 (72)
Total internal gains	359.9014	357.2090	343.9945	323.1756	302.1660	281.8921	269.1321	275.5126	286.5312	307.5515	331.5486	349.5812 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d		Gains W	
South				10.2200	46.7521		0.6300	0.7000		0.7700		146.0238 (78)	
Solar gains	146.0238	239.1493	304.6338	344.3023	358.7843	345.2811	337.3606	327.6239	318.2259	257.9449	173.0879	126.1780	(83)
Total gains	505.9251	596.3583	648.6283	667.4779	660.9503	627.1731	606.4927	603.1365	604.7572	565.4965	504.6366	475.7592	(84)

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	72.5530	72.8020	73.0478	74.2246	74.4490	75.5118	75.5118	75.7119	75.0988	74.4490	73.9964	73.5291
alpha	5.8369	5.8535	5.8699	5.9483	5.9633	6.0341	6.0341	6.0475	6.0066	5.9633	5.9331	5.9019
util living area	0.9951	0.9866	0.9682	0.9230	0.8253	0.6469	0.4717	0.4938	0.7118	0.9265	0.9875	0.9965 (86)
MIT	20.1331	20.3100	20.5171	20.7402	20.9017	20.9822	20.9977	20.9969	20.9679	20.7718	20.4102	20.1023 (87)
Th 2	20.1192	20.1219	20.1246	20.1373	20.1397	20.1508	20.1508	20.1529	20.1465	20.1397	20.1349	20.1299 (88)
util rest of house	0.9935	0.9826	0.9585	0.8999	0.7768	0.5697	0.3822	0.4049	0.6384	0.8999	0.9830	0.9953 (89)
MIT 2	18.9682	19.2260	19.5236	19.8413	20.0462	20.1392	20.1499	20.1516	20.1232	19.8900	19.3827	18.9314 (90)
Living area fraction	19.3580	19.5888	19.8561	20.1421	20.3325	20.4213	20.4336	20.4345	20.4059	20.1851	19.7265	19.3232 (92)
Temperature adjustment	19.3580	19.5888	19.8561	20.1421	20.3325	20.4213	20.4336	20.4345	20.4059	20.1851	19.7265	19.3232 (93)
adjusted MIT	19.3580	19.5888	19.8561	20.1421	20.3325	20.4213	20.4336	20.4345	20.4059	20.1851	19.7265	19.3232 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9917	0.9795	0.9550	0.9000	0.7885	0.5950	0.4123	0.4347	0.6617	0.9015	0.9803	0.9939 (94)
Ext temp.	501.7353	584.1350	619.4220	600.7506	521.1573	373.1565	250.0268	262.1940	400.1534	509.7797	494.6942	472.8681 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Month fracti	1025.0422	996.4873	903.0305	748.0497	572.6724	380.7457	250.7408	263.1814	414.7064	635.8684	842.7581	1015.8144 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating per m2	389.3403	277.1007	211.0048	106.0554	38.3273	0.0000	0.0000	0.0000	0.0000	93.8100	250.6060	403.9520 (98)
												1770.1964 (98)
												24.8903 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
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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													1895.2853 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	389.3403	277.1007	211.0048	106.0554	38.3273	0.0000	0.0000	0.0000	0.0000	93.8100	250.6060	403.9520	(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)	416.8526	296.6817	225.9152	113.5496	41.0356	0.0000	0.0000	0.0000	0.0000	100.4389	268.3148	432.4968	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	193.2829	168.8376	175.6646	155.8056	150.8473	132.8579	127.2880	141.8963	143.4634	163.3616	174.3853	188.7439	(64)
Efficiency of water heater	86.7790	86.2907	85.5136	84.1058	82.1598	80.3000	80.3000	80.3000	80.3000	83.7117	85.9634	86.9186	(217)
Fuel for water heating, kWh/month	222.7300	195.6613	205.4229	185.2497	183.6024	165.4519	158.5156	176.7077	178.6592	195.1480	202.8599	217.1503	(219)
Water heating fuel used												2287.1589	(219)
Annual totals kWh/year													
Space heating fuel - main system												1895.2853	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												335.7397	(232)
Total delivered energy for all uses												4593.1838	(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	1895.2853	0.2160	409.3816 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2287.1589	0.2160	494.0263 (264)
Space and water heating			903.4079 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	335.7397	0.5190	174.2489 (268)
Total CO2, kg/m2/year			1116.5818 (272)
Emissions per m2 for space and water heating			12.7026 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4501 (272b)
Emissions per m2 for pumps and fans			0.5473 (272c)
Target Carbon Dioxide Emission Rate (TER) = (12.7026 * 1.00) + 2.4501 + 0.5473, rounded to 2 d.p.			15.7000 (273)

