FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Built)

Design SAP
elmhurst energy

Property Reference	PMCC-ROPE-1655-109	**Issued on Date**	06/08/2020
Assessment Reference	ABF	**Prop Type Ref**	
Property	1 Chalkhill Blue Apartments, 4, Salt Marsh Road, SHOREHAM-BY-SEA, West Sussex, BN43 5QP		

SAP Rating	79 C	**DER**	31.03	**TER**	30.64
Environmental	82 B	**% DER<TER**	-1.28		
CO_2 Emissions (t/year)	1.14	**DFEE**	44.32	**TFEE**	54.17
General Requirements Compliance	Fail	**% DFEE<TFEE**	18.18		

Assessor Details	Mr. Malcolm Maclean, SRE Limited, Tel: 01730 710044, malcolm@sre.co.uk	**Assessor ID**	V497-0002
Client			

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

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DWELLING AS BUILT

Mid-floor flat, total floor area 50 m²

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

1a TER and DER
Fuel for main heating:Electricity
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 30.64 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 31.03 kgCO□/m²Fail
Excess emissions =0.39 kgCO□/m² (1.3%)

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)54.2 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)44.3 kWh/m²/yrOK
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2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.08 (max. 0.25)	0.13 (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: 3.81 (measured in this dwelling)
Maximum 10.0 OK
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4 Heating efficiency
Main heating system: Boiler system with radiators or underfloor - Electric
Direct-acting boiler

Secondary heating system: None
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5 Cylinder insulation
Hot water storage Measured cylinder loss: 1.06 kWh/day
Permitted by DBSCG 1.66 OK
Primary pipework insulated: No primary pipework
---
6 Controls
Space heating controls: Time and temperature zone control OK

Hot water controls: Cylinderstat OK

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7 Low energy lights
Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK
---
8 Mechanical ventilation
Continuous extract system (decentralised)
Specific fan power: 0.1800 0.1600
Maximum 0.7 OK
---
9 Summertime temperature
Overheating risk (South East England): Slight OK
Based on:
Overshading: Average
Windows facing North: 7.56 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: Light-coloured curtain or roller blind, closed 100% of daylight hours
---
10 Key features
Party wall U-value 0.00 W/m²K
Party wall U-value 0.00 W/m²K
Exposed floor U-value 0.07 W/m²K
Air permeability 3.8 m³/m²h
Photovoltaic array 0.61 kW

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	50.0000 (1b)	x	2.3800 (2b)	=	119.0000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	119.0000	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(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) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.8100	
Infiltration rate		0.1905	(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) =	0.1619	(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	0.2065	0.2024	0.1984	0.1781	0.1741	0.1538	0.1538	0.1498	0.1619	0.1741	0.1822	0.1903	(22b)
Mechanical extract ventilation - decentralised													
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 (Uw = 1.30)			7.5600	1.2357	9.3422			(27)
Above Commercial			39.4000	0.0700	2.7580			(28b)
Exposed Floor			10.6000	0.1300	1.3780			(28b)
External Wall	33.5600	7.5600	26.0000	0.1800	4.6800			(29a)
Total net area of external elements Aum(A, m2)			83.5600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	18.1582			(33)
Corridor Wall			16.9000	0.0000	0.0000			(32)
Party			16.6600	0.0000	0.0000			(32)
Party Ceiling 1			50.0000					(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.6416	(36)
Total fabric heat loss					(33) + (36) =		31.7998	(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	19.6350	19.6350	19.6350	19.6350	19.6350	19.6350	19.6350	19.6350	19.6350	19.6350	19.6350	19.6350	(38)
Heat transfer coeff	51.4348	51.4348	51.4348	51.4348	51.4348	51.4348	51.4348	51.4348	51.4348	51.4348	51.4348	51.4348	(39)
Average = Sum(39)m / 12 =												51.4348	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0287	1.0287	1.0287	1.0287	1.0287	1.0287	1.0287	1.0287	1.0287	1.0287	1.0287	1.0287	(40)
HLP (average)												1.0287	(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												1.6901	(42)
Average daily hot water use (litres/day)												74.3399	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	81.7739	78.8003	75.8267	72.8531	69.8795	66.9059	66.9059	69.8795	72.8531	75.8267	78.8003	81.7739	(44)
Energy conte	121.2683	106.0620	109.4465	95.4181	91.5560	79.0058	73.2105	84.0101	85.0135	99.0750	108.1481	117.4419	(45)
Energy content (annual)										Total = Sum(45)m =		1169.6560	(45)
Distribution loss (46)m = 0.15 x (45)m	18.1902	15.9093	16.4170	14.3127	13.7334	11.8509	10.9816	12.6015	12.7520	14.8613	16.2222	17.6163	(46)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Water storage loss:
Store volume 120.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.0600 (48)
Temperature factor from Table 2b 0.6000 (49)
Enter (49) or (54) in (55) 0.6360 (55)
Total storage loss

	19.7160	17.8080	19.7160	19.0800	19.7160	19.0800	19.7160	19.7160	19.0800	19.7160	19.0800	19.7160 (56)

If cylinder contains dedicated solar storage

	19.7160	17.8080	19.7160	19.0800	19.7160	19.0800	19.7160	19.7160	19.0800	19.7160	19.0800	19.7160 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)

Total heat required for water heating calculated for each month

	140.9843	123.8700	129.1625	114.4981	111.2720	98.0858	92.9265	103.7261	104.0935	118.7910	127.2281	137.1579 (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

	140.9843	123.8700	129.1625	114.4981	111.2720	98.0858	92.9265	103.7261	104.0935	118.7910	127.2281	137.1579 (64)

Total per year (kWh/year) = Sum(64)m = 1401.7960 (64)
Heat gains from water heating, kWh/month

	56.0945	49.5120	52.1638	46.9905	46.2152	41.5334	40.1153	43.7062	43.5310	48.7152	51.2233	54.8222 (65)

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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	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	13.3651	11.8708	9.6540	7.3087	5.4633	4.6124	4.9838	6.4782	8.6950	11.0403	12.8856	13.7366 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	147.2339	148.7618	144.9117	136.7153	126.3689	116.6447	110.1484	108.6205	112.4706	120.6670	131.0134	140.7376 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505 (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)

	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040 (71)

Water heating gains (Table 5)

	75.3959	73.6786	70.1126	65.2646	62.1171	57.6853	53.9184	58.7449	60.4597	65.4775	71.1434	73.6858 (72)

Total internal gains

	287.3465	285.6627	276.0298	260.6402	245.3009	230.2939	220.4021	225.1951	232.9768	248.5363	266.3940	279.5115 (73)

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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	
North	7.5600	10.6334	0.6200	0.8500	0.7700	29.3587	(74)

Solar gains	29.3587	56.1061	95.3379	153.1371	206.2897	220.8393	206.1817	163.5789	114.6271	66.7869	36.2178	24.4749	(83)
Total gains	316.7052	341.7688	371.3677	413.7773	451.5906	451.1332	426.5838	388.7740	347.6039	315.3232	302.6118	303.9864	(84)

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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	67.5072	67.5072	67.5072	67.5072	67.5072	67.5072	67.5072	67.5072	67.5072	67.5072	67.5072	67.5072	
alpha	5.5005	5.5005	5.5005	5.5005	5.5005	5.5005	5.5005	5.5005	5.5005	5.5005	5.5005	5.5005	
util living area	0.9974	0.9955	0.9890	0.9618	0.8694	0.6897	0.5228	0.5924	0.8548	0.9768	0.9949	0.9979	(86)
MIT	19.9569	20.0629	20.2730	20.5690	20.8354	20.9653	20.9937	20.9879	20.8891	20.5642	20.2050	19.9229	(87)
Th 2	20.0595	20.0595	20.0595	20.0595	20.0595	20.0595	20.0595	20.0595	20.0595	20.0595	20.0595	20.0595	(88)
util rest of house	0.9965	0.9940	0.9852	0.9476	0.8247	0.6043	0.4151	0.4795	0.7884	0.9656	0.9929	0.9972	(89)
MIT 2	18.6670	18.8216	19.1267	19.5478	19.8976	20.0364	20.0571	20.0544	19.9681	19.5472	19.0295	18.6175	(90)
Living area fraction									fLA = Living area / (4) =			0.4800	(91)
MIT	19.2861	19.4174	19.6769	20.0380	20.3477	20.4823	20.5066	20.5025	20.4102	20.0354	19.5938	19.2441	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2861	19.4174	19.6769	20.0380	20.3477	20.4823	20.5066	20.5025	20.4102	20.0354	19.5938	19.2441	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9956	0.9926	0.9831	0.9472	0.8397	0.6441	0.4670	0.5340	0.8157	0.9652	0.9915	0.9964	(94)
Useful gains	315.3010	339.2352	365.1060	391.9494	379.1899	290.5953	199.2338	207.5997	283.5489	304.3511	300.0493	302.9019	(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	770.8088	746.7010	677.7518	572.8807	444.7932	302.5557	200.9376	211.0110	324.5624	485.3064	642.6145	773.7903	(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	338.8978	273.8171	232.6085	130.2705	48.8088	0.0000	0.0000	0.0000	0.0000	134.6308	246.6470	350.3410	(98)

Space heating 1756.0213 (98)
Space heating per m2 (98) / (4) = 35.1204 (99)

8c. Space cooling requirement

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												1756.0213	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	338.8978	273.8171	232.6085	130.2705	48.8088	0.0000	0.0000	0.0000	0.0000	134.6308	246.6470	350.3410	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	338.8978	273.8171	232.6085	130.2705	48.8088	0.0000	0.0000	0.0000	0.0000	134.6308	246.6470	350.3410	(211)
Water heating requirement													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	140.9843	123.8700	129.1625	114.4981	111.2720	98.0858	92.9265	103.7261	104.0935	118.7910	127.2281	137.1579	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	140.9843	123.8700	129.1625	114.4981	111.2720	98.0858	92.9265	103.7261	104.0935	118.7910	127.2281	137.1579	(219)
Water heating fuel used												1401.7960	(219)
Annual totals kWh/year													
Space heating fuel - main system												1756.0213	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 4.2640, total flow = 21.0000, SFP = 0.2030)													
mechanical ventilation fans (SFP = 0.2030)												29.4785	(230a)
central heating pump												30.0000	(230c)
Total electricity for the above, kWh/year												59.4785	(231)
Electricity for lighting (calculated in Appendix L)												236.0326	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.61 * 951 * 1.00) =												-463.9006	(233)
Total delivered energy for all uses												2989.4278	(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	1756.0213	0.5190	911.3751	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating	1401.7960	0.5190	727.5321	(264)
Space and water heating			1638.9072	(265)
Pumps and fans	59.4785	0.5190	30.8693	(267)
Energy for lighting	236.0326	0.5190	122.5009	(268)
Energy saving/generation technologies				
PV Unit (0.90*22.10 + 0.10*8.66)	-463.9006	0.5190	-240.7644	(269)
Total CO2, kg/year			1551.5130	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			31.0300	(273)

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

DER		31.0300	ZC1
Total Floor Area	TFA	50.0000	
Assumed number of occupants	N	1.6901	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.4495	ZC2
CO2 emissions from cooking, equation (L16)		3.1912	ZC3
Total CO2 emissions		51.6708	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		51.6708	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	50.0000 (1b)	x	2.3800 (2b)	=	119.0000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	119.0000	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							2 * 10 =	20.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1681	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4181	(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) =	0.3554	(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	0.4531	0.4442	0.4353	0.3909	0.3820	0.3376	0.3376	0.3287	0.3554	0.3820	0.3998	0.4175	(22b)
Effective ac	0.6026	0.5987	0.5947	0.5764	0.5730	0.5570	0.5570	0.5540	0.5631	0.5730	0.5799	0.5872	(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)			7.5600	1.3258	10.0227			(27)
Above Commercial			39.4000	0.1300	5.1220			(28b)
Exposed Floor			10.6000	0.1300	1.3780			(28b)
External Wall	33.5600	7.5600	26.0000	0.1800	4.6800			(29a)
Total net area of external elements Aum(A, m2)			83.5600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.2027			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.2908	(36)
Total fabric heat loss					(33) + (36) =		32.4935	(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	23.6657	23.5092	23.3558	22.6352	22.5004	21.8727	21.8727	21.7565	22.1145	22.5004	22.7731	23.0582	(38)
Heat transfer coeff	56.1592	56.0027	55.8493	55.1287	54.9939	54.3663	54.3663	54.2500	54.6080	54.9939	55.2666	55.5518	(39)
Average = Sum(39)m / 12 =												55.1281	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1232	1.1201	1.1170	1.1026	1.0999	1.0873	1.0873	1.0850	1.0922	1.0999	1.1053	1.1110	(40)
HLP (average)												1.1026	(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	1.6901	(42)
Average daily hot water use (litres/day)	74.3399	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	81.7739	78.8003	75.8267	72.8531	69.8795	66.9059	66.9059	69.8795	72.8531	75.8267	78.8003	81.7739	(44)
Energy conte	121.2683	106.0620	109.4465	95.4181	91.5560	79.0058	73.2105	84.0101	85.0135	99.0750	108.1481	117.4419	(45)
Energy content (annual)										Total = Sum(45)m =		1169.6560	(45)
Distribution loss (46)m = 0.15 x (45)m	18.1902	15.9093	16.4170	14.3127	13.7334	11.8509	10.9816	12.6015	12.7520	14.8613	16.2222	17.6163	(46)

Water storage loss:		
Store volume	120.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.2247	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.6613	(55)
Total storage loss		

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	20.5007	18.5168	20.5007	19.8394	20.5007	19.8394	20.5007	20.5007	19.8394	20.5007	19.8394	20.5007	(56)
If cylinder contains dedicated solar storage													
	20.5007	18.5168	20.5007	19.8394	20.5007	19.8394	20.5007	20.5007	19.8394	20.5007	19.8394	20.5007	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	165.0314	145.5900	153.2096	137.7695	135.3191	121.3572	116.9736	127.7733	127.3649	142.8381	150.4995	161.2050	(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													
	165.0314	145.5900	153.2096	137.7695	135.3191	121.3572	116.9736	127.7733	127.3649	142.8381	150.4995	161.2050	(64)
									Total per year (kWh/year) = Sum(64)m =			1684.9313	(64)
Heat gains from water heating, kWh/month													
	75.3322	66.8880	71.4015	65.6076	65.4528	60.1506	59.3530	62.9439	62.1481	67.9529	69.8404	74.0599	(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	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	13.8524	12.3036	10.0059	7.5751	5.6625	4.7805	5.1655	6.7143	9.0120	11.4428	13.3554	14.2374	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	147.2339	148.7618	144.9117	136.7153	126.3689	116.6447	110.1484	108.6205	112.4706	120.6670	131.0134	140.7376	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	(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)													
	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	(71)
Water heating gains (Table 5)													
	101.2530	99.5357	95.9697	91.1217	87.9743	83.5424	79.7755	84.6020	86.3168	91.3346	97.0005	99.5429	(72)
Total internal gains													
	313.6908	311.9526	302.2388	286.7637	271.3572	256.3192	246.4409	251.2884	259.1509	274.7958	292.7208	305.8694	(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	
North	7.5600	10.6334	0.6300	0.7000	0.7700	24.5678	(74)

Solar gains	24.5678	46.9502	79.7799	128.1470	172.6258	184.8010	172.5353	136.8848	95.9213	55.8881	30.3075	20.4809	(83)
Total gains	338.2585	358.9028	382.0188	414.9107	443.9829	441.1202	418.9763	388.1731	355.0722	330.6840	323.0283	326.3503	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.8282	62.0010	62.1713	62.9839	63.1383	63.8672	63.8672	64.0041	63.5845	63.1383	62.8267	62.5043	
alpha	5.1219	5.1334	5.1448	5.1989	5.2092	5.2578	5.2578	5.2669	5.2390	5.2092	5.1884	5.1670	
util living area													
	0.9965	0.9947	0.9888	0.9662	0.8920	0.7269	0.5577	0.6190	0.8636	0.9749	0.9935	0.9971	(86)
MIT	19.8660	19.9713	20.1835	20.4957	20.7812	20.9481	20.9894	20.9824	20.8668	20.5269	20.1530	19.8501	(87)
Th 2	19.9819	19.9845	19.9870	19.9987	20.0009	20.0112	20.0112	20.0131	20.0072	20.0009	19.9965	19.9918	(88)
util rest of house													
	0.9954	0.9929	0.9848	0.9531	0.8504	0.6382	0.4392	0.4980	0.7969	0.9625	0.9909	0.9962	(89)
MIT 2	18.4781	18.6334	18.9435	19.3981	19.7817	19.9760	20.0072	20.0056	19.8970	19.4493	18.9074	18.4620	(90)
Living area fraction										fLA = Living area / (4) =		0.4800	(91)
MIT	19.1443	19.2756	19.5387	19.9250	20.2615	20.4426	20.4787	20.4744	20.3625	19.9665	19.5053	19.1283	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1443	19.2756	19.5387	19.9250	20.2615	20.4426	20.4787	20.4744	20.3625	19.9665	19.5053	19.1283	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9941	0.9912	0.9825	0.9519	0.8625	0.6790	0.4964	0.5564	0.8235	0.9620	0.9892	0.9951	(94)
Useful gains	336.2699	355.7360	375.3188	394.9451	382.9481	299.5021	207.9967	215.9880	292.4163	318.1154	319.5532	324.7465	(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													
	833.6437	805.0738	728.2018	607.7918	470.8297	317.6420	210.8695	221.0390	341.9842	515.1018	685.5982	829.2914	(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													
	370.0461	301.9550	262.5450	153.2496	65.3840	0.0000	0.0000	0.0000	0.0000	146.5579	263.5524	375.3814	(98)
Space heating												1938.6714	(98)
Space heating per m2											(98) / (4) =	38.7734	(99)

8c. Space cooling requirement

Not applicable

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												93.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2073.4453	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	370.0461	301.9550	262.5450	153.2496	65.3840	0.0000	0.0000	0.0000	0.0000	146.5579	263.5524	375.3814	(98)
Space heating efficiency (main heating system 1)													
	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)													
	395.7712	322.9465	280.7968	163.9034	69.9294	0.0000	0.0000	0.0000	0.0000	156.7464	281.8742	401.4774	(211)
Water heating requirement													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	165.0314	145.5900	153.2096	137.7695	135.3191	121.3572	116.9736	127.7733	127.3649	142.8381	150.4995	161.2050	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.9060	86.7175	86.2388	85.0983	82.9968	79.8000	79.8000	79.8000	79.8000	84.8824	86.2943	86.9956	(217)
Fuel for water heating, kWh/month													
	189.8965	167.8901	177.6574	161.8946	163.0413	152.0767	146.5835	160.1169	159.6051	168.2777	174.4027	185.3025	(219)
Water heating fuel used												2006.7451	(219)
Annual totals kWh/year													
Space heating fuel - main system												2073.4453	(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)												244.6374	(232)
Total delivered energy for all uses												4399.8277	(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	2073.4453	0.2160	447.8642	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2006.7451	0.2160	433.4569	(264)
Space and water heating			881.3211	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	244.6374	0.5190	126.9668	(268)
Total CO2, kg/m2/year			1047.2129	(272)
Emissions per m2 for space and water heating			17.6264	(272a)
Fuel factor (electricity)			1.5500	
Emissions per m2 for lighting			2.5393	(272b)
Emissions per m2 for pumps and fans			0.7785	(272c)
Target Carbon Dioxide Emission Rate (TER) = (17.6264 * 1.55) + 2.5393 + 0.7785, rounded to 2 d.p.			30.6400	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Built)