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CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	71.1200 (1b)	x 2.4000 (2b)	= 170.6880 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.1200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.6880 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					30.0000 / (5) = 0.1758 (8)
Measured/design AP50					Yes
Infiltration rate					3.2600
Number of sides sheltered					0.3388 (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) =				0.2879 (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												
	0.3671	0.3599	0.3527	0.3167	0.3095	0.2735	0.2735	0.2663	0.2879	0.3095	0.3239	0.3383 (22b)
Effective ac	0.5674	0.5648	0.5622	0.5502	0.5479	0.5374	0.5374	0.5355	0.5415	0.5479	0.5525	0.5572 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			10.2200	1.2357	12.6293		(27)
WT-E-03	41.2400	10.2200	31.0200	0.1600	4.9632		(29a)
WT-I-02	7.4800	2.1200	5.3600	0.1584	0.8491		(29a)
Flat	20.4000		20.4000	0.1500	3.0600		(30)
Total net area of external elements Aum, m ²			69.1200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	23.6216		(33)
Party Wall 1			33.8400	0.0000	0.0000		(32)
Party Floor 1			71.1200				(32d)
Party Ceilings 1			50.8000				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.6088 (36)
Total fabric heat loss						(33) + (36) =	34.2304 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	31.9595	31.8121	31.6676	30.9890	30.8620	30.2710	30.2710	30.1615	30.4986	30.8620	31.1189	31.3874 (38)
Heat transfer coeff	66.1899	66.0425	65.8980	65.2194	65.0924	64.5014	64.5014	64.3919	64.7290	65.0924	65.3493	65.6178 (39)
Average = Sum(39)m / 12 =												65.2188 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9307	0.9286	0.9266	0.9170	0.9152	0.9069	0.9069	0.9054	0.9101	0.9152	0.9189	0.9226 (40)
HLP (average)												0.9170 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2730 (42)
Average daily hot water use (litres/day)												88.1839 (43)