Design SAP
elmhurst energy

Property Reference	PMCC-ROPE-1655-110	**Issued on Date**	06/08/2020
Assessment Reference	ABF	**Prop Type Ref**	
Property	2 Chalkhill Blue Apartments, 4, Salt Marsh Road, SHOREHAM-BY-SEA, West Sussex, BN43 5QP		

SAP Rating	77 C	**DER**	28.13	**TER**	27.79
Environmental	81 B	**% DER<TER**	-1.22		
CO_2 Emissions (t/year)	1.42	**DFEE**	41.92	**TFEE**	53.66
General Requirements Compliance	Fail	**% DFEE<TFEE**	21.87		

Assessor Details	Mr. Malcolm Maclean, SRE Limited, Tel: 01730 710044, malcolm@sre.co.uk	**Assessor ID**	V497-0002
Client			

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

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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 70 m²

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

1a TER and DER
Fuel for main heating:Electricity
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 27.79 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 28.13 kgCO□/m²Fail
Excess emissions =0.34 kgCO□/m² (1.2%)

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)53.7 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)41.9 kWh/m²/yrOK
---
2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.07 (max. 0.25)	0.07 (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: 2.32 (measured in this dwelling)
Maximum 10.0 OK
---
4 Heating efficiency
Main heating system: Boiler system with radiators or underfloor - Electric
Direct-acting boiler

Secondary heating system: None
---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 1.30 kWh/day
Permitted by DBSCG 1.89 OK
Primary pipework insulated: No primary pipework
---
6 Controls
Space heating controls: Time and temperature zone control OK

Hot water controls: Cylinderstat OK

---
7 Low energy lights
Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK
---
8 Mechanical ventilation
Continuous extract system (decentralised)
Specific fan power: 0.1800 0.1600
Maximum 0.7 OK
---
9 Summertime temperature
Overheating risk (South East England): Medium OK
Based on:
Overshading: Average
Windows facing North: 6.62 m², No overhang
Windows facing North East: 7.56 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: Light-coloured curtain or roller blind, closed 100% of daylight hours
---
10 Key features
Party wall U-value 0.00 W/m²K
Party wall U-value 0.00 W/m²K
Exposed floor U-value 0.07 W/m²K
Air permeability 2.3 m³/m²h
Photovoltaic array 0.85 kW

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	70.0000 (1b)	x	2.3800 (2b)	=	166.6000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	166.6000	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(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) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		2.3200	
Infiltration rate		0.1160	(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) =	0.0986	(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	0.1257	0.1233	0.1208	0.1085	0.1060	0.0937	0.0937	0.0912	0.0986	0.1060	0.1109	0.1159	(22b)
Mechanical extract ventilation - decentralised													
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 (Uw = 1.30)			14.1800	1.2357	17.5228			(27)
Above Commercial			70.0000	0.0700	4.9000			(28b)
External Wall	38.4400	14.1800	24.2600	0.1800	4.3668			(29a)
Total net area of external elements Aum(A, m2)			108.4400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.7896			(33)
Corridor Wall			9.2800	0.0000	0.0000			(32)
Party			34.7500	0.0000	0.0000			(32)
Party Ceiling 1			70.0000					(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							18.0906	(36)
Total fabric heat loss					(33) + (36) =		44.8802	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.4890	27.4890	27.4890	27.4890	27.4890	27.4890	27.4890	27.4890	27.4890	27.4890	27.4890	27.4890	(38)
Heat transfer coeff	72.3692	72.3692	72.3692	72.3692	72.3692	72.3692	72.3692	72.3692	72.3692	72.3692	72.3692	72.3692	(39)
Average = Sum(39)m / 12 =												72.3692	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0338	1.0338	1.0338	1.0338	1.0338	1.0338	1.0338	1.0338	1.0338	1.0338	1.0338	1.0338	(40)
HLP (average)												1.0338	(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	2.2461	(42)
Average daily hot water use (litres/day)	87.5455	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	96.3000	92.7982	89.2964	85.7946	82.2927	78.7909	78.7909	82.2927	85.7946	89.2964	92.7982	96.3000	(44)
Energy conte	142.8101	124.9027	128.8884	112.3680	107.8198	93.0403	86.2155	98.9335	100.1151	116.6745	127.3593	138.3040	(45)
Energy content (annual)										Total = Sum(45)m =		1377.4311	(45)
Distribution loss (46)m = 0.15 x (45)m	21.4215	18.7354	19.3333	16.8552	16.1730	13.9560	12.9323	14.8400	15.0173	17.5012	19.1039	20.7456	(46)
Water storage loss:													

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3000	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.7800	(55)
Total storage loss													
	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(56)
If cylinder contains dedicated solar storage													
	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Total heat required for water heating calculated for each month													
	166.9901	146.7427	153.0684	135.7680	131.9998	116.4403	110.3955	123.1135	123.5151	140.8545	150.7593	162.4840	(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													
	166.9901	146.7427	153.0684	135.7680	131.9998	116.4403	110.3955	123.1135	123.5151	140.8545	150.7593	162.4840	(64)
Total per year (kWh/year) = Sum(64)m =												1662.1311	(64)
Heat gains from water heating, kWh/month													
	66.8284	59.0021	62.1994	56.0824	55.1941	49.6559	48.0106	52.2394	52.0083	58.1383	61.0670	65.3301	(65)

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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	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.5892	15.6226	12.7051	9.6186	7.1900	6.0701	6.5590	8.5256	11.4430	14.5296	16.9581	18.0780	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	197.2971	199.3444	194.1852	183.2019	169.3374	156.3068	147.6015	145.5542	150.7134	161.6967	175.5612	188.5918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	(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)													
	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	(71)
Water heating gains (Table 5)													
	89.8231	87.8008	83.6013	77.8922	74.1856	68.9665	64.5304	70.2142	72.2337	78.1428	84.8152	87.8092	(72)
Total internal gains													
	364.4012	362.4596	350.1835	330.4045	310.4049	291.0353	278.3828	283.9859	294.0820	314.0610	337.0264	354.1709	(73)

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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	
North	6.6200	10.6334	0.6200	0.8500	0.7700	25.7083	(74)
Northeast	7.5600	11.2829	0.6200	0.8500	0.7700	31.1521	(75)

Solar gains	56.8605	112.5410	197.7304	321.7221	432.8458	462.2586	432.0753	343.7623	239.5858	135.9761	70.9120	46.8721	(83)
Total gains	421.2617	475.0006	547.9138	652.1266	743.2507	753.2938	710.4581	627.7482	533.6678	450.0371	407.9384	401.0431	(84)

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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	67.1710	67.1710	67.1710	67.1710	67.1710	67.1710	67.1710	67.1710	67.1710	67.1710	67.1710	67.1710	
alpha	5.4781	5.4781	5.4781	5.4781	5.4781	5.4781	5.4781	5.4781	5.4781	5.4781	5.4781	5.4781	
util living area													
	0.9980	0.9956	0.9862	0.9404	0.8008	0.5976	0.4451	0.5225	0.8162	0.9751	0.9958	0.9985	(86)
MIT	19.9197	20.0512	20.3023	20.6403	20.8933	20.9822	20.9970	20.9933	20.9126	20.5699	20.1780	19.8824	(87)
Th 2	20.0552	20.0552	20.0552	20.0552	20.0552	20.0552	20.0552	20.0552	20.0552	20.0552	20.0552	20.0552	(88)
util rest of house													
	0.9973	0.9942	0.9814	0.9203	0.7471	0.5167	0.3512	0.4192	0.7433	0.9631	0.9941	0.9979	(89)
MIT 2	18.6097	18.8015	19.1654	19.6394	19.9561	20.0441	20.0542	20.0525	19.9863	19.5516	18.9871	18.5552	(90)
Living area fraction									fLA = Living area / (4) =			0.3771	(91)
MIT	19.1037	19.2728	19.5942	20.0169	20.3096	20.3979	20.4097	20.4073	20.3357	19.9357	19.4362	19.0557	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1037	19.2728	19.5942	20.0169	20.3096	20.3979	20.4097	20.4073	20.3357	19.9357	19.4362	19.0557	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9963	0.9925	0.9784	0.9194	0.7626	0.5468	0.3867	0.4583	0.7670	0.9611	0.9925	0.9972	(94)
Useful gains	419.7201	471.4546	536.0794	599.5391	566.7723	411.8817	274.7620	287.7205	409.3088	432.5523	404.8845	399.9077	(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													
	1071.3349	1040.1478	947.6152	804.5199	623.0671	419.5898	275.7085	290.0056	451.2706	675.6141	892.7647	1075.0975	(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													
	484.8014	382.1618	306.1826	147.5861	41.8834	0.0000	0.0000	0.0000	0.0000	180.8380	351.2737	502.3412	(98)
Space heating												2397.0682	(98)
Space heating per m2											(98) / (4) =	34.2438	(99)

8c. Space cooling requirement

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2397.0682	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	484.8014	382.1618	306.1826	147.5861	41.8834	0.0000	0.0000	0.0000	0.0000	180.8380	351.2737	502.3412	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	484.8014	382.1618	306.1826	147.5861	41.8834	0.0000	0.0000	0.0000	0.0000	180.8380	351.2737	502.3412	(211)
Water heating requirement													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	166.9901	146.7427	153.0684	135.7680	131.9998	116.4403	110.3955	123.1135	123.5151	140.8545	150.7593	162.4840	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	166.9901	146.7427	153.0684	135.7680	131.9998	116.4403	110.3955	123.1135	123.5151	140.8545	150.7593	162.4840	(219)
Water heating fuel used												1662.1311	(219)
Annual totals kWh/year													
Space heating fuel - main system												2397.0682	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 4.2640, total flow = 21.0000, SFP = 0.2030)													
mechanical ventilation fans (SFP = 0.2030)												41.2698	(230a)
central heating pump												30.0000	(230c)
Total electricity for the above, kWh/year												71.2698	(231)
Electricity for lighting (calculated in Appendix L)												310.6304	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.85 * 951 * 1.00) =												-646.4189	(233)
Total delivered energy for all uses												3794.6806	(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	2397.0682	0.5190	1244.0784	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating	1662.1311	0.5190	862.6460	(264)
Space and water heating			2106.7244	(265)
Pumps and fans	71.2698	0.5190	36.9890	(267)
Energy for lighting	310.6304	0.5190	161.2172	(268)
Energy saving/generation technologies				
PV Unit (0.90*22.10 + 0.10*8.66)	-646.4189	0.5190	-335.4914	(269)
Total CO2, kg/year			1969.4392	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			28.1300	(273)

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

DER		28.1300	ZC1
Total Floor Area	TFA	70.0000	
Assumed number of occupants	N	2.2461	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.7020	ZC2
CO2 emissions from cooking, equation (L16)		2.4701	ZC3
Total CO2 emissions		47.3021	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		47.3021	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	70.0000 (1b)	x	2.3800 (2b)	=	166.6000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	166.6000	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							2 * 10 =	20.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1200	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3700	(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) =	0.3145	(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	0.4010	0.3932	0.3853	0.3460	0.3381	0.2988	0.2988	0.2910	0.3145	0.3381	0.3539	0.3696	(22b)
Effective ac	0.5804	0.5773	0.5742	0.5599	0.5572	0.5446	0.5446	0.5423	0.5495	0.5572	0.5626	0.5683	(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)			14.1800	1.3258	18.7992			(27)
Above Commercial			70.0000	0.1300	9.1000			(28b)
External Wall	38.4400	14.1800	24.2600	0.1800	4.3668			(29a)
Total net area of external elements Aum(A, m2)			108.4400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.2660			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	14.8438	(36)
Total fabric heat loss (33) + (36) =	47.1098	(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	31.9101	31.7385	31.5702	30.7798	30.6319	29.9435	29.9435	29.8160	30.2086	30.6319	30.9311	31.2438	(38)
Heat transfer coeff	79.0200	78.8483	78.6800	77.8896	77.7417	77.0533	77.0533	76.9258	77.3185	77.7417	78.0409	78.3537	(39)
Average = Sum(39)m / 12 =												77.8889	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1289	1.1264	1.1240	1.1127	1.1106	1.1008	1.1008	1.0989	1.1045	1.1106	1.1149	1.1193	(40)
HLP (average)												1.1127	(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	2.2461 (42)
Average daily hot water use (litres/day)	87.5455 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	96.3000	92.7982	89.2964	85.7946	82.2927	78.7909	78.7909	82.2927	85.7946	89.2964	92.7982	96.3000	(44)
Energy conte	142.8101	124.9027	128.8884	112.3680	107.8198	93.0403	86.2155	98.9335	100.1151	116.6745	127.3593	138.3040	(45)
Energy content (annual)										Total = Sum(45)m =		1377.4311	(45)
Distribution loss (46)m = 0.15 x (45)m	21.4215	18.7354	19.3333	16.8552	16.1730	13.9560	12.9323	14.8400	15.0173	17.5012	19.1039	20.7456	(46)

Water storage loss:	
Store volume	150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.3938 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.7527 (55)

Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage

	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)

Total heat required for water heating calculated for each month

	189.4050	166.9884	175.4833	157.4598	154.4147	138.1321	132.8104	145.5284	145.2069	163.2694	172.4512	184.8989	(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

	189.4050	166.9884	175.4833	157.4598	154.4147	138.1321	132.8104	145.5284	145.2069	163.2694	172.4512	184.8989	(64)
								Total per year (kWh/year) = Sum(64)m =				1926.0485	(64)

Heat gains from water heating, kWh/month

	84.7603	75.1987	80.1313	73.4358	73.1260	67.0094	65.9426	70.1713	69.3617	76.0702	78.4205	83.2620	(65)

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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	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	17.6904	15.7125	12.7782	9.6740	7.2314	6.1050	6.5967	8.5747	11.5089	14.6132	17.0558	18.1821	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	197.2971	199.3444	194.1852	183.2019	169.3374	156.3068	147.6015	145.5542	150.7134	161.6967	175.5612	188.5918	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	(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)

	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	(71)

Water heating gains (Table 5)

	113.9251	111.9028	107.7034	101.9942	98.2876	93.0686	88.6325	94.3163	96.3358	102.2449	108.9173	111.9113	(72)

Total internal gains

	388.6045	386.6516	374.3587	354.5619	334.5483	315.1722	302.5226	308.1370	318.2499	338.2466	361.2261	378.3771	(73)

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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	
North	6.6200	10.6334	0.6300	0.7000	0.7700	21.5130	(74)
Northeast	7.5600	11.2829	0.6300	0.7000	0.7700	26.0685	(75)

Solar gains	47.5815	94.1757	165.4632	269.2209	362.2106	386.8236	361.5659	287.6645	200.4883	113.7865	59.3400	39.2232	(83)
Total gains	436.1860	480.8273	539.8218	623.7828	696.7589	701.9958	664.0885	595.8015	518.7382	452.0331	420.5661	417.6002	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.5175	61.6514	61.7833	62.4103	62.5290	63.0876	63.0876	63.1922	62.8713	62.5290	62.2893	62.0406	
alpha	5.1012	5.1101	5.1189	5.1607	5.1686	5.2058	5.2058	5.2128	5.1914	5.1686	5.1526	5.1360	
util living area	0.9976	0.9956	0.9884	0.9564	0.8530	0.6651	0.5029	0.5773	0.8500	0.9775	0.9953	0.9981	(86)
MIT	19.8087	19.9345	20.1814	20.5328	20.8261	20.9644	20.9931	20.9866	20.8748	20.5045	20.1005	19.7864	(87)
Th 2	19.9773	19.9793	19.9813	19.9905	19.9922	20.0002	20.0002	20.0017	19.9971	19.9922	19.9887	19.9851	(88)
util rest of house	0.9968	0.9941	0.9843	0.9402	0.8037	0.5762	0.3926	0.4604	0.7800	0.9663	0.9935	0.9975	(89)
MIT 2	18.3913	18.5762	18.9361	19.4417	19.8246	19.9772	19.9977	19.9962	19.8954	19.4115	18.8258	18.3642	(90)
Living area fraction									fLA = Living area / (4) =			0.3771	(91)
MIT	18.9259	19.0885	19.4057	19.8532	20.2023	20.3496	20.3731	20.3697	20.2647	19.8238	19.3065	18.9005	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9259	19.0885	19.4057	19.8532	20.2023	20.3496	20.3731	20.3697	20.2647	19.8238	19.3065	18.9005	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9957	0.9923	0.9812	0.9375	0.8150	0.6086	0.4344	0.5048	0.8010	0.9639	0.9917	0.9965	(94)
Useful gains	434.2969	477.1422	529.6492	584.7956	567.8757	427.2331	288.5010	300.7350	415.5279	435.6971	417.0656	416.1449	(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	1155.7364	1118.7384	1015.4234	853.1389	660.9823	443.0220	290.7318	305.3752	476.6491	717.0713	952.6070	1151.8403	(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	536.7510	431.1527	361.4160	193.2071	69.2713	0.0000	0.0000	0.0000	0.0000	209.3424	385.5898	547.3574	(98)
Space heating												2734.0877	(98)
Space heating per m2											(98) / (4) =	39.0584	(99)