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

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CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
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 (57)
Heat gains from water heating, kWh/month	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)
	30.5685	26.7354	27.5885	24.0523	23.0788	19.9152	18.4544	21.1767	21.4296	24.9741	27.2612	29.6039 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.0110	16.8854	13.7321	10.3961	7.7712	6.5608	7.0891	9.2147	12.3680	15.7040	18.3289	19.5393	(67)
Appliances gains (calculated in Appendix L13, equation L13a), also see Table 5	199.8968	201.9711	196.7439	185.6159	171.5687	158.3664	149.5464	147.4721	152.6993	163.8273	177.8745	191.0768	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	(71)
Water heating gains (Table 5)	41.0866	39.7848	37.0813	33.4060	31.0199	27.6600	24.8043	28.4633	29.7633	33.5674	37.8628	39.7902	(72)
Total internal gains	317.0895	315.7364	304.6525	286.5131	267.4549	249.6823	238.5350	242.2452	251.9257	270.1938	291.1613	307.5015	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF			Access factor Table 6d	Gains W
South				10.2200	46.7521	0.4500		0.0000				0.7700	165.5598 (78)
Solar gains	165.5598	271.1443	345.3898	390.3654	406.7849	391.4751	382.4950	371.4557	360.8004	292.4546	196.2448	143.0589	(83)
Total gains	482.6493	586.8807	650.0422	676.8785	674.2398	641.1574	621.0300	613.7009	612.7261	562.6484	487.4062	450.5604	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.8468	29.9134	29.9790	30.2909	30.3500	30.6281	30.6281	30.6802	30.5204	30.3500	30.2307	30.1070	
alpha	2.9898	2.9942	2.9986	3.0194	3.0233	3.0419	3.0419	3.0453	3.0347	3.0233	3.0154	3.0071	
util living area	0.9509	0.9166	0.8718	0.8056	0.7096	0.5716	0.4331	0.4540	0.6239	0.8161	0.9227	0.9587	(86)
MIT	19.2426	19.5707	19.9414	20.3335	20.6530	20.8729	20.9592	20.9517	20.8237	20.4044	19.7477	19.1719	(87)
Th 2	20.1415	20.1433	20.1450	20.1530	20.1546	20.1616	20.1616	20.1629	20.1589	20.1546	20.1515	20.1483	(88)
util rest of house	0.9444	0.9063	0.8559	0.7807	0.6708	0.5129	0.3584	0.3804	0.5688	0.7877	0.9113	0.9532	(89)
MIT 2	18.5301	18.8513	19.2115	19.5916	19.8864	20.0797	20.1420	20.1386	20.0393	19.6659	19.0354	18.4658	(90)
Living area fraction									fLA = Living area / (4) =			0.3346	(91)
MIT	18.7685	19.0921	19.4558	19.8399	20.1430	20.3451	20.4155	20.4107	20.3018	19.9130	19.2738	18.7021	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7685	19.0921	19.4558	19.8399	20.1430	20.3451	20.4155	20.4107	20.3018	19.9130	19.2738	18.7021	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9316	0.8912	0.8413	0.7706	0.6702	0.5263	0.3816	0.4028	0.5787	0.7787	0.8972	0.9415	(94)
Ext temp.	449.6437	523.0312	546.8668	521.6221	451.8938	337.4470	236.9921	247.2059	354.5623	438.1482	437.3107	424.1955	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	957.6720	937.2799	853.7600	713.4925	549.5726	370.5679	246.1029	258.2569	401.4348	606.2075	795.5463	951.5957	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating per m2	377.9730	278.3751	228.3286	138.1467	72.6730	0.0000	0.0000	0.0000	0.0000	125.0361	257.9296	392.3857	(98)
												1870.8479	(98)
										(98) / (4) =		26.3055	(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	606.3128	477.3101	489.3785	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8572	0.9066	0.8999	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	519.7496	432.7306	440.3699	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	834.3692	809.1740	802.1479	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	226.5261	280.0739	269.1628	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												775.7629	(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 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	56.6315	70.0185	67.2907	0.0000	0.0000	0.0000 (107)
Space cooling											193.9407 (107)
Space cooling per m2											2.7270 (108)
Energy for space heating											26.3055 (99)
Energy for space cooling											2.7270 (108)
Total											29.0325 (109)
Dwelling Fabric Energy Efficiency (DFEE)											29.0 (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	71.1200 (1b)	x 2.4000 (2b)	= 170.6880 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.1200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.6880 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
					Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1758 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4258 (18)
Number of sides sheltered					2 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3619 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4614	0.4524	0.4433	0.3981	0.3890	0.3438	0.3438	0.3348	0.3619	0.3890	0.4071	0.4252 (22b)
Effective ac	0.6065	0.6023	0.5983	0.5792	0.5757	0.5591	0.5591	0.5560	0.5655	0.5757	0.5829	0.5904 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.40)			10.2200	1.3258	13.5492		(27)
WT-E-03	41.2400	10.2200	31.0200	0.1800	5.5836		(29a)
WT-I-02	7.4800	2.1200	5.3600	0.1800	0.9648		(29a)
Flat	20.4000		20.4000	0.1300	2.6520		(30)
Total net area of external elements Aum(A, m ²)			69.1200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 24.8696		(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)							9.0435 (36)
Total fabric heat loss						(33) + (36) =	33.9131 (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	34.1597	33.9268	33.6986	32.6266	32.4261	31.4924	31.4924	31.3195	31.8520	32.4261	32.8318	33.2560 (38)
Heat transfer coeff	68.0728	67.8400	67.6118	66.5398	66.3392	65.4056	65.4056	65.2327	65.7652	66.3392	66.7450	67.1691 (39)
Average = Sum(39)m / 12 =												66.5388 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9572	0.9539	0.9507	0.9356	0.9328	0.9197	0.9197	0.9172	0.9247	0.9328	0.9385	0.9444 (40)
HLP (average)												0.9356 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	30.5685	26.7354	27.5885	24.0523	23.0788	19.9152	18.4544	21.1767	21.4296	24.9741	27.2612	29.6039 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	113.6503	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.0110	16.8854	13.7321	10.3961	7.7712	6.5608	7.0891	9.2147	12.3680	15.7040	18.3289	19.5393	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.8968	201.9711	196.7439	185.6159	171.5687	158.3664	149.5464	147.4721	152.6993	163.8273	177.8745	191.0768	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	34.3650	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	(71)
Water heating gains (Table 5)	41.0866	39.7848	37.0813	33.4060	31.0199	27.6600	24.8043	28.4633	29.7633	33.5674	37.8628	39.7902	(72)
Total internal gains	317.0895	315.7364	304.6525	286.5131	267.4549	249.6823	238.5350	242.2452	251.9257	270.1938	291.1613	307.5015	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c				Access factor Table 6d	Gains W	
South				10.2200	46.7521	0.6300	0.7000				0.7700	146.0238 (78)	
Solar gains	146.0238	239.1493	304.6338	344.3023	358.7843	345.2811	337.3606	327.6239	318.2259	257.9449	173.0879	126.1780 (83)	
Total gains	463.1133	554.8856	609.2862	630.8154	626.2392	594.9634	575.8956	569.8691	570.1517	528.1388	464.2493	433.6795 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													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	72.5530	72.8020	73.0478	74.2246	74.4490	75.5118	75.5118	75.7119	75.0988	74.4490	73.9964	73.5291	
alpha	5.8369	5.8535	5.8699	5.9483	5.9633	6.0341	6.0341	6.0475	6.0066	5.9633	5.9331	5.9019	
util living area	0.9969	0.9906	0.9759	0.9379	0.8499	0.6763	0.4959	0.5213	0.7442	0.9436	0.9917	0.9978 (86)	
MIT	20.0760	20.2570	20.4714	20.7066	20.8835	20.9776	20.9970	20.9959	20.9594	20.7366	20.3581	20.0456 (87)	
Th 2	20.1192	20.1219	20.1246	20.1373	20.1397	20.1508	20.1508	20.1529	20.1465	20.1397	20.1349	20.1299 (88)	
util rest of house	0.9958	0.9876	0.9682	0.9180	0.8043	0.5978	0.4023	0.4281	0.6711	0.9214	0.9886	0.9971 (89)	
MIT 2	19.2766	19.4583	19.6707	19.9056	20.0625	20.1406	20.1500	20.1517	20.1259	19.9387	19.5704	19.2552 (90)	
Living area fraction	19.5441	19.7255	19.9387	20.1736	20.3373	20.4207	20.4335	20.4342	20.4048	20.2057	19.8340	19.5197 (92)	
MIT	19.5441	19.7255	19.9387	20.1736	20.3373	20.4207	20.4335	20.4342	20.4048	20.2057	19.8340	19.5197 (93)	
Temperature adjustment												0.0000	
adjusted MIT	19.5441	19.7255	19.9387	20.1736	20.3373	20.4207	20.4335	20.4342	20.4048	20.2057	19.8340	19.5197 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	460.7929	547.1000	588.7434	579.6627	510.8309	371.0189	249.7892	261.8333	395.9339	487.6898	458.3338	432.1451 (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	1037.7091	1005.7649	908.6115	750.1447	572.9885	380.7068	250.7291	263.1632	414.6377	637.2349	849.9291	1029.0109 (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	429.2256	308.2228	237.9819	122.7471	46.2453	0.0000	0.0000	0.0000	0.0000	111.2616	281.9486	444.0681 (98)	
Space heating												1981.7009 (98)	
Space heating per m2												27.8642 (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	614.8123	484.0011	495.7682	0.0000	0.0000	0.0000	0.0000 (100)	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9381	0.9746	0.9708	0.0000	0.0000	0.0000	0.0000 (101)	
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	576.7634	471.6869	481.3146	0.0000	0.0000	0.0000	0.0000 (102)	
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	780.3762	756.4195	750.9160	0.0000	0.0000	0.0000	0.0000 (103)	
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)	
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	146.6012	211.8411	200.5834	0.0000	0.0000	0.0000	0.0000 (104)	
Space cooling												559.0256 (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	36.6503	52.9603	50.1458	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling													139.7564 (107)
Space cooling per m2													1.9651 (108)
Energy for space heating													27.8642 (99)
Energy for space cooling													1.9651 (108)
Total													29.8293 (109)
Target Fabric Energy Efficiency (TFEE)													34.3 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	71.1200 (1b)	x 2.4000 (2b)	= 170.6880 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.1200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.6880 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.2600
Infiltration rate					0.1630 (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) =				0.1386 (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	0.1455	0.1386	0.1386	0.1282	0.1282	0.1143	0.1178	0.1108	0.1143	0.1212	0.1212	0.1316 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			10.2200	1.2357	12.6293		(27)
WT-E-03	41.2400	10.2200	31.0200	0.1600	4.9632		(29a)
WT-I-02	7.4800	2.1200	5.3600	0.1584	0.8491		(29a)
Flat	20.4000		20.4000	0.1500	3.0600		(30)
Total net area of external elements Aum(A, m2)			69.1200				(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =				23.6216		(33)
Party Wall 1					33.8400	0.0000	(32)
Party Floor 1					71.1200		(32d)
Party Ceilings 1					50.8000		(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.6088 (36)
Total fabric heat loss							(33) + (36) = 34.2304 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635 (38)
Heat transfer coeff	62.3939	62.3939	62.3939	62.3939	62.3939	62.3939	62.3939	62.3939	62.3939	62.3939	62.3939	62.3939 (39)
Average = Sum(39)m / 12 =												62.3939 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8773	0.8773	0.8773	0.8773	0.8773	0.8773	0.8773	0.8773	0.8773	0.8773	0.8773	0.8773 (40)
HLP (average)												0.8773 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2730 (42)
Average daily hot water use (litres/day)												88.1839 (43)