8c. Space cooling requirement

Not applicable

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												93.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2924.1580	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	536.7510	431.1527	361.4160	193.2071	69.2713	0.0000	0.0000	0.0000	0.0000	209.3424	385.5898	547.3574	(98)
Space heating efficiency (main heating system 1)													
	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)													
	574.0652	461.1259	386.5412	206.6386	74.0870	0.0000	0.0000	0.0000	0.0000	223.8956	412.3955	585.4090	(211)
Water heating requirement													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	189.4050	166.9884	175.4833	157.4598	154.4147	138.1321	132.8104	145.5284	145.2069	163.2694	172.4512	184.8989	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.4418	87.2345	86.7003	85.3606	82.8329	79.8000	79.8000	79.8000	79.8000	85.4779	86.8992	87.5363	(217)
Fuel for water heating, kWh/month													
	216.6069	191.4247	202.4020	184.4643	186.4172	173.0979	166.4290	182.3664	181.9636	191.0077	198.4496	211.2255	(219)
Water heating fuel used												2285.8549	(219)
Annual totals kWh/year													
Space heating fuel - main system												2924.1580	(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)												312.4184	(232)
Total delivered energy for all uses												5597.4313	(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	2924.1580	0.2160	631.6181	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2285.8549	0.2160	493.7447	(264)
Space and water heating			1125.3628	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	312.4184	0.5190	162.1452	(268)
Total CO2, kg/m2/year			1326.4329	(272)
Emissions per m2 for space and water heating			16.0766	(272a)
Fuel factor (electricity)			1.5500	
Emissions per m2 for lighting			2.3164	(272b)
Emissions per m2 for pumps and fans			0.5561	(272c)
Target Carbon Dioxide Emission Rate (TER) = (16.0766 * 1.55) + 2.3164 + 0.5561, rounded to 2 d.p.			27.7900	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Built)

Design SAP
elmhurst energy

Property Reference	PMCC-ROPE-1655-111	**Issued on Date**	06/08/2020
Assessment Reference	ABF	**Prop Type Ref**	
Property	3 Chalkhill Blue Apartments, 4, Salt Marsh Road, SHOREHAM-BY-SEA, West Sussex, BN43 5QP		

SAP Rating	78 C	**DER**	25.71	**TER**	26.38
Environmental	81 B	**% DER<TER**	2.52		
CO_2 Emissions (t/year)	1.46	**DFEE**	39.93	**TFEE**	52.37
General Requirements Compliance	Pass	**% DFEE<TFEE**	23.75		

Assessor Details	Mr. Malcolm Maclean, SRE Limited, Tel: 01730 710044, malcolm@sre.co.uk	**Assessor ID**	V497-0002
Client			

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

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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 80 m²

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

1a TER and DER
Fuel for main heating:Electricity
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 26.38 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 25.71 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)52.4 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)39.9 kWh/m²/yrOK

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2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.07 (max. 0.25)	0.07 (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: 2.26 (measured in this dwelling)
Maximum 10.0 OK

---
4 Heating efficiency
Main heating system: Boiler system with radiators or underfloor - Electric
Direct-acting boiler

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 1.30 kWh/day
Permitted by DBSCG 1.89 OK
Primary pipework insulated: No primary pipework

---
6 Controls
Space heating controls: Time and temperature zone control OK

Hot water controls: Cylinderstat OK

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

---
8 Mechanical ventilation
Continuous extract system (decentralised)
Specific fan power: 0.1800 0.1600
Maximum 0.7 OK

---
9 Summertime temperature
Overheating risk (South East England): Medium OK
Based on:
Overshading: Average
Windows facing North East: 12.18 m², No overhang
Windows facing South: 6.62 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: Light-coloured curtain or roller blind, closed 100% of daylight hours

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10 Key features
Party wall U-value 0.00 W/m²K
Party wall U-value 0.00 W/m²K
Exposed floor U-value 0.07 W/m²K
Air permeability 2.3 m³/m²h
Photovoltaic array 0.97 kW

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	80.0000 (1b)	x	2.3800 (2b)	=	190.4000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	190.4000	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(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) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		2.2600	
Infiltration rate		0.1130	(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) =	0.0961	(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	0.1225	0.1201	0.1177	0.1057	0.1033	0.0912	0.0912	0.0888	0.0961	0.1033	0.1081	0.1129	(22b)
Mechanical extract ventilation - decentralised													
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 (Uw = 1.30)			18.8000	1.2357	23.2319			(27)
Above Commercial			80.0000	0.0700	5.6000			(28b)
External Wall	47.8400	18.8000	29.0400	0.1800	5.2272			(29a)
Total net area of external elements Aum(A, m2)			127.8400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.0591			(33)
Corridor Wall			3.5700	0.0000	0.0000			(32)
Party			47.9600	0.0000	0.0000			(32)
Party Ceiling 1			80.0000					(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							21.4606	(36)
Total fabric heat loss					(33) + (36) =		55.5197	(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	31.4160	31.4160	31.4160	31.4160	31.4160	31.4160	31.4160	31.4160	31.4160	31.4160	31.4160	31.4160	(38)
Heat transfer coeff	86.9357	86.9357	86.9357	86.9357	86.9357	86.9357	86.9357	86.9357	86.9357	86.9357	86.9357	86.9357	(39)
Average = Sum(39)m / 12 =												86.9357	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0867	1.0867	1.0867	1.0867	1.0867	1.0867	1.0867	1.0867	1.0867	1.0867	1.0867	1.0867	(40)
HLP (average)												1.0867	(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		2.4629 (42)
Average daily hot water use (litres/day)		92.6930 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	101.9622	98.2545	94.5468	90.8391	87.1314	83.4237	83.4237	87.1314	90.8391	94.5468	98.2545	101.9622	(44)
Energy conte	151.2071	132.2467	136.4667	118.9750	114.1593	98.5108	91.2848	104.7506	106.0017	123.5347	134.8478	146.4360	(45)
Energy content (annual)										Total = Sum(45)m =		1458.4211	(45)
Distribution loss (46)m = 0.15 x (45)m	22.6811	19.8370	20.4700	17.8462	17.1239	14.7766	13.6927	15.7126	15.9002	18.5302	20.2272	21.9654	(46)
Water storage loss:													

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3000	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.7800	(55)
Total storage loss													
	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(56)
If cylinder contains dedicated solar storage													
	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Total heat required for water heating calculated for each month													
	175.3871	154.0867	160.6467	142.3750	138.3393	121.9108	115.4648	128.9306	129.4017	147.7147	158.2478	170.6160	(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													
	175.3871	154.0867	160.6467	142.3750	138.3393	121.9108	115.4648	128.9306	129.4017	147.7147	158.2478	170.6160	(64)
Total per year (kWh/year) = Sum(64)m =												1743.1211	(64)
Heat gains from water heating, kWh/month													
	69.6203	61.4440	64.7192	58.2792	57.3020	51.4748	49.6962	54.1736	53.9655	60.4193	63.5569	68.0340	(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	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	19.5633	17.3759	14.1311	10.6981	7.9970	6.7514	7.2951	9.4825	12.7273	16.1603	18.8614	20.1070	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.4405	221.7177	215.9794	203.7634	188.3429	173.8497	164.1674	161.8903	167.6286	179.8446	195.2651	209.7582	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	(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)													
	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	(71)
Water heating gains (Table 5)													
	93.5757	91.4345	86.9881	80.9433	77.0188	71.4928	66.7959	72.8139	74.9522	81.2087	88.2735	91.4435	(72)
Total internal gains													
	395.5225	393.4711	380.0415	358.3477	336.3015	315.0369	301.2014	307.1296	318.2510	340.1565	365.3429	384.2517	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	12.1800	11.2829	0.6200	0.8500	0.7700	50.1896	(75)
South	6.6200	46.7521	0.6200	0.8500	0.7700	113.0323	(78)

Solar gains	163.2219	287.2801	419.8713	568.7994	684.0551	700.4636	666.3828	576.6674	470.6134	324.5174	197.1333	138.6577	(83)
Total gains	558.7444	680.7512	799.9128	927.1471	1020.3566	1015.5005	967.5842	883.7970	788.8644	664.6739	562.4762	522.9093	(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	63.9042	63.9042	63.9042	63.9042	63.9042	63.9042	63.9042	63.9042	63.9042	63.9042	63.9042	63.9042	
alpha	5.2603	5.2603	5.2603	5.2603	5.2603	5.2603	5.2603	5.2603	5.2603	5.2603	5.2603	5.2603	
util living area													
	0.9959	0.9883	0.9645	0.8883	0.7293	0.5372	0.3935	0.4486	0.7078	0.9386	0.9903	0.9971	(86)
MIT	19.9366	20.1367	20.4192	20.7288	20.9236	20.9871	20.9979	20.9960	20.9507	20.6671	20.2264	19.8847	(87)
Th 2	20.0117	20.0117	20.0117	20.0117	20.0117	20.0117	20.0117	20.0117	20.0117	20.0117	20.0117	20.0117	(88)
util rest of house													
	0.9946	0.9846	0.9535	0.8570	0.6701	0.4589	0.3061	0.3543	0.6259	0.9136	0.9867	0.9962	(89)
MIT 2	18.6024	18.8924	19.2952	19.7135	19.9442	20.0040	20.0110	20.0102	19.9766	19.6447	19.0245	18.5267	(90)
Living area fraction									fLA = Living area / (4) =			0.4538	(91)
MIT	19.2078	19.4570	19.8052	20.1742	20.3886	20.4501	20.4588	20.4575	20.4186	20.1086	19.5699	19.1429	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2078	19.4570	19.8052	20.1742	20.3886	20.4501	20.4588	20.4575	20.4186	20.1086	19.5699	19.1429	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9932	0.9819	0.9508	0.8627	0.6937	0.4941	0.3458	0.3972	0.6612	0.9164	0.9845	0.9950	(94)
Useful gains	554.9216	668.4412	760.5486	799.8126	707.7790	501.8093	334.6341	351.0446	521.5820	609.1392	553.7539	520.2953	(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													
	1296.0233	1265.5227	1156.7000	980.1286	755.3500	508.5796	335.4686	352.7402	549.3129	826.6396	1084.0785	1299.0701	(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													
	551.3796	401.2387	294.7366	129.8275	35.3928	0.0000	0.0000	0.0000	0.0000	161.8203	381.8338	579.4085	(98)
Space heating												2535.6379	(98)
Space heating per m2											(98) / (4) =	31.6955	(99)

8c. Space cooling requirement

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2535.6379	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	551.3796	401.2387	294.7366	129.8275	35.3928	0.0000	0.0000	0.0000	0.0000	161.8203	381.8338	579.4085	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	551.3796	401.2387	294.7366	129.8275	35.3928	0.0000	0.0000	0.0000	0.0000	161.8203	381.8338	579.4085	(211)
Water heating requirement													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	175.3871	154.0867	160.6467	142.3750	138.3393	121.9108	115.4648	128.9306	129.4017	147.7147	158.2478	170.6160	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	175.3871	154.0867	160.6467	142.3750	138.3393	121.9108	115.4648	128.9306	129.4017	147.7147	158.2478	170.6160	(219)
Water heating fuel used												1743.1211	(219)
Annual totals kWh/year													
Space heating fuel - main system												2535.6379	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 4.2640, total flow = 21.0000, SFP = 0.2030)													
mechanical ventilation fans (SFP = 0.2030)												47.1655	(230a)
central heating pump												30.0000	(230c)
Total electricity for the above, kWh/year												77.1655	(231)
Electricity for lighting (calculated in Appendix L)												345.4937	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.97 * 951 * 1.00) =												-737.6780	(233)
Total delivered energy for all uses												3963.7402	(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	2535.6379	0.5190	1315.9961	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating	1743.1211	0.5190	904.6798	(264)
Space and water heating			2220.6759	(265)
Pumps and fans	77.1655	0.5190	40.0489	(267)
Energy for lighting	345.4937	0.5190	179.3112	(268)
Energy saving/generation technologies				
PV Unit (0.90*22.10 + 0.10*8.66)	-737.6780	0.5190	-382.8549	(269)
Total CO2, kg/year			2057.1811	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			25.7100	(273)

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

DER		25.7100	ZC1
Total Floor Area	TFA	80.0000	
Assumed number of occupants	N	2.4629	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.2545	ZC2
CO2 emissions from cooking, equation (L16)		2.2264	ZC3
Total CO2 emissions		44.1908	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		44.1908	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	80.0000 (1b)	x	2.3800 (2b)	=	190.4000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	190.4000	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							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) =	0.1576	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4076	(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) =	0.3464	(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	0.4417	0.4330	0.4244	0.3811	0.3724	0.3291	0.3291	0.3204	0.3464	0.3724	0.3897	0.4071	(22b)
Effective ac	0.5975	0.5938	0.5900	0.5726	0.5693	0.5542	0.5542	0.5513	0.5600	0.5693	0.5759	0.5828	(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)			18.8000	1.3258	24.9242			(27)
Above Commercial			80.0000	0.1300	10.4000			(28b)
External Wall	47.8400	18.8000	29.0400	0.1800	5.2272			(29a)
Total net area of external elements Aum(A, m2)			127.8400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.5514			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	17.4058	(36)
Total fabric heat loss (33) + (36) =	57.9572	(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	37.5451	37.3071	37.0738	35.9781	35.7731	34.8187	34.8187	34.6420	35.1863	35.7731	36.1878	36.6214	(38)
Heat transfer coeff	95.5024	95.2644	95.0311	93.9353	93.7303	92.7760	92.7760	92.5992	93.1436	93.7303	94.1451	94.5786	(39)
Average = Sum(39)m / 12 =												93.9343	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1938	1.1908	1.1879	1.1742	1.1716	1.1597	1.1597	1.1575	1.1643	1.1716	1.1768	1.1822	(40)
HLP (average)												1.1742	(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	2.4629	(42)
Average daily hot water use (litres/day)	92.6930	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	101.9622	98.2545	94.5468	90.8391	87.1314	83.4237	83.4237	87.1314	90.8391	94.5468	98.2545	101.9622	(44)
Energy conte	151.2071	132.2467	136.4667	118.9750	114.1593	98.5108	91.2848	104.7506	106.0017	123.5347	134.8478	146.4360	(45)
Energy content (annual)										Total = Sum(45)m =		1458.4211	(45)
Distribution loss (46)m = 0.15 x (45)m	22.6811	19.8370	20.4700	17.8462	17.1239	14.7766	13.6927	15.7126	15.9002	18.5302	20.2272	21.9654	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage

	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)

Total heat required for water heating calculated for each month

	197.8020	174.3324	183.0616	164.0668	160.7542	143.6027	137.8797	151.3455	151.0935	170.1296	179.9396	193.0309 (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

	197.8020	174.3324	183.0616	164.0668	160.7542	143.6027	137.8797	151.3455	151.0935	170.1296	179.9396	193.0309 (64)

Total per year (kWh/year) = Sum(64)m = 2007.0385 (64)

Heat gains from water heating, kWh/month

	87.5523	77.6406	82.6511	75.6327	75.2339	68.8283	67.6281	72.1055	71.3190	78.3512	80.9104	85.9659 (65)

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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	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	19.5633	17.3759	14.1311	10.6981	7.9970	6.7514	7.2951	9.4825	12.7273	16.1603	18.8614	20.1070 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	219.4405	221.7177	215.9794	203.7634	188.3429	173.8497	164.1674	161.8903	167.6286	179.8446	195.2651	209.7582 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143 (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)

	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144 (71)

Water heating gains (Table 5)

	117.6778	115.5366	111.0902	105.0454	101.1208	95.5949	90.8980	96.9160	99.0542	105.3108	112.3755	115.5455 (72)

Total internal gains

	419.6245	417.5731	404.1436	382.4498	360.4036	339.1389	325.3035	331.2317	342.3530	364.2585	389.4450	408.3537 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	12.1800	11.2829	0.6300	0.7000	0.7700	41.9992	(75)
South	6.6200	46.7521	0.6300	0.7000	0.7700	94.5868	(78)

Solar gains	136.5861	240.3995	351.3534	475.9782	572.4256	586.1564	557.6372	482.5623	393.8150	271.5601	164.9635	116.0304 (83)
Total gains	556.2106	657.9726	755.4970	858.4280	932.8292	925.2954	882.9407	813.7940	736.1680	635.8186	554.4085	524.3841 (84)

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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	58.1719	58.3172	58.4604	59.1423	59.2717	59.8814	59.8814	59.9957	59.6451	59.2717	59.0106	58.7401	
alpha	4.8781	4.8878	4.8974	4.9428	4.9514	4.9921	4.9921	4.9997	4.9763	4.9514	4.9340	4.9160	
util living area	0.9962	0.9908	0.9755	0.9247	0.8026	0.6147	0.4570	0.5134	0.7716	0.9545	0.9916	0.9971	(86)
MIT	19.7878	19.9724	20.2527	20.5993	20.8561	20.9707	20.9945	20.9905	20.9125	20.5698	20.1135	19.7558	(87)
Th 2	19.9250	19.9274	19.9297	19.9407	19.9428	19.9524	19.9524	19.9542	19.9487	19.9428	19.9386	19.9342	(88)
util rest of house	0.9949	0.9878	0.9672	0.8998	0.7452	0.5253	0.3510	0.4018	0.6885	0.9340	0.9883	0.9962	(89)
MIT 2	18.3235	18.5933	18.9982	19.4875	19.8102	19.9343	19.9505	19.9505	19.8836	19.4601	18.8080	18.2834	(90)
Living area fraction										fLA = Living area / (4) =		0.4538	(91)
MIT	18.9879	19.2191	19.5674	19.9920	20.2848	20.4046	20.4242	20.4224	20.3505	19.9636	19.4004	18.9515	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9879	19.2191	19.5674	19.9920	20.2848	20.4046	20.4242	20.4224	20.3505	19.9636	19.4004	18.9515	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9933	0.9851	0.9637	0.9011	0.7652	0.5650	0.3993	0.4527	0.7226	0.9345	0.9861	0.9949	(94)
Useful gains	552.5116	648.1878	728.0844	773.5616	713.7586	522.8149	352.5443	368.3735	531.9548	594.1945	546.6805	521.7107	(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	1402.7305	1364.0980	1241.8092	1041.9279	804.6547	538.5240	354.7934	372.4691	582.1933	877.6557	1158.0176	1395.1770	(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	632.5628	481.0917	382.2113	193.2237	67.6267	0.0000	0.0000	0.0000	0.0000	210.8951	440.1627	649.8589	(98)
Space heating												3057.6330	(98)
Space heating per m2											(98) / (4) =	38.2204	(99)

8c. Space cooling requirement

Not applicable

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												93.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												3270.1958	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	632.5628	481.0917	382.2113	193.2237	67.6267	0.0000	0.0000	0.0000	0.0000	210.8951	440.1627	649.8589	(98)
Space heating efficiency (main heating system 1)													
	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)													
	676.5378	514.5366	408.7821	206.6564	72.3281	0.0000	0.0000	0.0000	0.0000	225.5563	470.7622	695.0363	(211)
Water heating requirement													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	197.8020	174.3324	183.0616	164.0668	160.7542	143.6027	137.8797	151.3455	151.0935	170.1296	179.9396	193.0309	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.6988	87.3835	86.7338	85.2510	82.6952	79.8000	79.8000	79.8000	79.8000	85.3878	87.1107	87.8038	(217)
Fuel for water heating, kWh/month													
	225.5468	199.5026	211.0616	192.4516	194.3937	179.9532	172.7815	189.6560	189.3402	199.2433	206.5644	219.8434	(219)
Water heating fuel used												2380.3385	(219)
Annual totals kWh/year													
Space heating fuel - main system												3270.1958	(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)												345.4937	(232)
Total delivered energy for all uses												6071.0279	(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	3270.1958	0.2160	706.3623	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2380.3385	0.2160	514.1531	(264)
Space and water heating			1220.5154	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	345.4937	0.5190	179.3112	(268)
Total CO2, kg/m2/year			1438.7516	(272)
Emissions per m2 for space and water heating			15.2564	(272a)
Fuel factor (electricity)			1.5500	
Emissions per m2 for lighting			2.2414	(272b)
Emissions per m2 for pumps and fans			0.4866	(272c)
Target Carbon Dioxide Emission Rate (TER) = (15.2564 * 1.55) + 2.2414 + 0.4866, rounded to 2 d.p.			26.3800	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Built)

Design SAP
elmhurst energy

Property Reference	PMCC-ROPE-1655-112	**Issued on Date**	06/08/2020
Assessment Reference	ABF	**Prop Type Ref**	
Property	4 Chalkhill Blue Apartments, 4, Salt Marsh Road, SHOREHAM-BY-SEA, West Sussex, BN43 5QP		

SAP Rating	79 C	**DER**	21.12	**TER**	23.40
Environmental	85 B	**% DER<TER**	9.76		
CO_2 Emissions (t/year)	1.06	**DFEE**	28.26	**TFEE**	38.61
General Requirements Compliance	Pass	**% DFEE<TFEE**	26.81		

Assessor Details	Mr. Malcolm Maclean, SRE Limited, Tel: 01730 710044, malcolm@sre.co.uk	**Assessor ID**	V497-0002
Client			

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

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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:Electricity
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 23.40 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 21.12 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)38.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)28.3 kWh/m²/yrOK

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2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.08 (max. 0.25)	0.13 (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: 2.42 (measured in this dwelling)
Maximum 10.0 OK

---
4 Heating efficiency
Main heating system: Boiler system with radiators or underfloor - Electric
Direct-acting boiler

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 1.30 kWh/day
Permitted by DBSCG 1.89 OK
Primary pipework insulated: No primary pipework

---
6 Controls
Space heating controls: Time and temperature zone control OK

Hot water controls: Cylinderstat OK

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

---
8 Mechanical ventilation
Continuous extract system (decentralised)
Specific fan power: 0.1900 0.1800
Maximum 0.7 OK

---
9 Summertime temperature
Overheating risk (South East England): Medium OK
Based on:
Overshading: Average
Windows facing South: 11.35 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: Light-coloured curtain or roller blind, closed 100% of daylight hours

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10 Key features
Party wall U-value 0.00 W/m²K
Party wall U-value 0.00 W/m²K
Exposed floor U-value 0.07 W/m²K
Air permeability 2.4 m³/m²h
Photovoltaic array 0.86 kW

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	71.0000 (1b)	x	2.3800 (2b)	=	168.9800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	168.9800	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(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) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		2.4200	
Infiltration rate		0.1210	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.0938	(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	0.1196	0.1172	0.1149	0.1032	0.1008	0.0891	0.0891	0.0867	0.0938	0.1008	0.1055	0.1102	(22b)
Mechanical extract ventilation - decentralised													
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 (Uw = 1.30)			11.3500	1.2357	14.0257			(27)
Above Commercial			54.3000	0.0700	3.8010			(28b)
Exposed Floor			16.7000	0.1300	2.1710			(28b)
External Wall	24.1100	11.3500	12.7600	0.1800	2.2968			(29a)
Total net area of external elements Aum(A, m2)			95.1100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	22.2945			(33)
Corridor Wall			36.4600	0.0000	0.0000			(32)
Party			29.7500	0.0000	0.0000			(32)
Party Ceiling 1			71.0000					(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							16.9992	(36)
Total fabric heat loss					(33) + (36) =		39.2937	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.8817	27.8817	27.8817	27.8817	27.8817	27.8817	27.8817	27.8817	27.8817	27.8817	27.8817	27.8817	(38)
Heat transfer coeff	67.1754	67.1754	67.1754	67.1754	67.1754	67.1754	67.1754	67.1754	67.1754	67.1754	67.1754	67.1754	(39)
Average = Sum(39)m / 12 =												67.1754	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9461	0.9461	0.9461	0.9461	0.9461	0.9461	0.9461	0.9461	0.9461	0.9461	0.9461	0.9461	(40)
HLP (average)												0.9461	(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												2.2702	(42)
Average daily hot water use (litres/day)												88.1162	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	96.9278	93.4032	89.8785	86.3539	82.8292	79.3046	79.3046	82.8292	86.3539	89.8785	93.4032	96.9278	(44)
Energy conte	143.7412	125.7169	129.7286	113.1005	108.5227	93.6468	86.7775	99.5785	100.7678	117.4351	128.1896	139.2056	(45)
Energy content (annual)										Total = Sum(45)m =		1386.4109	(45)
Distribution loss (46)m = 0.15 x (45)m	21.5612	18.8575	19.4593	16.9651	16.2784	14.0470	13.0166	14.9368	15.1152	17.6153	19.2284	20.8808	(46)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3000	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.7800	(55)
Total storage loss													
	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(56)
If cylinder contains dedicated solar storage													
	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Total heat required for water heating calculated for each month													
	167.9212	147.5569	153.9086	136.5005	132.7027	117.0468	110.9575	123.7585	124.1678	141.6151	151.5896	163.3856	(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													
	167.9212	147.5569	153.9086	136.5005	132.7027	117.0468	110.9575	123.7585	124.1678	141.6151	151.5896	163.3856	(64)
									Total per year (kWh/year) = Sum(64)m =			1671.1109	(64)
Heat gains from water heating, kWh/month													
	67.1379	59.2729	62.4788	56.3259	55.4278	49.8576	48.1975	52.4538	52.2253	58.3912	61.3430	65.6299	(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	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.9825	15.9719	12.9892	9.8337	7.3508	6.2058	6.7056	8.7162	11.6989	14.8544	17.3373	18.4823	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	199.6196	201.6911	196.4711	185.3585	171.3309	158.1468	149.3391	147.2676	152.4876	163.6002	177.6279	190.8119	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	(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)													
	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	(71)
Water heating gains (Table 5)													
	90.2392	88.2037	83.9768	78.2305	74.4997	69.2466	64.7816	70.5025	72.5351	78.4828	85.1987	88.2122	(72)
Total internal gains													
	367.8936	365.9190	353.4895	333.4750	313.2337	293.6516	280.8787	286.5387	296.7739	316.9897	340.2162	357.5587	(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	11.3500	46.7521	0.6200	0.8500	0.7700	193.7941	(78)

Solar gains	193.7941	317.3848	404.2919	456.9376	476.1573	458.2366	447.7250	434.8030	422.3306	342.3293	229.7121	167.4559	(83)
Total gains	561.6877	683.3037	757.7814	790.4126	789.3909	751.8882	728.6037	721.3417	719.1045	659.3190	569.9283	525.0146	(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	73.3983	73.3983	73.3983	73.3983	73.3983	73.3983	73.3983	73.3983	73.3983	73.3983	73.3983	73.3983	
alpha	5.8932	5.8932	5.8932	5.8932	5.8932	5.8932	5.8932	5.8932	5.8932	5.8932	5.8932	5.8932	
util living area													
	0.9915	0.9743	0.9385	0.8666	0.7395	0.5625	0.4045	0.4267	0.6265	0.8785	0.9780	0.9941	(86)
MIT	20.2239	20.4288	20.6389	20.8244	20.9437	20.9904	20.9988	20.9984	20.9821	20.8359	20.4830	20.1666	(87)
Th 2	20.1285	20.1285	20.1285	20.1285	20.1285	20.1285	20.1285	20.1285	20.1285	20.1285	20.1285	20.1285	(88)
util rest of house													
	0.9889	0.9672	0.9224	0.8342	0.6854	0.4900	0.3250	0.3468	0.5546	0.8420	0.9706	0.9923	(89)
MIT 2	19.1067	19.3999	19.6928	19.9375	20.0779	20.1225	20.1280	20.1278	20.1162	19.9575	19.4806	19.0237	(90)
Living area fraction									fLA = Living area / (4) =			0.3113	(91)
MIT	19.4544	19.7202	19.9873	20.2135	20.3474	20.3927	20.3991	20.3988	20.3857	20.2310	19.7926	19.3795	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4544	19.7202	19.9873	20.2135	20.3474	20.3927	20.3991	20.3988	20.3857	20.2310	19.7926	19.3795	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9863	0.9631	0.9194	0.8376	0.6996	0.5123	0.3498	0.3717	0.5764	0.8467	0.9671	0.9902	(94)
Useful gains	553.9906	658.0967	696.6924	662.0723	552.2612	385.2118	254.8618	268.1199	414.4847	558.2582	551.1638	519.8679	(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													
	1018.0035	995.5498	906.0136	759.9905	580.8919	389.1236	255.2046	268.6201	422.2446	646.9627	852.6295	1019.6873	(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													
	345.2256	226.7685	155.7350	70.5011	21.3012	0.0000	0.0000	0.0000	0.0000	65.9962	217.0553	371.8656	(98)
Space heating												1474.4485	(98)
Space heating per m2											(98) / (4) =	20.7669	(99)

8c. Space cooling requirement

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												1474.4485	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	345.2256	226.7685	155.7350	70.5011	21.3012	0.0000	0.0000	0.0000	0.0000	65.9962	217.0553	371.8656	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	345.2256	226.7685	155.7350	70.5011	21.3012	0.0000	0.0000	0.0000	0.0000	65.9962	217.0553	371.8656	(211)
Water heating requirement													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	167.9212	147.5569	153.9086	136.5005	132.7027	117.0468	110.9575	123.7585	124.1678	141.6151	151.5896	163.3856	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	167.9212	147.5569	153.9086	136.5005	132.7027	117.0468	110.9575	123.7585	124.1678	141.6151	151.5896	163.3856	(219)
Water heating fuel used												1671.1109	(219)
Annual totals kWh/year													
Space heating fuel - main system												1474.4485	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 5.0830, total flow = 21.0000, SFP = 0.2420)													
mechanical ventilation fans (SFP = 0.2420)												49.8995	(230a)
central heating pump												30.0000	(230c)
Total electricity for the above, kWh/year												79.8995	(231)
Electricity for lighting (calculated in Appendix L)												317.5762	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.86 * 951 * 1.00) =												-654.0238	(233)
Total delivered energy for all uses												2889.0112	(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	1474.4485	0.5190	765.2388	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1671.1109	0.5190	867.3066	(264)
Space and water heating			1632.5453	(265)
Pumps and fans	79.8995	0.5190	41.4678	(267)
Energy for lighting	317.5762	0.5190	164.8220	(268)
Energy saving/generation technologies				
PV Unit	-654.0238	0.5190	-339.4384	(269)
Total CO2, kg/year			1499.3968	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			21.1200	(273)

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

DER		21.1200	ZC1
Total Floor Area	TFA	71.0000	
Assumed number of occupants	N	2.2702	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.6606	ZC2
CO2 emissions from cooking, equation (L16)		2.4434	ZC3
Total CO2 emissions		40.2241	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		40.2241	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	71.0000 (1b)	x	2.3800 (2b)	=	168.9800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	168.9800	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							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) =	0.1775	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4275	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3313	(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	0.4225	0.4142	0.4059	0.3645	0.3562	0.3148	0.3148	0.3065	0.3313	0.3562	0.3728	0.3893	(22b)
Effective ac	0.5892	0.5858	0.5824	0.5664	0.5634	0.5495	0.5495	0.5470	0.5549	0.5634	0.5695	0.5758	(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)			11.3500	1.3258	15.0473			(27)
Above Commercial			54.3000	0.1300	7.0590			(28b)
Exposed Floor			16.7000	0.1300	2.1710			(28b)
External Wall	24.1100	11.3500	12.7600	0.1800	2.2968			(29a)
Total net area of external elements Aum(A, m2)			95.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.5741			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.7106	(36)
Total fabric heat loss					(33) + (36) =		41.2847	(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	32.8578	32.6646	32.4752	31.5855	31.4191	30.6443	30.6443	30.5008	30.9427	31.4191	31.7558	32.1078	(38)
Heat transfer coeff	74.1425	73.9493	73.7599	72.8703	72.7039	71.9290	71.9290	71.7855	72.2275	72.7039	73.0406	73.3926	(39)
Average = Sum(39)m / 12 =												72.8695	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0443	1.0415	1.0389	1.0263	1.0240	1.0131	1.0131	1.0111	1.0173	1.0240	1.0287	1.0337	(40)
HLP (average)												1.0263	(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		2.2702 (42)
Average daily hot water use (litres/day)		88.1162 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	96.9278	93.4032	89.8785	86.3539	82.8292	79.3046	79.3046	82.8292	86.3539	89.8785	93.4032	96.9278	(44)
Energy conte	143.7412	125.7169	129.7286	113.1005	108.5227	93.6468	86.7775	99.5785	100.7678	117.4351	128.1896	139.2056	(45)
Energy content (annual)										Total = Sum(45)m =		1386.4109	(45)
Distribution loss (46)m = 0.15 x (45)m	21.5612	18.8575	19.4593	16.9651	16.2784	14.0470	13.0166	14.9368	15.1152	17.6153	19.2284	20.8808	(46)

Water storage loss:		
Store volume		150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):		1.3938 (48)
Temperature factor from Table 2b		0.5400 (49)
Enter (49) or (54) in (55)		0.7527 (55)
Total storage loss		

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	190.3361	167.8026	176.3235	158.1924	155.1176	138.7387	133.3724	146.1734	145.8596	164.0300	173.2815	185.8005	(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													
	190.3361	167.8026	176.3235	158.1924	155.1176	138.7387	133.3724	146.1734	145.8596	164.0300	173.2815	185.8005	(64)
								Total per year (kWh/year) = Sum(64)m =				1935.0283	(64)
Heat gains from water heating, kWh/month													
	85.0699	75.4695	80.4107	73.6794	73.3597	67.2110	66.1295	70.3858	69.5788	76.3231	78.6965	83.5618	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	18.5697	16.4934	13.4134	10.1548	7.5908	6.4085	6.9246	9.0008	12.0809	15.3395	17.9035	19.0858	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	199.6196	201.6911	196.4711	185.3585	171.3309	158.1468	149.3391	147.2676	152.4876	163.6002	177.6279	190.8119	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	(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)													
	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	(71)
Water heating gains (Table 5)													
	114.3412	112.3057	108.0789	102.3325	98.6018	93.3487	88.8837	94.6045	96.6372	102.5848	109.3007	112.3142	(72)
Total internal gains													
	392.5829	390.5426	378.0157	357.8981	337.5758	317.9563	305.1997	310.9254	321.2580	341.5768	364.8844	382.2643	(73)

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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	11.3500	46.7521	0.6300	0.7000	0.7700	162.1692	(78)

Solar gains	162.1692	265.5914	338.3164	382.3709	398.4542	383.4579	374.6617	363.8484	353.4114	286.4653	192.2259	140.1292	(83)
Total gains	554.7521	656.1340	716.3321	740.2691	736.0299	701.4142	679.8614	674.7738	674.6694	628.0421	557.1102	522.3934	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	66.5010	66.6748	66.8460	67.6621	67.8170	68.5475	68.5475	68.6845	68.2643	67.8170	67.5043	67.1806	
alpha	5.4334	5.4450	5.4564	5.5108	5.5211	5.5698	5.5698	5.5790	5.5510	5.5211	5.5003	5.4787	
util living area													
	0.9929	0.9821	0.9599	0.9100	0.8086	0.6333	0.4620	0.4847	0.6970	0.9134	0.9830	0.9948	(86)
MIT	20.0729	20.2630	20.4844	20.7184	20.8903	20.9781	20.9967	20.9957	20.9619	20.7530	20.3675	20.0360	(87)
Th 2	20.0466	20.0489	20.0511	20.0614	20.0634	20.0724	20.0724	20.0741	20.0690	20.0634	20.0595	20.0553	(88)
util rest of house													
	0.9907	0.9768	0.9479	0.8833	0.7559	0.5511	0.3665	0.3896	0.6187	0.8825	0.9770	0.9931	(89)
MIT 2	18.8260	19.1014	19.4173	19.7454	19.9609	20.0584	20.0713	20.0724	20.0418	19.7981	19.2625	18.7790	(90)
Living area fraction										fLA = Living area / (4) =		0.3113	(91)
MIT	19.2141	19.4630	19.7495	20.0482	20.2502	20.3446	20.3593	20.3598	20.3282	20.0953	19.6064	19.1702	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2141	19.4630	19.7495	20.0482	20.2502	20.3446	20.3593	20.3598	20.3282	20.0953	19.6064	19.1702	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9881	0.9726	0.9433	0.8829	0.7672	0.5760	0.3963	0.4193	0.6416	0.8837	0.9732	0.9910	(94)
Useful gains	548.1589	638.1308	675.7502	653.5576	564.6845	404.0120	269.4439	282.9301	432.8502	555.0013	542.1916	517.6910	(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													
	1105.7722	1076.9221	977.2797	812.3754	621.6300	413.2070	270.4047	284.2577	449.8462	690.3462	913.4770	1098.7041	(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													
	414.8643	294.8678	224.3380	114.3488	42.3674	0.0000	0.0000	0.0000	0.0000	100.6966	267.3255	432.2738	(98)
Space heating												1891.0822	(98)
Space heating per m2											(98) / (4) =	26.6350	(99)

8c. Space cooling requirement

Not applicable

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												93.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2022.5478	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	414.8643	294.8678	224.3380	114.3488	42.3674	0.0000	0.0000	0.0000	0.0000	100.6966	267.3255	432.2738	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	443.7052	315.3666	239.9336	122.2982	45.3128	0.0000	0.0000	0.0000	0.0000	107.6969	285.9096	462.3249	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	190.3361	167.8026	176.3235	158.1924	155.1176	138.7387	133.3724	146.1734	145.8596	164.0300	173.2815	185.8005	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.8380	86.3030	85.4573	83.9652	81.8768	79.8000	79.8000	79.8000	79.8000	83.5579	85.9667	86.9935	(217)
Fuel for water heating, kWh/month	219.1851	194.4342	206.3294	188.4024	189.4524	173.8580	167.1334	183.1747	182.7815	196.3071	201.5681	213.5798	(219)
Water heating fuel used												2316.2059	(219)
Annual totals kWh/year													
Space heating fuel - main system												2022.5478	(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)												327.9464	(232)
Total delivered energy for all uses												4741.7002	(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	2022.5478	0.2160	436.8703	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2316.2059	0.2160	500.3005	(264)
Space and water heating			937.1708	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	327.9464	0.5190	170.2042	(268)
Total CO2, kg/m2/year			1146.3000	(272)
Emissions per m2 for space and water heating			13.1996	(272a)
Fuel factor (electricity)			1.5500	
Emissions per m2 for lighting			2.3972	(272b)
Emissions per m2 for pumps and fans			0.5482	(272c)
Target Carbon Dioxide Emission Rate (TER) = (13.1996 * 1.55) + 2.3972 + 0.5482, rounded to 2 d.p.			23.4000	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Built)