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

Regs Region: England

Elmhurst Energy Systems
SAP2012 Calculator (Design
System) version 4.14r16

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

	21.5777	18.8720	19.4742	16.9781	16.2909	14.0578	13.0266	14.9482	15.1268	17.6288	19.2432	20.8969 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	14.0915	12.7075	14.0368	13.5476	13.9726	13.4913	13.9220	13.9548	13.5220	14.0103	13.6006	14.0809 (61)
Total heat required for water heating calculated for each month	157.9430	138.5210	143.8651	126.7350	122.5787	107.2101	100.7662	113.6098	114.3671	131.5356	141.8887	153.3935 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
								Solar input (sum of months) = Sum (63)m =				0.0000 (63)
Output from w/h	157.9430	138.5210	143.8651	126.7350	122.5787	107.2101	100.7662	113.6098	114.3671	131.5356	141.8887	153.3935 (64)
								Total per year (kWh/year) = Sum (64)m =				1552.4138 (64)
RHI water heating demand												1552 (64)
Heat gains from water heating, kWh/month	51.3535	45.0099	46.6771	41.0217	39.6047	34.5343	32.3562	36.6240	36.9115	42.5797	46.0559	49.8417 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.3804	136.3804	136.3804	136.3804	136.3804	136.3804	136.3804	136.3804	136.3804	136.3804	136.3804	136.3804	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	47.5274	42.2134	34.3303	25.9902	19.4280	16.4019	17.7229	23.0369	30.9200	39.2601	45.8223	48.8484	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	298.3535	301.4494	293.6477	277.0387	256.0728	236.3678	223.2036	220.1076	227.9094	244.5184	265.4843	285.1893	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.9110	50.9110	50.9110	50.9110	50.9110	50.9110	50.9110	50.9110	50.9110	50.9110	50.9110	50.9110	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	(71)
Water heating gains (Table 5)	69.0235	66.9790	62.7380	56.9746	53.2321	47.9643	43.4895	49.2258	51.2660	57.2308	63.9666	66.9915	(72)
Total internal gains	514.2756	510.0130	490.0872	459.3746	428.1040	400.1052	383.7872	391.7414	409.4666	440.3805	474.6444	500.4003	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
South				10.2200	50.9848	0.4500	0.0000	0.7700	180.5490 (78)			
Solar gains	180.5490	265.3663	333.3669	389.6318	398.2891	411.8829	397.3472	392.0371	377.7133	305.2939	219.0656	154.6394 (83)
Total gains	694.8246	775.3793	823.4540	849.0064	826.3931	811.9880	781.1344	783.7786	787.1799	745.6744	693.7100	655.0397 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th _l (C)													21.0000 (85)
Utilisation factor for gains for living area, n _{l,m} (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	31.6626	31.6626	31.6626	31.6626	31.6626	31.6626	31.6626	31.6626	31.6626	31.6626	31.6626	31.6626	
alpha	3.1108	3.1108	3.1108	3.1108	3.1108	3.1108	3.1108	3.1108	3.1108	3.1108	3.1108	3.1108	
util living area	0.8713	0.8309	0.7680	0.6751	0.5470	0.3719	0.2452	0.2520	0.4366	0.6597	0.8123	0.8859	(86)
MIT	19.9273	20.1218	20.4003	20.6687	20.8693	20.9723	20.9947	20.9941	20.9496	20.7377	20.3131	19.8577	(87)
Th 2	20.1868	20.1868	20.1868	20.1868	20.1868	20.1868	20.1868	20.1868	20.1868	20.1868	20.1868	20.1868	(88)
util rest of house	0.8572	0.8136	0.7446	0.6429	0.5023	0.3153	0.1819	0.1891	0.3817	0.6212	0.7903	0.8729	(89)
MIT 2	19.2277	19.4120	19.6746	19.9205	20.0944	20.1723	20.1852	20.1849	20.1571	19.9855	19.5983	19.1617	(90)
Living area fraction									f _{LA} = Living area / (4) =			0.3346	(91)
MIT	19.4618	19.6495	19.9175	20.1709	20.3537	20.4400	20.4561	20.4557	20.4223	20.2372	19.8375	19.3946	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.3118	19.4995	19.7675	20.0209	20.2037	20.2900	20.3061	20.3057	20.2723	20.0872	19.6875	19.2446	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.8399	0.7973	0.7316	0.6360	0.5033	0.3226	0.1913	0.1984	0.3876	0.6162	0.7753	0.8556	(94)
Useful gains	583.5907	618.2183	602.4588	539.9450	415.8903	261.9252	149.4085	155.5095	305.0950	459.4624	537.8261	560.4756	(95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Heat loss rate W	886.7303	867.2473	771.6551	631.4818	449.4678	267.6688	150.1264	156.3414	316.4805	529.5506	729.2269	882.5385	(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	225.5359	167.3475	125.8820	65.9064	24.9816	0.0000	0.0000	0.0000	0.0000	52.1457	137.8086	239.6148	(98)
Space heating												1039.2226	(98)
RHI space heating demand												1039	(98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	71.1200 (1b)	x 2.4000 (2b)	= 170.6880 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.1200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.6880 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.2600
Infiltration rate					0.1630 (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) =		0.1386 (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	0.1767	0.1732	0.1697	0.1524	0.1489	0.1316	0.1316	0.1282	0.1386	0.1489	0.1559	0.1628 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			10.2200	1.2357	12.6293		(27)
WT-E-03	41.2400	10.2200	31.0200	0.1600	4.9632		(29a)
WT-I-02	7.4800	2.1200	5.3600	0.1584	0.8491		(29a)
Flat	20.4000		20.4000	0.1500	3.0600		(30)
Total net area of external elements Aum(A, m ²)			69.1200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	23.6216		(33)
Party Wall 1			33.8400	0.0000	0.0000		(32)
Party Floor 1			71.1200				(32d)
Party Ceilings 1			50.8000				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.6088 (36)
Total fabric heat loss						(33) + (36) =	34.2304 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635 (38)
Heat transfer coeff	62.3939	62.3939	62.3939	62.3939	62.3939	62.3939	62.3939	62.3939	62.3939	62.3939	62.3939	62.3939 (39)
Average = Sum(39)m / 12 =												62.3939 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8773	0.8773	0.8773	0.8773	0.8773	0.8773	0.8773	0.8773	0.8773	0.8773	0.8773	0.8773 (40)
HLP (average)												0.8773 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

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

Regs Region: England

Elmhurst Energy Systems
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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

	21.5777	18.8720	19.4742	16.9781	16.2909	14.0578	13.0266	14.9482	15.1268	17.6288	19.2432	20.8969 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	14.0915	12.7075	14.0368	13.5476	13.9726	13.4913	13.9220	13.9548	13.5220	14.0103	13.6006	14.0809 (61)
Total heat required for water heating calculated for each month	157.9430	138.5210	143.8651	126.7350	122.5787	107.2101	100.7662	113.6098	114.3671	131.5356	141.8887	153.3935 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
								Solar input (sum of months) = Sum(63)m =				0.0000 (63)
Output from w/h	157.9430	138.5210	143.8651	126.7350	122.5787	107.2101	100.7662	113.6098	114.3671	131.5356	141.8887	153.3935 (64)
								Total per year (kWh/year) = Sum(64)m =				1552.4138 (64)
Heat gains from water heating, kWh/month	51.3535	45.0099	46.6771	41.0217	39.6047	34.5343	32.3562	36.6240	36.9115	42.5797	46.0559	49.8417 (65)

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	136.3804	136.3804	136.3804	136.3804	136.3804	136.3804	136.3804	136.3804	136.3804	136.3804	136.3804	136.3804 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	47.5274	42.2134	34.3303	25.9902	19.4280	16.4019	17.7229	23.0369	30.9200	39.2601	45.8223	48.8484 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	298.3535	301.4494	293.6477	277.0387	256.0728	236.3678	223.2036	220.1076	227.9094	244.5184	265.4843	285.1893 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.9110	50.9110	50.9110	50.9110	50.9110	50.9110	50.9110	50.9110	50.9110	50.9110	50.9110	50.9110 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202	-90.9202 (71)
Water heating gains (Table 5)	69.0235	66.9790	62.7380	56.9746	53.2321	47.9643	43.4895	49.2258	51.2660	57.2308	63.9666	66.9915 (72)
Total internal gains	514.2756	510.0130	490.0872	459.3746	428.1040	400.1052	383.7872	391.7414	409.4666	440.3805	474.6444	500.4003 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
South				10.2200	46.7521	0.4500	0.0000			0.7700			165.5598 (78)
Solar gains	165.5598	271.1443	345.3898	390.3654	406.7849	391.4751	382.4950	371.4557	360.8004	292.4546	196.2448	143.0589	(83)
Total gains	679.8354	781.1573	835.4769	849.7401	834.8889	791.5803	766.2822	763.1971	770.2670	732.8351	670.8892	643.4592	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	31.6626	31.6626	31.6626	31.6626	31.6626	31.6626	31.6626	31.6626	31.6626	31.6626	31.6626	31.6626	
alpha	3.1108	3.1108	3.1108	3.1108	3.1108	3.1108	3.1108	3.1108	3.1108	3.1108	3.1108	3.1108	
util living area	0.8887	0.8422	0.7860	0.7103	0.6069	0.4728	0.3487	0.3647	0.5145	0.7089	0.8437	0.9022 (86)	
MIT	19.7854	20.0383	20.3119	20.5800	20.7960	20.9305	20.9796	20.9759	20.9051	20.6411	20.1644	19.7026 (87)	
Th 2	20.1868	20.1868	20.1868	20.1868	20.1868	20.1868	20.1868	20.1868	20.1868	20.1868	20.1868	20.1868 (88)	
util rest of house	0.8766	0.8263	0.7650	0.6817	0.5677	0.4205	0.2875	0.3040	0.4637	0.6753	0.8253	0.8913 (89)	
MIT 2	19.0902	19.3315	19.5908	19.8401	20.0328	20.1431	20.1772	20.1749	20.1242	19.9004	19.4576	19.0107 (90)	
Living area fraction									fLA = Living area / (4) =				0.3346 (91)
MIT	19.3229	19.5680	19.8321	20.0877	20.2882	20.4066	20.4457	20.4430	20.3855	20.1483	19.6941	19.2422 (92)	
Temperature adjustment												-0.1500	
adjusted MIT	19.1729	19.4180	19.6821	19.9377	20.1382	20.2566	20.2957	20.2930	20.2355	19.9983	19.5441	19.0922 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8593	0.8096	0.7508	0.6724	0.5653	0.4251	0.2959	0.3120	0.4669	0.6670	0.8089	0.8742 (94)
Useful gains	584.1556	632.3964	627.2567	571.3289	471.9556	336.4941	226.7191	238.1527	359.6348	488.7887	542.6867	562.4968 (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	927.9778	905.8359	822.4813	688.6879	526.4916	352.9390	230.5922	242.8976	382.8199	586.3944	776.4380	929.1858 (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	255.8037	183.7513	145.2471	84.4984	40.5748	0.0000	0.0000	0.0000	0.0000	72.6187	168.3010	272.8166 (98)
Space heating												1223.6116 (98)
Space heating per m2										(98) / (4) =		17.2049 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1352.0570 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	255.8037	183.7513	145.2471	84.4984	40.5748	0.0000	0.0000	0.0000	0.0000	72.6187	168.3010	272.8166	(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)	282.6560	203.0401	160.4940	93.3684	44.8340	0.0000	0.0000	0.0000	0.0000	80.2417	185.9679	301.4548	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	157.9430	138.5210	143.8651	126.7350	122.5787	107.2101	100.7662	113.6098	114.3671	131.5356	141.8887	153.3935	(64)
Efficiency of water heater (217)m	89.2511	89.0963	88.8789	88.5525	88.0745	87.3000	87.3000	87.3000	87.3000	88.4120	89.0076	89.3216	(216)
Fuel for water heating, kWh/month	176.9647	155.4735	161.8665	143.1184	139.1761	122.8065	115.4252	130.1372	131.0047	148.7758	159.4119	171.7316	(219)
Water heating fuel used													1755.8921 (219)
Annual totals kWh/year													
Space heating fuel - main system													1352.0570 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 5.3360, total flow = 29.0000, SFP = 0.1840)													
mechanical ventilation fans (SFP = 0.1840)													38.3160 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													113.3160 (231)
Electricity for lighting (calculated in Appendix L)													335.7397 (232)
Total delivered energy for all uses													3557.0048 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1352.0570	3.4800	47.0516 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1755.8921	3.4800	61.1050 (247)
Mechanical ventilation fans	38.3160	13.1900	5.0539 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	335.7397	13.1900	44.2841 (250)
Additional standing charges			120.0000 (251)
Total energy cost			287.3871 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)		1.0395 (257)
SAP value		85.4995
SAP rating (Section 12)		85 (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	1352.0570	0.2160	292.0443 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1755.8921	0.2160	379.2727 (264)
Space and water heating			671.3170 (265)
Pumps and fans	113.3160	0.5190	58.8110 (267)
Energy for lighting	335.7397	0.5190	174.2489 (268)
Total kg/year			904.3769 (272)
CO2 emissions per m2			12.7200 (273)
EI value			89.5637
EI rating			90 (274)
EI band			B