Design SAP
elmhurst energy

Property Reference	PMCC-ROPE-1655-113	**Issued on Date**	06/08/2020
Assessment Reference	ABF	**Prop Type Ref**	
Property	5 Chalkhill Blue Apartments, 4, Salt Marsh Road, SHOREHAM-BY-SEA, West Sussex, BN43 5QP		

SAP Rating	84 B	**DER**	24.09	**TER**	24.63
Environmental	86 B	**% DER<TER**	2.19		
CO_2 Emissions (t/year)	0.86	**DFEE**	30.35	**TFEE**	34.01
General Requirements Compliance	Pass	**% DFEE<TFEE**	10.77		

Assessor Details	Mr. Malcolm Maclean, SRE Limited, Tel: 01730 710044, malcolm@sre.co.uk	**Assessor ID**	V497-0002
Client			

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

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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 50 m²

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

1a TER and DER
Fuel for main heating:Electricity
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 24.63 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 24.09 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)34.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)30.3 kWh/m²/yrOK

---
2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(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: 3.01 (measured in this dwelling)
Maximum 10.0 OK

---
4 Heating efficiency
Main heating system: Boiler system with radiators or underfloor - Electric
Direct-acting boiler

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 1.06 kWh/day
Permitted by DBSCG 1.66 OK
Primary pipework insulated: No primary pipework

---
6 Controls
Space heating controls: Time and temperature zone control OK

Hot water controls: Cylinderstat OK

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

---
8 Mechanical ventilation
Continuous extract system (decentralised)
Specific fan power: 0.1800 0.1600
Maximum 0.7 OK

---
9 Summertime temperature
Overheating risk (South East England): Medium OK
Based on:
Overshading: Average
Windows facing North: 7.56 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: Light-coloured curtain or roller blind, closed 100% of daylight hours

---
10 Key features
Party wall U-value 0.00 W/m²K
Party wall U-value 0.00 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 0.61 kW

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	50.0000 (1b)	x	2.3800 (2b)	=	119.0000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	119.0000	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(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) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0100	
Infiltration rate		0.1505	(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) =	0.1279	(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	0.1631	0.1599	0.1567	0.1407	0.1375	0.1215	0.1215	0.1183	0.1279	0.1375	0.1439	0.1503	(22b)

Mechanical extract ventilation - decentralised
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 (Uw = 1.30)			7.5600	1.2357	9.3422			(27)
External Wall	33.5600	7.5600	26.0000	0.1800	4.6800			(29a)
Total net area of external elements Aum(A, m2)			33.5600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		14.0222			(33)
Corridor Wall			16.9000	0.0000	0.0000			(32)
Party			16.6600	0.0000	0.0000			(32)
Party Floor 1			50.0000					(32d)
Party Ceiling 1			50.0000					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.5916	(36)
Total fabric heat loss	(33) + (36) =	20.6138	(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	19.6350	19.6350	19.6350	19.6350	19.6350	19.6350	19.6350	19.6350	19.6350	19.6350	19.6350	19.6350	(38)
Heat transfer coeff	40.2488	40.2488	40.2488	40.2488	40.2488	40.2488	40.2488	40.2488	40.2488	40.2488	40.2488	40.2488	(39)

Average = Sum(39)m / 12 = 40.2488 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8050	0.8050	0.8050	0.8050	0.8050	0.8050	0.8050	0.8050	0.8050	0.8050	0.8050	0.8050	(40)

HLP (average) 0.8050 (40)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	1.6901 (42)
Average daily hot water use (litres/day)	74.3399 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	81.7739	78.8003	75.8267	72.8531	69.8795	66.9059	66.9059	69.8795	72.8531	75.8267	78.8003	81.7739	(44)
Energy conte	121.2683	106.0620	109.4465	95.4181	91.5560	79.0058	73.2105	84.0101	85.0135	99.0750	108.1481	117.4419	(45)

Energy content (annual) Total = Sum(45)m = 1169.6560 (45)

Distribution loss (46)m = 0.15 x (45)m	18.1902	15.9093	16.4170	14.3127	13.7334	11.8509	10.9816	12.6015	12.7520	14.8613	16.2222	17.6163	(46)

Water storage loss:

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume												120.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.0600	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.6360	(55)
Total storage loss													
	19.7160	17.8080	19.7160	19.0800	19.7160	19.0800	19.7160	19.7160	19.0800	19.7160	19.0800	19.7160	(56)
If cylinder contains dedicated solar storage													
	19.7160	17.8080	19.7160	19.0800	19.7160	19.0800	19.7160	19.7160	19.0800	19.7160	19.0800	19.7160	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Total heat required for water heating calculated for each month													
	140.9843	123.8700	129.1625	114.4981	111.2720	98.0858	92.9265	103.7261	104.0935	118.7910	127.2281	137.1579	(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													
	140.9843	123.8700	129.1625	114.4981	111.2720	98.0858	92.9265	103.7261	104.0935	118.7910	127.2281	137.1579	(64)
								Total per year (kWh/year) = Sum(64)m =				1401.7960	(64)
Heat gains from water heating, kWh/month													
	56.0945	49.5120	52.1638	46.9905	46.2152	41.5334	40.1153	43.7062	43.5310	48.7152	51.2233	54.8222	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	13.3651	11.8708	9.6540	7.3087	5.4633	4.6124	4.9838	6.4782	8.6950	11.0403	12.8856	13.7366	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	147.2339	148.7618	144.9117	136.7153	126.3689	116.6447	110.1484	108.6205	112.4706	120.6670	131.0134	140.7376	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	(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)													
	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	(71)
Water heating gains (Table 5)													
	75.3959	73.6786	70.1126	65.2646	62.1171	57.6853	53.9184	58.7449	60.4597	65.4775	71.1434	73.6858	(72)
Total internal gains													
	287.3465	285.6627	276.0298	260.6402	245.3009	230.2939	220.4021	225.1951	232.9768	248.5363	266.3940	279.5115	(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	
North	7.5600	10.6334	0.6200	0.8500	0.7700	29.3587	(74)
Solar gains	29.3587	56.1061	95.3379	153.1371	206.2897	220.8393	206.1817	163.5789	114.6271	66.7869	36.2178	24.4749	(83)
Total gains	316.7052	341.7688	371.3677	413.7773	451.5906	451.1332	426.5838	388.7740	347.6039	315.3232	302.6118	303.9864	(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	86.2690	86.2690	86.2690	86.2690	86.2690	86.2690	86.2690	86.2690	86.2690	86.2690	86.2690	86.2690	
alpha	6.7513	6.7513	6.7513	6.7513	6.7513	6.7513	6.7513	6.7513	6.7513	6.7513	6.7513	6.7513	
util living area													
	0.9967	0.9937	0.9823	0.9302	0.7768	0.5653	0.4145	0.4746	0.7561	0.9590	0.9927	0.9975	(86)
MIT	20.2855	20.3819	20.5614	20.7954	20.9528	20.9949	20.9995	20.9987	20.9702	20.7671	20.4808	20.2525	(87)
Th 2	20.2490	20.2490	20.2490	20.2490	20.2490	20.2490	20.2490	20.2490	20.2490	20.2490	20.2490	20.2490	(88)
util rest of house													
	0.9957	0.9917	0.9767	0.9098	0.7290	0.5015	0.3441	0.3980	0.6897	0.9425	0.9900	0.9967	(89)
MIT 2	19.2903	19.4305	19.6893	20.0132	20.2054	20.2458	20.2488	20.2485	20.2263	19.9814	19.5749	19.2422	(90)
Living area fraction									fLA = Living area / (4) =			0.4800	(91)
MIT	19.7680	19.8871	20.1079	20.3886	20.5641	20.6053	20.6091	20.6086	20.5833	20.3585	20.0097	19.7272	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7680	19.8871	20.1079	20.3886	20.5641	20.6053	20.6091	20.6086	20.5833	20.3585	20.0097	19.7272	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9948	0.9905	0.9754	0.9140	0.7498	0.5321	0.3779	0.4348	0.7204	0.9453	0.9890	0.9960	(94)
Useful gains	315.0737	338.5315	362.2412	378.1824	338.5861	240.0339	161.2206	169.0395	250.4197	298.0628	299.2761	302.7785	(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													
	622.5681	603.2144	547.7021	462.4037	356.7712	241.7080	161.3622	169.3904	260.9468	392.7693	519.6011	624.9498	(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													
	228.7759	177.8670	137.9829	60.6393	13.5297	0.0000	0.0000	0.0000	0.0000	70.4617	158.6340	239.6954	(98)
Space heating												1087.5857	(98)
Space heating per m2											(98) / (4) =	21.7517	(99)

8c. Space cooling requirement

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	1087.5857	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	228.7759	177.8670	137.9829	60.6393	13.5297	0.0000	0.0000	0.0000	0.0000	70.4617	158.6340	239.6954	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	228.7759	177.8670	137.9829	60.6393	13.5297	0.0000	0.0000	0.0000	0.0000	70.4617	158.6340	239.6954	(211)
Water heating requirement													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	140.9843	123.8700	129.1625	114.4981	111.2720	98.0858	92.9265	103.7261	104.0935	118.7910	127.2281	137.1579	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	140.9843	123.8700	129.1625	114.4981	111.2720	98.0858	92.9265	103.7261	104.0935	118.7910	127.2281	137.1579	(219)
Water heating fuel used												1401.7960	(219)

Annual totals kWh/year		
Space heating fuel - main system	1087.5857	(211)
Space heating fuel - secondary	0.0000	(215)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 4.2640, total flow = 21.0000, SFP = 0.2030)		
mechanical ventilation fans (SFP = 0.2030)	29.4785	(230a)
central heating pump	30.0000	(230c)
Total electricity for the above, kWh/year	59.4785	(231)
Electricity for lighting (calculated in Appendix L)	236.0326	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV Unit 0 (0.80 * 0.61 * 951 * 1.00) =	-463.9006	(233)
Total delivered energy for all uses	2320.9922	(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	1087.5857	0.5190	564.4570	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating	1401.7960	0.5190	727.5321	(264)
Space and water heating			1291.9891	(265)
Pumps and fans	59.4785	0.5190	30.8693	(267)
Energy for lighting	236.0326	0.5190	122.5009	(268)
Energy saving/generation technologies				
PV Unit (0.90*22.10 + 0.10*8.66)	-463.9006	0.5190	-240.7644	(269)
Total CO2, kg/year			1204.5950	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			24.0900	(273)

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

DER		24.0900	ZC1
Total Floor Area	TFA	50.0000	
Assumed number of occupants	N	1.6901	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.4495	ZC2
CO2 emissions from cooking, equation (L16)		3.1912	ZC3
Total CO2 emissions		44.7308	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		44.7308	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	50.0000 (1b)	x	2.3800 (2b)	=	119.0000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	119.0000	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							2 * 10 =	20.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1681	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4181	(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) =	0.3554	(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	0.4531	0.4442	0.4353	0.3909	0.3820	0.3376	0.3376	0.3287	0.3554	0.3820	0.3998	0.4175	(22b)
Effective ac	0.6026	0.5987	0.5947	0.5764	0.5730	0.5570	0.5570	0.5540	0.5631	0.5730	0.5799	0.5872	(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)			7.5600	1.3258	10.0227			(27)
External Wall	33.5600	7.5600	26.0000	0.1800	4.6800			(29a)
Total net area of external elements Aum(A, m2)			33.5600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		14.7027			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	3.2538	(36)
Total fabric heat loss (33) + (36) =	17.9565	(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	23.6657	23.5092	23.3558	22.6352	22.5004	21.8727	21.8727	21.7565	22.1145	22.5004	22.7731	23.0582	(38)
Heat transfer coeff	41.6222	41.4657	41.3123	40.5917	40.4569	39.8293	39.8293	39.7130	40.0710	40.4569	40.7296	41.0148	(39)
Average = Sum(39)m / 12 =												40.5911	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8324	0.8293	0.8262	0.8118	0.8091	0.7966	0.7966	0.7943	0.8014	0.8091	0.8146	0.8203	(40)
HLP (average)												0.8118	(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	1.6901 (42)
Average daily hot water use (litres/day)	74.3399 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	81.7739	78.8003	75.8267	72.8531	69.8795	66.9059	66.9059	69.8795	72.8531	75.8267	78.8003	81.7739	(44)
Energy conte	121.2683	106.0620	109.4465	95.4181	91.5560	79.0058	73.2105	84.0101	85.0135	99.0750	108.1481	117.4419	(45)
Energy content (annual)										Total = Sum(45)m =		1169.6560	(45)
Distribution loss (46)m = 0.15 x (45)m	18.1902	15.9093	16.4170	14.3127	13.7334	11.8509	10.9816	12.6015	12.7520	14.8613	16.2222	17.6163	(46)

Water storage loss:	
Store volume	120.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.2247 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.6613 (55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	20.5007	18.5168	20.5007	19.8394	20.5007	19.8394	20.5007	20.5007	19.8394	20.5007	19.8394	20.5007	(56)

If cylinder contains dedicated solar storage

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	20.5007	18.5168	20.5007	19.8394	20.5007	19.8394	20.5007	20.5007	19.8394	20.5007	19.8394	20.5007	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	165.0314	145.5900	153.2096	137.7695	135.3191	121.3572	116.9736	127.7733	127.3649	142.8381	150.4995	161.2050	(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													
	165.0314	145.5900	153.2096	137.7695	135.3191	121.3572	116.9736	127.7733	127.3649	142.8381	150.4995	161.2050	(64)
								Total per year (kWh/year) = Sum(64)m =				1684.9313	(64)
Heat gains from water heating, kWh/month													
	75.3322	66.8880	71.4015	65.6076	65.4528	60.1506	59.3530	62.9439	62.1481	67.9529	69.8404	74.0599	(65)

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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	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	13.8524	12.3036	10.0059	7.5751	5.6625	4.7805	5.1655	6.7143	9.0120	11.4428	13.3554	14.2374	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	147.2339	148.7618	144.9117	136.7153	126.3689	116.6447	110.1484	108.6205	112.4706	120.6670	131.0134	140.7376	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	(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)													
	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	(71)
Water heating gains (Table 5)													
	101.2530	99.5357	95.9697	91.1217	87.9743	83.5424	79.7755	84.6020	86.3168	91.3346	97.0005	99.5429	(72)
Total internal gains													
	313.6908	311.9526	302.2388	286.7637	271.3572	256.3192	246.4409	251.2884	259.1509	274.7958	292.7208	305.8694	(73)

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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	
North	7.5600	10.6334	0.6300	0.7000	0.7700	24.5678	(74)

Solar gains	24.5678	46.9502	79.7799	128.1470	172.6258	184.8010	172.5353	136.8848	95.9213	55.8881	30.3075	20.4809	(83)
Total gains	338.2585	358.9028	382.0188	414.9107	443.9829	441.1202	418.9763	388.1731	355.0722	330.6840	323.0283	326.3503	(84)

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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	83.4223	83.7372	84.0481	85.5402	85.8253	87.1777	87.1777	87.4328	86.6517	85.8253	85.2505	84.6579	
alpha	6.5615	6.5825	6.6032	6.7027	6.7217	6.8118	6.8118	6.8289	6.7768	6.7217	6.6834	6.6439	
util living area													
	0.9954	0.9922	0.9808	0.9311	0.7885	0.5720	0.4176	0.4692	0.7418	0.9498	0.9898	0.9963	(86)
MIT	20.2855	20.3786	20.5522	20.7902	20.9476	20.9948	20.9995	20.9989	20.9737	20.7864	20.5070	20.2728	(87)
Th 2	20.2253	20.2280	20.2306	20.2431	20.2454	20.2563	20.2563	20.2583	20.2521	20.2454	20.2407	20.2358	(88)
util rest of house													
	0.9940	0.9897	0.9747	0.9108	0.7412	0.5081	0.3474	0.3943	0.6753	0.9305	0.9861	0.9952	(89)
MIT 2	19.2716	19.4089	19.6609	20.0011	20.1966	20.2529	20.2561	20.2578	20.2323	20.0034	19.6059	19.2614	(90)
Living area fraction									fLA = Living area / (4) =			0.4800	(91)
MIT	19.7583	19.8743	20.0887	20.3799	20.5571	20.6090	20.6129	20.6135	20.5882	20.3792	20.0384	19.7469	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7583	19.8743	20.0887	20.3799	20.5571	20.6090	20.6129	20.6135	20.5882	20.3792	20.0384	19.7469	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9930	0.9884	0.9734	0.9148	0.7615	0.5387	0.3811	0.4303	0.7062	0.9344	0.9850	0.9943	(94)
Useful gains	335.8793	354.7331	371.8659	379.5753	338.0958	237.6205	159.6916	167.0275	250.7468	308.9885	318.1683	324.4788	(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													
	643.4089	620.9211	561.3823	465.9868	358.3299	239.3349	159.8310	167.3320	259.9871	395.6364	526.9770	637.6507	(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													
	228.8020	178.8784	141.0002	62.2163	15.0542	0.0000	0.0000	0.0000	0.0000	64.4660	150.3423	232.9999	(98)
Space heating												1073.7592	(98)
Space heating per m2											(98) / (4) =	21.4752	(99)

8c. Space cooling requirement

Not applicable

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

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												93.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												1148.4056	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	228.8020	178.8784	141.0002	62.2163	15.0542	0.0000	0.0000	0.0000	0.0000	64.4660	150.3423	232.9999	(98)
Space heating efficiency (main heating system 1)													
	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)													
	244.7080	191.3138	150.8023	66.5415	16.1007	0.0000	0.0000	0.0000	0.0000	68.9476	160.7939	249.1978	(211)
Water heating requirement													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	165.0314	145.5900	153.2096	137.7695	135.3191	121.3572	116.9736	127.7733	127.3649	142.8381	150.4995	161.2050	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.6856	85.3641	84.5933	82.8473	80.7559	79.8000	79.8000	79.8000	79.8000	82.8460	84.8111	85.7956	(217)
Fuel for water heating, kWh/month													
	192.6011	170.5518	181.1132	166.2933	167.5656	152.0767	146.5835	160.1169	159.6051	172.4140	177.4527	187.8942	(219)
Water heating fuel used												2034.2682	(219)
Annual totals kWh/year													
Space heating fuel - main system												1148.4056	(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)												244.6374	(232)
Total delivered energy for all uses												3502.3111	(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	1148.4056	0.2160	248.0556	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2034.2682	0.2160	439.4019	(264)
Space and water heating			687.4575	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	244.6374	0.5190	126.9668	(268)
Total CO2, kg/m2/year			853.3493	(272)
Emissions per m2 for space and water heating			13.7492	(272a)
Fuel factor (electricity)			1.5500	
Emissions per m2 for lighting			2.5393	(272b)
Emissions per m2 for pumps and fans			0.7785	(272c)
Target Carbon Dioxide Emission Rate (TER) = (13.7492 * 1.55) + 2.5393 + 0.7785, rounded to 2 d.p.			24.6300	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Built)