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9050 = 3.845$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9050 = 0.2387$, stars = 4
Water heating energy efficiency	$3.48 / 0.8832 = 3.940$, stars = 4
Water heating environmental impact	$0.216 / 0.8832 = 0.2446$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	71.1200 (1b)	x 2.4000 (2b)	= 170.6880 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.1200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.6880 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.2600
Infiltration rate					0.1630 (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) =				0.1386 (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	0.1455	0.1386	0.1386	0.1282	0.1282	0.1143	0.1178	0.1108	0.1143	0.1212	0.1212	0.1316 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			10.2200	1.2357	12.6293		(27)
WT-E-03	41.2400	10.2200	31.0200	0.1600	4.9632		(29a)
WT-I-02	7.4800	2.1200	5.3600	0.1584	0.8491		(29a)
Flat	20.4000		20.4000	0.1500	3.0600		(30)
Total net area of external elements Aum(A, m2)			69.1200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	23.6216	(33)
Party Wall 1			33.8400	0.0000	0.0000		(32)
Party Floor 1			71.1200				(32d)
Party Ceilings 1			50.8000				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.6088 (36)
Total fabric heat loss							(33) + (36) = 34.2304 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635	28.1635 (38)
Heat transfer coeff	62.3939	62.3939	62.3939	62.3939	62.3939	62.3939	62.3939	62.3939	62.3939	62.3939	62.3939	62.3939 (39)
Average = Sum(39)m / 12 =												62.3939 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8773	0.8773	0.8773	0.8773	0.8773	0.8773	0.8773	0.8773	0.8773	0.8773	0.8773	0.8773 (40)
HLP (average)												0.8773 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

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

Regs Region: England

Elmhurst Energy Systems
SAP2012 Calculator (Design
System) version 4.14r16

Southern Energy
Consultants
Energy & Sustainability Solutions

	21.5777	18.8720	19.4742	16.9781	16.2909	14.0578	13.0266	14.9482	15.1268	17.6288	19.2432	20.8969 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	14.0915	12.7075	14.0368	13.5476	13.9726	13.4913	13.9220	13.9548	13.5220	14.0103	13.6006	14.0809 (61)
Total heat required for water heating calculated for each month	157.9430	138.5210	143.8651	126.7350	122.5787	107.2101	100.7662	113.6098	114.3671	131.5356	141.8887	153.3935 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	157.9430	138.5210	143.8651	126.7350	122.5787	107.2101	100.7662	Solar input (sum of months) = Sum(63)m =				0.0000 (63)
	157.9430	138.5210	143.8651	126.7350	122.5787	107.2101	100.7662	113.6098	114.3671	131.5356	141.8887	153.3935 (64)
								Total per year (kWh/year) = Sum(64)m =				1552.4138 (64)
Heat gains from water heating, kWh/month	51.3535	45.0099	46.6771	41.0217	39.6047	34.5343	32.3562	36.6240	36.9115	42.5797	46.0559	49.8417 (65)

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	1148.3122 (211)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	225.5359	167.3475	125.8820	65.9064	24.9816	0.0000	0.0000	0.0000	0.0000	52.1457	137.8086	239.6148 (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)	249.2110	184.9144	139.0962	72.8248	27.6040	0.0000	0.0000	0.0000	0.0000	57.6195	152.2747	264.7677 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	157.9430	138.5210	143.8651	126.7350	122.5787	107.2101	100.7662	113.6098	114.3671	131.5356	141.8887	153.3935 (64)
Efficiency of water heater (217)m	89.1540	89.0222	88.7647	88.3690	87.8257	87.3000	87.3000	87.3000	87.3000	88.1852	88.8479	87.3000 (216)
Fuel for water heating, kWh/month	177.1575	155.6028	162.0747	143.4157	139.5703	122.8065	115.4252	130.1372	131.0047	149.1583	159.6985	171.9205 (219)
Water heating fuel used												1757.9718 (219)
Annual totals kWh/year												
Space heating fuel - main system												1148.3122 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(MEV)Decentralised, Database: total watage = 5.3360, total flow = 29.0000, SFP = 0.1840)												
mechanical ventilation fans (SFP = 0.1840)												38.3160 (230a)
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												113.3160 (231)
Electricity for lighting (calculated in Appendix L)												335.7397 (232)
Total delivered energy for all uses												3355.3398 (238)

10a. Fuel costs - using BEDF prices (482)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1148.3122	3.7400	42.9469 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1757.9718	3.7400	65.7481 (247)
Mechanical ventilation fans	38.3160	19.1200	7.3260 (249)
Pumps and fans for heating	75.0000	19.1200	14.3400 (249)
Energy for lighting	335.7397	19.1200	64.1934 (250)
Additional standing charges			94.0000 (251)
Total energy cost			288.5545 (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	1148.3122	0.2160	248.0354 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1757.9718	0.2160	379.7219 (264)
Space and water heating			627.7574 (265)
Pumps and fans	113.3160	0.5190	58.8110 (267)
Energy for lighting	335.7397	0.5190	174.2489 (268)
Total kg/year			860.8173 (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	1148.3122	1.2200	1400.9409 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1757.9718	1.2200	2144.7256 (264)
Space and water heating			3545.6666 (265)
Pumps and fans	113.3160	3.0700	347.8802 (267)
Energy for lighting	335.7397	3.0700	1030.7208 (268)
Primary energy kWh/year			4924.2676 (272)
Primary energy kWh/m2/year			69.2389 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 85
Current environmental impact rating: B 90

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



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

(For testing purposes):

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

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

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
	Total Savings £0		0.00 kg/m²
Potential energy efficiency rating:		B 85	
Potential environmental impact rating:			B 90

Fuel prices for cost data on this page from database revision number 482 TEST (31 Aug 2021)
 Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, Thames Valley):			
	Current	Potential	Saving
Electricity	£86	£86	£0
Mains gas	£203	£203	£0
Space heating	£159	£159	£0
Water heating	£66	£66	£0
Lighting	£64	£64	£0
Total cost of fuels	£289	£289	£0
Total cost of uses	£289	£289	£0
Delivered energy	47 kWh/m²	47 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.9 tonnes	0.9 tonnes	0.0 tonnes
CO2 emissions per m²	12 kg/m²	12 kg/m²	0 kg/m²
Primary energy	69 kWh/m²	69 kWh/m²	0 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



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

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

No improvements selected / applicable

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

Overheating Calculation Input Data

Dwelling type	EndTerrace Flat
Number of storeys	1
Cross ventilation possible	Yes
SAP Region	Thames Valley
Front of dwelling faces	North
Overshading	Average or unknown
Thermal mass parameter	100.0
Night ventilation	Yes
Ventilation rate during hot weather (ach)	6.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient	337.96 (P1)
Transmission heat loss coefficient	34.23 (37)
Summer heat loss coefficient	372.19 (P2)

Overhangs	Ratio	Z_overhangs	Overhang type	
Orientation				
South	0.000	1.000	None	
Solar shading				
Orientation	Z blinds	Solar access	Z overhangs	Z summer
South	1.000	0.90	1.000	0.900 (P8)
[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c
South	10.2200	112.2060	0.4500	0.0000
total:				464.4318

Solar gains	Jun	Jul	Aug	
Internal gains	481	464	458	(P4)
Total summer gains	397	381	389	
	879	845	847	(P5)
Summer gain/loss ratio	2.36	2.27	2.28	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 100.0)	1.30	1.30	1.30	
Threshold temperature	19.66	21.47	21.38	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	
Assessment of likelihood of high internal temperature:	Slight			