Design SAP
elmhurst energy

Property Reference	PMCC-ROPE-1655-114	**Issued on Date**	06/08/2020
Assessment Reference	ABF	**Prop Type Ref**	
Property	6 Chalkhill Blue Apartments, 4, Salt Marsh Road, SHOREHAM-BY-SEA, West Sussex, BN43 5QP		

SAP Rating	79 C	**DER**	22.34	**TER**	22.34
Environmental	85 B	**% DER<TER**	0.01		
CO_2 Emissions (t/year)	1.09	**DFEE**	31.39	**TFEE**	35.59
General Requirements Compliance	Pass	**% DFEE<TFEE**	11.80		

Assessor Details	Mr. Malcolm Maclean, SRE Limited, Tel: 01730 710044, malcolm@sre.co.uk	**Assessor ID**	V497-0002
Client			

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

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DWELLING AS BUILT

Mid-floor flat, total floor area 70 m²

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

1a TER and DER
Fuel for main heating:Electricity
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 22.34 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 22.34 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)35.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)31.4 kWh/m²/yrOK

---
2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(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: 3.26 (measured in this dwelling)
Maximum 10.0 OK

---
4 Heating efficiency
Main heating system: Boiler system with radiators or underfloor - Electric
Direct-acting boiler

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 1.30 kWh/day
Permitted by DBSCG 1.89 OK
Primary pipework insulated: No primary pipework

---
6 Controls
Space heating controls: Time and temperature zone control OK

Hot water controls: Cylinderstat OK

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

---
8 Mechanical ventilation
Continuous extract system (decentralised)
Specific fan power: 0.1800 0.1600
Maximum 0.7 OK

---
9 Summertime temperature
Overheating risk (South East England): Medium OK
Based on:
Overshading: Average
Windows facing North: 6.62 m², No overhang
Windows facing North East: 7.56 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: Light-coloured curtain or roller blind, closed 100% of daylight hours

---
10 Key features
Party wall U-value 0.00 W/m²K
Party wall U-value 0.00 W/m²K
Air permeability 3.3 m³/m²h
Photovoltaic array 0.85 kW

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	70.0000 (1b)	x	2.3800 (2b)	=	166.6000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	166.6000	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(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) =	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													
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 (Uw = 1.30)			14.1800	1.2357	17.5228			(27)
External Wall	38.4400	14.1800	24.2600	0.1800	4.3668			(29a)
Total net area of external elements Aum(A, m2)			38.4400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.8896			(33)
Corridor Wall			9.2800	0.0000	0.0000			(32)
Party			34.7500	0.0000	0.0000			(32)
Party Floor 1			70.0000					(32d)
Party Ceiling 1			70.0000					(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.2726	(36)
Total fabric heat loss					(33) + (36) =		31.1622	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.4890	27.4890	27.4890	27.4890	27.4890	27.4890	27.4890	27.4890	27.4890	27.4890	27.4890	27.4890	(38)
Heat transfer coeff	58.6512	58.6512	58.6512	58.6512	58.6512	58.6512	58.6512	58.6512	58.6512	58.6512	58.6512	58.6512	(39)
Average = Sum(39)m / 12 =												58.6512	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8379	0.8379	0.8379	0.8379	0.8379	0.8379	0.8379	0.8379	0.8379	0.8379	0.8379	0.8379	(40)
HLP (average)												0.8379	(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	2.2461	(42)
Average daily hot water use (litres/day)	87.5455	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	96.3000	92.7982	89.2964	85.7946	82.2927	78.7909	78.7909	82.2927	85.7946	89.2964	92.7982	96.3000	(44)
Energy conte	142.8101	124.9027	128.8884	112.3680	107.8198	93.0403	86.2155	98.9335	100.1151	116.6745	127.3593	138.3040	(45)
Energy content (annual)										Total = Sum(45)m =		1377.4311	(45)
Distribution loss (46)m = 0.15 x (45)m	21.4215	18.7354	19.3333	16.8552	16.1730	13.9560	12.9323	14.8400	15.0173	17.5012	19.1039	20.7456	(46)
Water storage loss:													

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3000	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.7800	(55)
Total storage loss													
	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(56)
If cylinder contains dedicated solar storage													
	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Total heat required for water heating calculated for each month													
	166.9901	146.7427	153.0684	135.7680	131.9998	116.4403	110.3955	123.1135	123.5151	140.8545	150.7593	162.4840	(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													
	166.9901	146.7427	153.0684	135.7680	131.9998	116.4403	110.3955	123.1135	123.5151	140.8545	150.7593	162.4840	(64)
Total per year (kWh/year) = Sum(64)m =												1662.1311	(64)
Heat gains from water heating, kWh/month													
	66.8284	59.0021	62.1994	56.0824	55.1941	49.6559	48.0106	52.2394	52.0083	58.1383	61.0670	65.3301	(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	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.5892	15.6226	12.7051	9.6186	7.1900	6.0701	6.5590	8.5256	11.4430	14.5296	16.9581	18.0780	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	197.2971	199.3444	194.1852	183.2019	169.3374	156.3068	147.6015	145.5542	150.7134	161.6967	175.5612	188.5918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	(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)													
	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	(71)
Water heating gains (Table 5)													
	89.8231	87.8008	83.6013	77.8922	74.1856	68.9665	64.5304	70.2142	72.2337	78.1428	84.8152	87.8092	(72)
Total internal gains													
	364.4012	362.4596	350.1835	330.4045	310.4049	291.0353	278.3828	283.9859	294.0820	314.0610	337.0264	354.1709	(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	
North	6.6200	10.6334	0.6200	0.8500	0.7700	25.7083	(74)
Northeast	7.5600	11.2829	0.6200	0.8500	0.7700	31.1521	(75)

Solar gains	56.8605	112.5410	197.7304	321.7221	432.8458	462.2586	432.0753	343.7623	239.5858	135.9761	70.9120	46.8721	(83)
Total gains	421.2617	475.0006	547.9138	652.1266	743.2507	753.2938	710.4581	627.7482	533.6678	450.0371	407.9384	401.0431	(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	82.8817	82.8817	82.8817	82.8817	82.8817	82.8817	82.8817	82.8817	82.8817	82.8817	82.8817	82.8817	
alpha	6.5254	6.5254	6.5254	6.5254	6.5254	6.5254	6.5254	6.5254	6.5254	6.5254	6.5254	6.5254	
util living area													
	0.9977	0.9944	0.9790	0.9008	0.7051	0.4956	0.3629	0.4288	0.7239	0.9599	0.9945	0.9983	(86)
MIT	20.2045	20.3286	20.5533	20.8261	20.9696	20.9971	20.9997	20.9991	20.9739	20.7468	20.4174	20.1679	(87)
Th 2	20.2206	20.2206	20.2206	20.2206	20.2206	20.2206	20.2206	20.2206	20.2206	20.2206	20.2206	20.2206	(88)
util rest of house													
	0.9969	0.9926	0.9725	0.8748	0.6550	0.4365	0.2988	0.3567	0.6552	0.9434	0.9925	0.9978	(89)
MIT 2	19.1501	19.3308	19.6542	20.0258	20.1937	20.2189	20.2205	20.2203	20.2012	19.9296	19.4608	19.0966	(90)
Living area fraction									fLA = Living area / (4) =			0.3771	(91)
MIT	19.5478	19.7071	19.9933	20.3277	20.4863	20.5124	20.5144	20.5140	20.4926	20.2378	19.8216	19.5006	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5478	19.7071	19.9933	20.3277	20.4863	20.5124	20.5144	20.5140	20.4926	20.2378	19.8216	19.5006	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9961	0.9911	0.9702	0.8787	0.6725	0.4588	0.3230	0.3839	0.6801	0.9438	0.9911	0.9971	(94)
Useful gains	419.6169	470.7594	531.5839	573.0204	499.8628	345.5806	229.4848	241.0012	362.9538	424.7665	404.3037	399.8831	(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													
	894.3021	868.4545	791.3962	670.2457	515.3285	346.7687	229.5826	241.2913	374.9351	565.2684	746.1368	897.4009	(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													
	353.1658	267.2511	193.3003	70.0022	11.5064	0.0000	0.0000	0.0000	0.0000	104.5334	246.1198	370.1532	(98)
Space heating												1616.0323	(98)
Space heating per m2										(98) / (4) =		23.0862	(99)

8c. Space cooling requirement

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												1616.0323	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	353.1658	267.2511	193.3003	70.0022	11.5064	0.0000	0.0000	0.0000	0.0000	104.5334	246.1198	370.1532	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	353.1658	267.2511	193.3003	70.0022	11.5064	0.0000	0.0000	0.0000	0.0000	104.5334	246.1198	370.1532	(211)
Water heating requirement													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	166.9901	146.7427	153.0684	135.7680	131.9998	116.4403	110.3955	123.1135	123.5151	140.8545	150.7593	162.4840	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	166.9901	146.7427	153.0684	135.7680	131.9998	116.4403	110.3955	123.1135	123.5151	140.8545	150.7593	162.4840	(219)
Water heating fuel used												1662.1311	(219)
Annual totals kWh/year													
Space heating fuel - main system												1616.0323	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 4.2640, total flow = 21.0000, SFP = 0.2030)													
mechanical ventilation fans (SFP = 0.2030)												41.2698	(230a)
central heating pump												30.0000	(230c)
Total electricity for the above, kWh/year												71.2698	(231)
Electricity for lighting (calculated in Appendix L)												310.6304	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.85 * 951 * 1.00) =												-646.4189	(233)
Total delivered energy for all uses												3013.6447	(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	1616.0323	0.5190	838.7208	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1662.1311	0.5190	862.6460	(264)
Space and water heating			1701.3668	(265)
Pumps and fans	71.2698	0.5190	36.9890	(267)
Energy for lighting	310.6304	0.5190	161.2172	(268)
Energy saving/generation technologies				
PV Unit	-646.4189	0.5190	-335.4914	(269)
Total CO2, kg/year			1564.0816	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			22.3400	(273)

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

DER		22.3400	ZC1
Total Floor Area	TFA	70.0000	
Assumed number of occupants	N	2.2461	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.7020	ZC2
CO2 emissions from cooking, equation (L16)		2.4701	ZC3
Total CO2 emissions		41.5121	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		41.5121	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	70.0000 (1b)	x	2.3800 (2b)	=	166.6000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	166.6000	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							2 * 10 =	20.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1200	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3700	(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) =	0.3145	(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	0.4010	0.3932	0.3853	0.3460	0.3381	0.2988	0.2988	0.2910	0.3145	0.3381	0.3539	0.3696	(22b)
Effective ac	0.5804	0.5773	0.5742	0.5599	0.5572	0.5446	0.5446	0.5423	0.5495	0.5572	0.5626	0.5683	(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)			14.1800	1.3258	18.7992			(27)
External Wall	38.4400	14.1800	24.2600	0.1800	4.3668			(29a)
Total net area of external elements Aum(A, m2)			38.4400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.1660			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.8988	(36)
Total fabric heat loss					(33) + (36) =		28.0648	(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	31.9101	31.7385	31.5702	30.7798	30.6319	29.9435	29.9435	29.8160	30.2086	30.6319	30.9311	31.2438	(38)
Heat transfer coeff	59.9750	59.8033	59.6350	58.8446	58.6967	58.0083	58.0083	57.8808	58.2735	58.6967	58.9959	59.3087	(39)
Average = Sum(39)m / 12 =												58.8439	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8568	0.8543	0.8519	0.8406	0.8385	0.8287	0.8287	0.8269	0.8325	0.8385	0.8428	0.8473	(40)
HLP (average)												0.8406	(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	2.2461	(42)
Average daily hot water use (litres/day)	87.5455	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	96.3000	92.7982	89.2964	85.7946	82.2927	78.7909	78.7909	82.2927	85.7946	89.2964	92.7982	96.3000	(44)
Energy conte	142.8101	124.9027	128.8884	112.3680	107.8198	93.0403	86.2155	98.9335	100.1151	116.6745	127.3593	138.3040	(45)
Energy content (annual)										Total = Sum(45)m =		1377.4311	(45)
Distribution loss (46)m = 0.15 x (45)m	21.4215	18.7354	19.3333	16.8552	16.1730	13.9560	12.9323	14.8400	15.0173	17.5012	19.1039	20.7456	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

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	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	189.4050	166.9884	175.4833	157.4598	154.4147	138.1321	132.8104	145.5284	145.2069	163.2694	172.4512	184.8989	(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													
	189.4050	166.9884	175.4833	157.4598	154.4147	138.1321	132.8104	145.5284	145.2069	163.2694	172.4512	184.8989	(64)
								Total per year (kWh/year) = Sum(64)m =				1926.0485	(64)
Heat gains from water heating, kWh/month													
	84.7603	75.1987	80.1313	73.4358	73.1260	67.0094	65.9426	70.1713	69.3617	76.0702	78.4205	83.2620	(65)

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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	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.6904	15.7125	12.7782	9.6740	7.2314	6.1050	6.5967	8.5747	11.5089	14.6132	17.0558	18.1821	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	197.2971	199.3444	194.1852	183.2019	169.3374	156.3068	147.6015	145.5542	150.7134	161.6967	175.5612	188.5918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	(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)													
	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	(71)
Water heating gains (Table 5)													
	113.9251	111.9028	107.7034	101.9942	98.2876	93.0686	88.6325	94.3163	96.3358	102.2449	108.9173	111.9113	(72)
Total internal gains													
	388.6045	386.6516	374.3587	354.5619	334.5483	315.1722	302.5226	308.1370	318.2499	338.2466	361.2261	378.3771	(73)

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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	
North	6.6200	10.6334	0.6300	0.7000	0.7700	21.5130	(74)
Northeast	7.5600	11.2829	0.6300	0.7000	0.7700	26.0685	(75)

Solar gains	47.5815	94.1757	165.4632	269.2209	362.2106	386.8236	361.5659	287.6645	200.4883	113.7865	59.3400	39.2232	(83)
Total gains	436.1860	480.8273	539.8218	623.7828	696.7589	701.9958	664.0885	595.8015	518.7382	452.0331	420.5661	417.6002	(84)

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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	81.0523	81.2850	81.5144	82.6093	82.8174	83.8002	83.8002	83.9848	83.4189	82.8174	82.3974	81.9629	
alpha	6.4035	6.4190	6.4343	6.5073	6.5212	6.5867	6.5867	6.5990	6.5613	6.5212	6.4932	6.4642	
util living area													
	0.9972	0.9942	0.9813	0.9168	0.7424	0.5251	0.3839	0.4457	0.7368	0.9592	0.9936	0.9979	(86)
MIT	20.1969	20.3125	20.5248	20.8008	20.9593	20.9962	20.9996	20.9990	20.9717	20.7484	20.4284	20.1769	(87)
Th 2	20.2044	20.2065	20.2086	20.2183	20.2201	20.2285	20.2285	20.2301	20.2253	20.2201	20.2164	20.2126	(88)
util rest of house													
	0.9964	0.9923	0.9754	0.8934	0.6924	0.4635	0.3168	0.3717	0.6685	0.9425	0.9912	0.9972	(89)
MIT 2	19.1264	19.2963	19.6039	19.9919	20.1832	20.2262	20.2284	20.2297	20.2040	19.9312	19.4734	19.1036	(90)
Living area fraction									fLA = Living area / (4) =			0.3771	(91)
MIT	19.5302	19.6796	19.9512	20.2969	20.4759	20.5166	20.5192	20.5198	20.4935	20.2394	19.8336	19.5084	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5302	19.6796	19.9512	20.2969	20.4759	20.5166	20.5192	20.5198	20.4935	20.2394	19.8336	19.5084	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9954	0.9907	0.9730	0.8960	0.7093	0.4867	0.3422	0.3997	0.6931	0.9429	0.9897	0.9964	(94)
Useful gains	434.1722	476.3753	525.2486	558.9279	494.2287	341.6302	227.2200	238.1181	359.5387	426.2407	416.2287	416.1066	(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													
	913.4289	883.8666	802.1634	670.6480	515.1160	343.2115	227.3484	238.4581	372.5739	565.8030	751.2291	907.9185	(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													
	356.5670	273.8342	206.0246	80.4385	15.5402	0.0000	0.0000	0.0000	0.0000	103.8344	241.2003	365.9080	(98)
Space heating												1643.3471	(98)
Space heating per m2											(98) / (4) =	23.4764	(99)

8c. Space cooling requirement

Not applicable

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

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												93.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												1757.5905	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	356.5670	273.8342	206.0246	80.4385	15.5402	0.0000	0.0000	0.0000	0.0000	103.8344	241.2003	365.9080	(98)
Space heating efficiency (main heating system 1)													
	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)													
	381.3551	292.8708	220.3471	86.0305	16.6205	0.0000	0.0000	0.0000	0.0000	111.0528	257.9683	391.3455	(211)
Water heating requirement													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	189.4050	166.9884	175.4833	157.4598	154.4147	138.1321	132.8104	145.5284	145.2069	163.2694	172.4512	184.8989	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.4774	86.1254	85.2426	83.1230	80.6721	79.8000	79.8000	79.8000	79.8000	83.6444	85.7089	86.6020	(217)
Fuel for water heating, kWh/month													
	219.0225	193.8897	205.8633	189.4299	191.4102	173.0979	166.4290	182.3664	181.9636	195.1946	201.2058	213.5042	(219)
Water heating fuel used												2313.3772	(219)
Annual totals kWh/year													
Space heating fuel - main system												1757.5905	(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)												312.4184	(232)
Total delivered energy for all uses												4458.3861	(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	1757.5905	0.2160	379.6396	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2313.3772	0.2160	499.6895	(264)
Space and water heating			879.3290	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	312.4184	0.5190	162.1452	(268)
Total CO2, kg/m2/year			1080.3992	(272)
Emissions per m2 for space and water heating			12.5618	(272a)
Fuel factor (electricity)			1.5500	
Emissions per m2 for lighting			2.3164	(272b)
Emissions per m2 for pumps and fans			0.5561	(272c)
Target Carbon Dioxide Emission Rate (TER) = (12.5618 * 1.55) + 2.3164 + 0.5561, rounded to 2 d.p.			22.3400	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Built)

Design SAP
elmhurst energy

Property Reference	PMCC-ROPE-1655-115	**Issued on Date**	06/08/2020
Assessment Reference	ABF	**Prop Type Ref**	
Property	7 Chalkhill Blue Apartments, 4, Salt Marsh Road, SHOREHAM-BY-SEA, West Sussex, BN43 5QP		

SAP Rating	80 C	**DER**	19.98	**TER**	20.90
Environmental	86 B	**% DER<TER**	4.40		
CO_2 Emissions (t/year)	1.10	**DFEE**	29.24	**TFEE**	34.38
General Requirements Compliance	Pass	**% DFEE<TFEE**	14.95		

Assessor Details	Mr. Malcolm Maclean, SRE Limited, Tel: 01730 710044, malcolm@sre.co.uk	**Assessor ID**	V497-0002
Client			

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

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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 80 m²

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

1a TER and DER
Fuel for main heating:Electricity
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 20.90 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 19.98 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)34.4 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)29.2 kWh/m²/yrOK
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2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(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: 2.62 (measured in this dwelling)
Maximum 10.0 OK
---
4 Heating efficiency
Main heating system: Boiler system with radiators or underfloor - Electric
Direct-acting boiler

Secondary heating system: None
---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 1.30 kWh/day
Permitted by DBSCG 1.89 OK
Primary pipework insulated: No primary pipework
---
6 Controls
Space heating controls: Time and temperature zone control OK

Hot water controls: Cylinderstat OK

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7 Low energy lights
Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK
---
8 Mechanical ventilation
Continuous extract system (decentralised)
Specific fan power: 0.1800 0.1600
Maximum 0.7 OK
---
9 Summertime temperature
Overheating risk (South East England): Medium OK
Based on:
Overshading: Average
Windows facing North East: 12.18 m², No overhang
Windows facing South: 6.62 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: Light-coloured curtain or roller blind, closed 100% of daylight hours
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10 Key features
Party wall U-value 0.00 W/m²K
Party wall U-value 0.00 W/m²K
Air permeability 2.6 m³/m²h
Photovoltaic array 0.97 kW

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	80.0000 (1b)	x	2.3800 (2b)	=	190.4000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	190.4000	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(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) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		2.6200	
Infiltration rate		0.1310	(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) =	0.1114	(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	0.1420	0.1392	0.1364	0.1225	0.1197	0.1058	0.1058	0.1030	0.1114	0.1197	0.1253	0.1308	(22b)

Mechanical extract ventilation - decentralised
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 (Uw = 1.30)			18.8000	1.2357	23.2319			(27)
External Wall	47.8400	18.8000	29.0400	0.1800	5.2272			(29a)
Total net area of external elements Aum(A, m2)			47.8400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.4591			(33)
Corridor Wall			3.5700	0.0000	0.0000			(32)
Party			47.9600	0.0000	0.0000			(32)
Party Floor 1			80.0000					(32d)
Party Ceiling 1			80.0000					(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.9306	(36)
Total fabric heat loss					(33) + (36) =		39.3897	(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	31.4160	31.4160	31.4160	31.4160	31.4160	31.4160	31.4160	31.4160	31.4160	31.4160	31.4160	31.4160	(38)
Heat transfer coeff	70.8057	70.8057	70.8057	70.8057	70.8057	70.8057	70.8057	70.8057	70.8057	70.8057	70.8057	70.8057	(39)

Average = Sum(39)m / 12 = 70.8057 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8851	0.8851	0.8851	0.8851	0.8851	0.8851	0.8851	0.8851	0.8851	0.8851	0.8851	0.8851	(40)

HLP (average) 0.8851 (40)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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 2.4629 (42)
Average daily hot water use (litres/day) 92.6930 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	101.9622	98.2545	94.5468	90.8391	87.1314	83.4237	83.4237	87.1314	90.8391	94.5468	98.2545	101.9622	(44)
Energy conte	151.2071	132.2467	136.4667	118.9750	114.1593	98.5108	91.2848	104.7506	106.0017	123.5347	134.8478	146.4360	(45)

Energy content (annual) Total = Sum(45)m = 1458.4211 (45)

Distribution loss (46)m = 0.15 x (45)m	22.6811	19.8370	20.4700	17.8462	17.1239	14.7766	13.6927	15.7126	15.9002	18.5302	20.2272	21.9654	(46)

Water storage loss:

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3000	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.7800	(55)
Total storage loss													
	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(56)
If cylinder contains dedicated solar storage													
	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Total heat required for water heating calculated for each month													
	175.3871	154.0867	160.6467	142.3750	138.3393	121.9108	115.4648	128.9306	129.4017	147.7147	158.2478	170.6160	(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													
	175.3871	154.0867	160.6467	142.3750	138.3393	121.9108	115.4648	128.9306	129.4017	147.7147	158.2478	170.6160	(64)
								Total per year (kWh/year) = Sum(64)m =				1743.1211	(64)
Heat gains from water heating, kWh/month													
	69.6203	61.4440	64.7192	58.2792	57.3020	51.4748	49.6962	54.1736	53.9655	60.4193	63.5569	68.0340	(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	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	19.5633	17.3759	14.1311	10.6981	7.9970	6.7514	7.2951	9.4825	12.7273	16.1603	18.8614	20.1070	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.4405	221.7177	215.9794	203.7634	188.3429	173.8497	164.1674	161.8903	167.6286	179.8446	195.2651	209.7582	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	(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)													
	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	(71)
Water heating gains (Table 5)													
	93.5757	91.4345	86.9881	80.9433	77.0188	71.4928	66.7959	72.8139	74.9522	81.2087	88.2735	91.4435	(72)
Total internal gains													
	395.5225	393.4711	380.0415	358.3477	336.3015	315.0369	301.2014	307.1296	318.2510	340.1565	365.3429	384.2517	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	12.1800	11.2829	0.6200	0.8500	0.7700	50.1896	(75)
South	6.6200	46.7521	0.6200	0.8500	0.7700	113.0323	(78)

Solar gains	163.2219	287.2801	419.8713	568.7994	684.0551	700.4636	666.3828	576.6674	470.6134	324.5174	197.1333	138.6577	(83)
Total gains	558.7444	680.7512	799.9128	927.1471	1020.3566	1015.5005	967.5842	883.7970	788.8644	664.6739	562.4762	522.9093	(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	78.4619	78.4619	78.4619	78.4619	78.4619	78.4619	78.4619	78.4619	78.4619	78.4619	78.4619	78.4619	
alpha	6.2308	6.2308	6.2308	6.2308	6.2308	6.2308	6.2308	6.2308	6.2308	6.2308	6.2308	6.2308	
util living area													
	0.9950	0.9834	0.9442	0.8255	0.6298	0.4446	0.3218	0.3681	0.6070	0.9017	0.9866	0.9966	(86)
MIT	20.2273	20.4196	20.6652	20.8872	20.9804	20.9980	20.9998	20.9995	20.9880	20.8310	20.4706	20.1756	(87)
Th 2	20.1802	20.1802	20.1802	20.1802	20.1802	20.1802	20.1802	20.1802	20.1802	20.1802	20.1802	20.1802	(88)
util rest of house													
	0.9935	0.9786	0.9295	0.7900	0.5794	0.3884	0.2619	0.3027	0.5400	0.8703	0.9819	0.9956	(89)
MIT 2	19.1517	19.4291	19.7735	20.0606	20.1634	20.1790	20.1801	20.1800	20.1720	19.9998	19.5048	19.0766	(90)
Living area fraction									fLA = Living area / (4) =			0.4538	(91)
MIT	19.6397	19.8785	20.1781	20.4357	20.5341	20.5506	20.5520	20.5519	20.5423	20.3769	19.9430	19.5753	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6397	19.8785	20.1781	20.4357	20.5341	20.5506	20.5520	20.5519	20.5423	20.3769	19.9430	19.5753	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9922	0.9764	0.9294	0.8016	0.6014	0.4139	0.2891	0.3324	0.5700	0.8786	0.9803	0.9946	(94)
Useful gains	554.3956	664.7094	743.4560	743.2281	613.6882	420.3083	279.7399	293.7687	449.6894	583.9761	551.3771	520.0777	(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													
	1086.1422	1060.5667	968.4871	816.7916	625.5064	421.3366	279.8273	293.9749	456.1497	692.2637	909.3605	1088.6561	(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													
	395.6194	266.0161	167.4231	52.9657	8.7927	0.0000	0.0000	0.0000	0.0000	80.5659	257.7480	423.0224	(98)
Space heating												1652.1534	(98)
Space heating per m2											(98) / (4) =	20.6519	(99)

8c. Space cooling requirement

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												1652.1534	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	395.6194	266.0161	167.4231	52.9657	8.7927	0.0000	0.0000	0.0000	0.0000	80.5659	257.7480	423.0224	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	395.6194	266.0161	167.4231	52.9657	8.7927	0.0000	0.0000	0.0000	0.0000	80.5659	257.7480	423.0224	(211)
Water heating requirement													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	175.3871	154.0867	160.6467	142.3750	138.3393	121.9108	115.4648	128.9306	129.4017	147.7147	158.2478	170.6160	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	175.3871	154.0867	160.6467	142.3750	138.3393	121.9108	115.4648	128.9306	129.4017	147.7147	158.2478	170.6160	(219)
Water heating fuel used												1743.1211	(219)
Annual totals kWh/year													
Space heating fuel - main system												1652.1534	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 4.2640, total flow = 21.0000, SFP = 0.2030)													
mechanical ventilation fans (SFP = 0.2030)												47.1655	(230a)
central heating pump												30.0000	(230c)
Total electricity for the above, kWh/year												77.1655	(231)
Electricity for lighting (calculated in Appendix L)												345.4937	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.97 * 951 * 1.00) =												-737.6780	(233)
Total delivered energy for all uses												3080.2557	(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	1652.1534	0.5190	857.4676	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1743.1211	0.5190	904.6798	(264)
Space and water heating			1762.1475	(265)
Pumps and fans	77.1655	0.5190	40.0489	(267)
Energy for lighting	345.4937	0.5190	179.3112	(268)
Energy saving/generation technologies				
PV Unit	-737.6780	0.5190	-382.8549	(269)
Total CO2, kg/year			1598.6527	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			19.9800	(273)

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

DER		19.9800	ZC1
Total Floor Area	TFA	80.0000	
Assumed number of occupants	N	2.4629	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.2545	ZC2
CO2 emissions from cooking, equation (L16)		2.2264	ZC3
Total CO2 emissions		38.4608	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		38.4608	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	80.0000 (1b)	x	2.3800 (2b)	=	190.4000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	190.4000	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							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) =	0.1576	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4076	(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) =	0.3464	(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	0.4417	0.4330	0.4244	0.3811	0.3724	0.3291	0.3291	0.3204	0.3464	0.3724	0.3897	0.4071	(22b)
Effective ac	0.5975	0.5938	0.5900	0.5726	0.5693	0.5542	0.5542	0.5513	0.5600	0.5693	0.5759	0.5828	(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)			18.8000	1.3258	24.9242			(27)
External Wall	47.8400	18.8000	29.0400	0.1800	5.2272			(29a)
Total net area of external elements Aum(A, m2)			47.8400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.1514			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.4688	(36)
Total fabric heat loss					(33) + (36) =		35.6202	(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	37.5451	37.3071	37.0738	35.9781	35.7731	34.8187	34.8187	34.6420	35.1863	35.7731	36.1878	36.6214	(38)
Heat transfer coeff	73.1654	72.9274	72.6941	71.5983	71.3933	70.4390	70.4390	70.2622	70.8066	71.3933	71.8081	72.2416	(39)
Average = Sum(39)m / 12 =												71.5973	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9146	0.9116	0.9087	0.8950	0.8924	0.8805	0.8805	0.8783	0.8851	0.8924	0.8976	0.9030	(40)
HLP (average)												0.8950	(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	2.4629	(42)
Average daily hot water use (litres/day)	92.6930	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	101.9622	98.2545	94.5468	90.8391	87.1314	83.4237	83.4237	87.1314	90.8391	94.5468	98.2545	101.9622	(44)
Energy conte	151.2071	132.2467	136.4667	118.9750	114.1593	98.5108	91.2848	104.7506	106.0017	123.5347	134.8478	146.4360	(45)
Energy content (annual)										Total = Sum(45)m =		1458.4211	(45)
Distribution loss (46)m = 0.15 x (45)m	22.6811	19.8370	20.4700	17.8462	17.1239	14.7766	13.6927	15.7126	15.9002	18.5302	20.2272	21.9654	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	197.8020	174.3324	183.0616	164.0668	160.7542	143.6027	137.8797	151.3455	151.0935	170.1296	179.9396	193.0309	(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													
	197.8020	174.3324	183.0616	164.0668	160.7542	143.6027	137.8797	151.3455	151.0935	170.1296	179.9396	193.0309	(64)
								Total per year (kWh/year) = Sum(64)m =				2007.0385	(64)
Heat gains from water heating, kWh/month													
	87.5523	77.6406	82.6511	75.6327	75.2339	68.8283	67.6281	72.1055	71.3190	78.3512	80.9104	85.9659	(65)

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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	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	19.5633	17.3759	14.1311	10.6981	7.9970	6.7514	7.2951	9.4825	12.7273	16.1603	18.8614	20.1070	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.4405	221.7177	215.9794	203.7634	188.3429	173.8497	164.1674	161.8903	167.6286	179.8446	195.2651	209.7582	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	(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)													
	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	(71)
Water heating gains (Table 5)													
	117.6778	115.5366	111.0902	105.0454	101.1208	95.5949	90.8980	96.9160	99.0542	105.3108	112.3755	115.5455	(72)
Total internal gains													
	419.6245	417.5731	404.1436	382.4498	360.4036	339.1389	325.3035	331.2317	342.3530	364.2585	389.4450	408.3537	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	12.1800	11.2829	0.6300	0.7000	0.7700	41.9992	(75)
South	6.6200	46.7521	0.6300	0.7000	0.7700	94.5868	(78)

Solar gains	136.5861	240.3995	351.3534	475.9782	572.4256	586.1564	557.6372	482.5623	393.8150	271.5601	164.9635	116.0304	(83)
Total gains	556.2106	657.9726	755.4970	858.4280	932.8292	925.2954	882.9407	813.7940	736.1680	635.8186	554.4085	524.3841	(84)

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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	75.9315	76.1793	76.4238	77.5934	77.8162	78.8705	78.8705	79.0689	78.4610	77.8162	77.3667	76.9024	
alpha	6.0621	6.0786	6.0949	6.1729	6.1877	6.2580	6.2580	6.2713	6.2307	6.1877	6.1578	6.1268	
util living area													
	0.9954	0.9868	0.9589	0.8645	0.6844	0.4844	0.3507	0.3964	0.6454	0.9181	0.9879	0.9967	(86)
MIT	20.1804	20.3559	20.5953	20.8471	20.9685	20.9968	20.9996	20.9993	20.9834	20.8045	20.4457	20.1506	(87)
Th 2	20.1551	20.1577	20.1601	20.1718	20.1740	20.1841	20.1841	20.1860	20.1802	20.1740	20.1695	20.1649	(88)
util rest of house													
	0.9939	0.9828	0.9472	0.8327	0.6322	0.4239	0.2859	0.3267	0.5760	0.8900	0.9836	0.9956	(89)
MIT 2	19.0643	19.3200	19.6612	20.0054	20.1464	20.1822	20.1840	20.1857	20.1685	19.9617	19.4609	19.0284	(90)
Living area fraction									fLA = Living area / (4) =			0.4538	(91)
MIT	19.5707	19.7900	20.0851	20.3873	20.5194	20.5518	20.5541	20.5549	20.5383	20.3441	19.9078	19.5376	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5707	19.7900	20.0851	20.3873	20.5194	20.5518	20.5541	20.5549	20.5383	20.3441	19.9078	19.5376	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9926	0.9807	0.9460	0.8415	0.6545	0.4513	0.3153	0.3584	0.6070	0.8965	0.9819	0.9946	(94)
Useful gains	552.1096	645.2694	714.7039	722.3796	610.5384	417.6175	278.3827	291.6275	446.8265	569.9801	544.3856	521.5477	(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													
	1117.2881	1085.8893	987.5534	822.4725	629.6490	419.2399	278.5222	291.9298	455.8724	695.6651	919.7027	1108.0134	(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													
	420.4928	296.0966	203.0001	72.0669	14.2183	0.0000	0.0000	0.0000	0.0000	93.5096	270.2283	436.3305	(98)
Space heating												1805.9431	(98)
Space heating per m2											(98) / (4) =	22.5743	(99)

8c. Space cooling requirement

Not applicable

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

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												93.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												1931.4899	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	420.4928	296.0966	203.0001	72.0669	14.2183	0.0000	0.0000	0.0000	0.0000	93.5096	270.2283	436.3305	(98)
Space heating efficiency (main heating system 1)													
	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)													
	449.7250	316.6809	217.1124	77.0769	15.2067	0.0000	0.0000	0.0000	0.0000	100.0103	289.0142	466.6636	(211)
Water heating requirement													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	197.8020	174.3324	183.0616	164.0668	160.7542	143.6027	137.8797	151.3455	151.0935	170.1296	179.9396	193.0309	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.7776	86.2160	85.0900	82.7873	80.5741	79.8000	79.8000	79.8000	79.8000	83.2929	85.8963	86.9252	(217)
Fuel for water heating, kWh/month													
	227.9413	202.2043	215.1389	198.1788	199.5110	179.9532	172.7815	189.6560	189.3402	204.2546	209.4847	222.0655	(219)
Water heating fuel used												2410.5101	(219)
Annual totals kWh/year													
Space heating fuel - main system												1931.4899	(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)												345.4937	(232)
Total delivered energy for all uses												4762.4937	(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	1931.4899	0.2160	417.2018	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2410.5101	0.2160	520.6702	(264)
Space and water heating			937.8720	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	345.4937	0.5190	179.3112	(268)
Total CO2, kg/m2/year			1156.1082	(272)
Emissions per m2 for space and water heating			11.7234	(272a)
Fuel factor (electricity)			1.5500	
Emissions per m2 for lighting			2.2414	(272b)
Emissions per m2 for pumps and fans			0.4866	(272c)
Target Carbon Dioxide Emission Rate (TER) = (11.7234 * 1.55) + 2.2414 + 0.4866, rounded to 2 d.p.			20.9000	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Built)

Design SAP
elmhurst energy

Property Reference	PMCC-ROPE-1655-116	**Issued on Date**	06/08/2020
Assessment Reference	ABF	**Prop Type Ref**	
Property	8 Chalkhill Blue Apartments, 4, Salt Marsh Road, SHOREHAM-BY-SEA, West Sussex, BN43 5QP		

SAP Rating	84 B	**DER**	15.09	**TER**	18.15
Environmental	89 B	**% DER<TER**	16.84		
CO_2 Emissions (t/year)	0.78	**DFEE**	13.97	**TFEE**	19.33
General Requirements Compliance	Pass	**% DFEE<TFEE**	27.73		

Assessor Details	Mr. Malcolm Maclean, SRE Limited, Tel: 01730 710044, malcolm@sre.co.uk	**Assessor ID**	V497-0002
Client			

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

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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:Electricity
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 18.15 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.09 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)19.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)14.0 kWh/m²/yrOK
---
2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(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: 2.68 (measured in this dwelling)
Maximum 10.0 OK
---
4 Heating efficiency
Main heating system: Boiler system with radiators or underfloor - Electric
Direct-acting boiler

Secondary heating system: None
---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 1.30 kWh/day
Permitted by DBSCG 1.89 OK
Primary pipework insulated: No primary pipework
---
6 Controls
Space heating controls: Time and temperature zone control OK

Hot water controls: Cylinderstat OK

---
7 Low energy lights
Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK
---
8 Mechanical ventilation
Continuous extract system (decentralised)
Specific fan power: 0.1900 0.1800
Maximum 0.7 OK
---
9 Summertime temperature
Overheating risk (South East England): Medium OK
Based on:
Overshading: Average
Windows facing South: 11.35 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: Light-coloured curtain or roller blind, closed 100% of daylight hours
---
10 Key features
Party wall U-value 0.00 W/m²K
Party wall U-value 0.00 W/m²K
Air permeability 2.7 m³/m²h
Photovoltaic array 0.86 kW

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	71.0000 (1b)	x	2.3800 (2b)	=	168.9800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	168.9800	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(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) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		2.6800	
Infiltration rate		0.1340	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1039	(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	0.1324	0.1298	0.1272	0.1142	0.1116	0.0987	0.0987	0.0961	0.1039	0.1116	0.1168	0.1220	(22b)

Mechanical extract ventilation - decentralised
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 (Uw = 1.30)			11.3500	1.2357	14.0257			(27)
External Wall	24.1100	11.3500	12.7600	0.1800	2.2968			(29a)
Total net area of external elements Aum(A, m2)			24.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.3225			(33)
Corridor Wall			36.4600	0.0000	0.0000			(32)
Party			29.7500	0.0000	0.0000			(32)
Party Floor 1			71.0000					(32d)
Party Ceiling 1			71.0000					(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.2852	(36)
Total fabric heat loss					(33) + (36) =		22.6077	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.8817	27.8817	27.8817	27.8817	27.8817	27.8817	27.8817	27.8817	27.8817	27.8817	27.8817	27.8817	(38)
Heat transfer coeff	50.4894	50.4894	50.4894	50.4894	50.4894	50.4894	50.4894	50.4894	50.4894	50.4894	50.4894	50.4894	(39)

Average = Sum(39)m / 12 = 50.4894 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7111	0.7111	0.7111	0.7111	0.7111	0.7111	0.7111	0.7111	0.7111	0.7111	0.7111	0.7111	(40)
HLP (average)												0.7111	(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 2.2702 (42)
Average daily hot water use (litres/day) 88.1162 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	96.9278	93.4032	89.8785	86.3539	82.8292	79.3046	79.3046	82.8292	86.3539	89.8785	93.4032	96.9278	(44)
Energy conte	143.7412	125.7169	129.7286	113.1005	108.5227	93.6468	86.7775	99.5785	100.7678	117.4351	128.1896	139.2056	(45)
Energy content (annual)										Total = Sum(45)m =		1386.4109	(45)

Distribution loss (46)m = 0.15 x (45)m

	21.5612	18.8575	19.4593	16.9651	16.2784	14.0470	13.0166	14.9368	15.1152	17.6153	19.2284	20.8808	(46)

Water storage loss:

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3000	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.7800	(55)
Total storage loss													
	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(56)
If cylinder contains dedicated solar storage													
	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Total heat required for water heating calculated for each month													
	167.9212	147.5569	153.9086	136.5005	132.7027	117.0468	110.9575	123.7585	124.1678	141.6151	151.5896	163.3856	(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													
	167.9212	147.5569	153.9086	136.5005	132.7027	117.0468	110.9575	123.7585	124.1678	141.6151	151.5896	163.3856	(64)
								Total per year (kWh/year) = Sum(64)m =				1671.1109	(64)
Heat gains from water heating, kWh/month													
	67.1379	59.2729	62.4788	56.3259	55.4278	49.8576	48.1975	52.4538	52.2253	58.3912	61.3430	65.6299	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.9825	15.9719	12.9892	9.8337	7.3508	6.2058	6.7056	8.7162	11.6989	14.8544	17.3373	18.4823	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	199.6196	201.6911	196.4711	185.3585	171.3309	158.1468	149.3391	147.2676	152.4876	163.6002	177.6279	190.8119	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	(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)													
	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	(71)
Water heating gains (Table 5)													
	90.2392	88.2037	83.9768	78.2305	74.4997	69.2466	64.7816	70.5025	72.5351	78.4828	85.1987	88.2122	(72)
Total internal gains													
	367.8936	365.9190	353.4895	333.4750	313.2337	293.6516	280.8787	286.5387	296.7739	316.9897	340.2162	357.5587	(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	11.3500	46.7521	0.6200	0.8500	0.7700	193.7941	(78)

Solar gains	193.7941	317.3848	404.2919	456.9376	476.1573	458.2366	447.7250	434.8030	422.3306	342.3293	229.7121	167.4559	(83)
Total gains	561.6877	683.3037	757.7814	790.4126	789.3909	751.8882	728.6037	721.3417	719.1045	659.3190	569.9283	525.0146	(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	97.6553	97.6553	97.6553	97.6553	97.6553	97.6553	97.6553	97.6553	97.6553	97.6553	97.6553	97.6553	
alpha	7.5104	7.5104	7.5104	7.5104	7.5104	7.5104	7.5104	7.5104	7.5104	7.5104	7.5104	7.5104	
util living area													
	0.9837	0.9439	0.8667	0.7444	0.5899	0.4293	0.3049	0.3219	0.4834	0.7621	0.9526	0.9894	(86)
MIT	20.5821	20.7586	20.8917	20.9676	20.9944	20.9995	21.0000	21.0000	20.9989	20.9675	20.7715	20.5274	(87)
Th 2	20.3310	20.3310	20.3310	20.3310	20.3310	20.3310	20.3310	20.3310	20.3310	20.3310	20.3310	20.3310	(88)
util rest of house													
	0.9794	0.9318	0.8434	0.7102	0.5492	0.3847	0.2585	0.2751	0.4370	0.7225	0.9399	0.9865	(89)
MIT 2	19.7851	20.0311	20.2064	20.2978	20.3263	20.3307	20.3310	20.3310	20.3303	20.2995	20.0523	19.7067	(90)
Living area fraction										fLA = Living area / (4) =		0.3113	(91)
MIT	20.0332	20.2576	20.4197	20.5063	20.5342	20.5389	20.5392	20.5392	20.5384	20.5074	20.2762	19.9621	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0332	20.2576	20.4197	20.5063	20.5342	20.5389	20.5392	20.5392	20.5384	20.5074	20.2762	19.9621	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9771	0.9303	0.8467	0.7194	0.5616	0.3986	0.2730	0.2897	0.4514	0.7333	0.9387	0.9846	(94)
Useful gains	548.8316	635.6593	641.6008	568.6188	443.3478	299.6708	198.8811	208.9734	324.6114	483.4510	535.0013	516.9217	(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													
	794.3573	775.3938	702.7975	585.9945	446.0344	299.8518	198.8896	208.9869	325.0702	500.2197	665.2576	795.8203	(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													
	182.6711	93.9016	45.5304	12.5105	1.9989	0.0000	0.0000	0.0000	0.0000	12.4759	93.7846	207.5006	(98)
Space heating												650.3735	(98)
Space heating per m2											(98) / (4) =	9.1602	(99)

8c. Space cooling requirement

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	650.3735	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	182.6711	93.9016	45.5304	12.5105	1.9989	0.0000	0.0000	0.0000	0.0000	12.4759	93.7846	207.5006	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	182.6711	93.9016	45.5304	12.5105	1.9989	0.0000	0.0000	0.0000	0.0000	12.4759	93.7846	207.5006	(211)
Water heating requirement													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	167.9212	147.5569	153.9086	136.5005	132.7027	117.0468	110.9575	123.7585	124.1678	141.6151	151.5896	163.3856	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	167.9212	147.5569	153.9086	136.5005	132.7027	117.0468	110.9575	123.7585	124.1678	141.6151	151.5896	163.3856	(219)
Water heating fuel used												1671.1109	(219)

Annual totals kWh/year		
Space heating fuel - main system	650.3735	(211)
Space heating fuel - secondary	0.0000	(215)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 5.0830, total flow = 21.0000, SFP = 0.2420)		
mechanical ventilation fans (SFP = 0.2420)	49.8995	(230a)
central heating pump	30.0000	(230c)
Total electricity for the above, kWh/year	79.8995	(231)
Electricity for lighting (calculated in Appendix L)	317.5762	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV Unit 0 (0.80 * 0.86 * 951 * 1.00) =	-654.0238	(233)
Total delivered energy for all uses	2064.9362	(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	650.3735	0.5190	337.5438	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1671.1109	0.5190	867.3066	(264)
Space and water heating			1204.8504	(265)
Pumps and fans	79.8995	0.5190	41.4678	(267)
Energy for lighting	317.5762	0.5190	164.8220	(268)
Energy saving/generation technologies				
PV Unit	-654.0238	0.5190	-339.4384	(269)
Total CO2, kg/year			1071.7019	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			15.0900	(273)

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

DER		15.0900	ZC1
Total Floor Area	TFA	71.0000	
Assumed number of occupants	N	2.2702	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.6606	ZC2
CO2 emissions from cooking, equation (L16)		2.4434	ZC3
Total CO2 emissions		34.1941	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		34.1941	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	71.0000 (1b)	x	2.3800 (2b)	=	168.9800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	168.9800	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							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) =	0.1775	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4275	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3313	(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	0.4225	0.4142	0.4059	0.3645	0.3562	0.3148	0.3148	0.3065	0.3313	0.3562	0.3728	0.3893	(22b)
Effective ac	0.5892	0.5858	0.5824	0.5664	0.5634	0.5495	0.5495	0.5470	0.5549	0.5634	0.5695	0.5758	(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)			11.3500	1.3258	15.0473			(27)
External Wall	24.1100	11.3500	12.7600	0.1800	2.2968			(29a)
Total net area of external elements Aum(A, m2)			24.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.3441			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.2896	(36)
Total fabric heat loss					(33) + (36) =		20.6337	(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	32.8578	32.6646	32.4752	31.5855	31.4191	30.6443	30.6443	30.5008	30.9427	31.4191	31.7558	32.1078	(38)
Heat transfer coeff	53.4915	53.2983	53.1089	52.2193	52.0529	51.2780	51.2780	51.1345	51.5765	52.0529	52.3896	52.7416	(39)
Average = Sum(39)m / 12 =												52.2185	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7534	0.7507	0.7480	0.7355	0.7331	0.7222	0.7222	0.7202	0.7264	0.7331	0.7379	0.7428	(40)
HLP (average)												0.7355	(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	2.2702	(42)
Average daily hot water use (litres/day)	88.1162	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	96.9278	93.4032	89.8785	86.3539	82.8292	79.3046	79.3046	82.8292	86.3539	89.8785	93.4032	96.9278	(44)
Energy conte	143.7412	125.7169	129.7286	113.1005	108.5227	93.6468	86.7775	99.5785	100.7678	117.4351	128.1896	139.2056	(45)
Energy content (annual)										Total = Sum(45)m =		1386.4109	(45)
Distribution loss (46)m = 0.15 x (45)m	21.5612	18.8575	19.4593	16.9651	16.2784	14.0470	13.0166	14.9368	15.1152	17.6153	19.2284	20.8808	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	190.3361	167.8026	176.3235	158.1924	155.1176	138.7387	133.3724	146.1734	145.8596	164.0300	173.2815	185.8005	(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													
	190.3361	167.8026	176.3235	158.1924	155.1176	138.7387	133.3724	146.1734	145.8596	164.0300	173.2815	185.8005	(64)
								Total per year (kWh/year) = Sum(64)m =				1935.0283	(64)
Heat gains from water heating, kWh/month													
	85.0699	75.4695	80.4107	73.6794	73.3597	67.2110	66.1295	70.3858	69.5788	76.3231	78.6965	83.5618	(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	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	18.5697	16.4934	13.4134	10.1548	7.5908	6.4085	6.9246	9.0008	12.0809	15.3395	17.9035	19.0858	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	199.6196	201.6911	196.4711	185.3585	171.3309	158.1468	149.3391	147.2676	152.4876	163.6002	177.6279	190.8119	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	(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)													
	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	(71)
Water heating gains (Table 5)													
	114.3412	112.3057	108.0789	102.3325	98.6018	93.3487	88.8837	94.6045	96.6372	102.5848	109.3007	112.3142	(72)
Total internal gains													
	392.5829	390.5426	378.0157	357.8981	337.5758	317.9563	305.1997	310.9254	321.2580	341.5768	364.8844	382.2643	(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	11.3500	46.7521	0.6300	0.7000	0.7700	162.1692	(78)

Solar gains	162.1692	265.5914	338.3164	382.3709	398.4542	383.4579	374.6617	363.8484	353.4114	286.4653	192.2259	140.1292	(83)
Total gains	554.7521	656.1340	716.3321	740.2691	736.0299	701.4142	679.8614	674.7738	674.6694	628.0421	557.1102	522.3934	(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	92.1745	92.5087	92.8386	94.4202	94.7221	96.1534	96.1534	96.4232	95.5970	94.7221	94.1133	93.4852	
alpha	7.1450	7.1672	7.1892	7.2947	7.3148	7.4102	7.4102	7.4282	7.3731	7.3148	7.2742	7.2323	
util living area													
	0.9871	0.9613	0.9072	0.7997	0.6469	0.4670	0.3318	0.3485	0.5252	0.8054	0.9624	0.9909	(86)
MIT	20.5071	20.6757	20.8284	20.9430	20.9886	20.9991	20.9999	20.9999	20.9978	20.9491	20.7254	20.4736	(87)
Th 2	20.2939	20.2963	20.2986	20.3096	20.3117	20.3212	20.3212	20.3230	20.3175	20.3117	20.3075	20.3031	(88)
util rest of house													
	0.9836	0.9519	0.8876	0.7662	0.6026	0.4179	0.2807	0.2973	0.4743	0.7665	0.9517	0.9883	(89)
MIT 2	19.6468	19.8868	20.0959	20.2497	20.3017	20.3207	20.3212	20.3230	20.3161	20.2611	19.9687	19.6063	(90)
Living area fraction									fLA = Living area / (4) =			0.3113	(91)
MIT	19.9146	20.1323	20.3239	20.4655	20.5155	20.5318	20.5325	20.5337	20.5283	20.4752	20.2042	19.8763	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9146	20.1323	20.3239	20.4655	20.5155	20.5318	20.5325	20.5337	20.5283	20.4752	20.2042	19.8763	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9813	0.9494	0.8884	0.7741	0.6159	0.4332	0.2966	0.3132	0.4901	0.7761	0.9498	0.9864	(94)
Useful gains	544.3718	622.9540	636.3956	573.0291	453.3122	303.8206	201.6325	211.3482	330.6507	487.4514	529.1658	515.2820	(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													
	835.2485	811.8565	734.1719	603.9416	458.8730	304.1735	201.6499	211.3743	331.5483	514.0336	686.5248	826.7918	(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													
	216.4123	126.9425	72.7456	22.2570	4.1372	0.0000	0.0000	0.0000	0.0000	19.7772	113.2985	231.7632	(98)
Space heating												807.3334	(98)
Space heating per m2											(98) / (4) =	11.3709	(99)

8c. Space cooling requirement

Not applicable

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

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												93.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												863.4582	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	216.4123	126.9425	72.7456	22.2570	4.1372	0.0000	0.0000	0.0000	0.0000	19.7772	113.2985	231.7632	(98)
Space heating efficiency (main heating system 1)													
	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)													
	231.4570	135.7673	77.8027	23.8043	4.4248	0.0000	0.0000	0.0000	0.0000	21.1521	121.1748	247.8751	(211)
Water heating requirement													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	190.3361	167.8026	176.3235	158.1924	155.1176	138.7387	133.3724	146.1734	145.8596	164.0300	173.2815	185.8005	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.1569	84.0815	82.6542	80.9809	80.0459	79.8000	79.8000	79.8000	79.8000	80.8283	83.7130	85.4045	(217)
Fuel for water heating, kWh/month													
	223.5123	199.5714	213.3267	195.3452	193.7859	173.8580	167.1334	183.1747	182.7815	202.9365	206.9948	217.5535	(219)
Water heating fuel used												2359.9738	(219)
Annual totals kWh/year													
Space heating fuel - main system												863.4582	(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)												327.9464	(232)
Total delivered energy for all uses												3626.3784	(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	863.4582	0.2160	186.5070	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2359.9738	0.2160	509.7543	(264)
Space and water heating			696.2613	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	327.9464	0.5190	170.2042	(268)
Total CO2, kg/m2/year			905.3905	(272)
Emissions per m2 for space and water heating			9.8065	(272a)
Fuel factor (electricity)			1.5500	
Emissions per m2 for lighting			2.3972	(272b)
Emissions per m2 for pumps and fans			0.5482	(272c)
Target Carbon Dioxide Emission Rate (TER) = (9.8065 * 1.55) + 2.3972 + 0.5482, rounded to 2 d.p.			18.1500	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Built)

Design SAP
elmhurst energy

Property Reference	PMCC-ROPE-1655-117	**Issued on Date**	06/08/2020
Assessment Reference	ABF	**Prop Type Ref**	
Property	9 Chalkhill Blue Apartments, 4, Salt Marsh Road, SHOREHAM-BY-SEA, West Sussex, BN43 5QP		

SAP Rating	77 C	**DER**	29.66	**TER**	28.07
Environmental	82 B	**% DER<TER**	-5.66		
CO_2 Emissions (t/year)	1.08	**DFEE**	41.30	**TFEE**	45.58
General Requirements Compliance	Fail	**% DFEE<TFEE**	9.39		

Assessor Details	Mr. Malcolm Maclean, SRE Limited, Tel: 01730 710044, malcolm@sre.co.uk	**Assessor ID**	V497-0002
Client			

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

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS BUILT

Top-floor flat, total floor area 50 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.
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1a TER and DER
Fuel for main heating:Electricity
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 28.07 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 29.66 kgCO□/m²Fail
Excess emissions =1.59 kgCO□/m²  (5.7%)
-------------------------------------------------------------------------------------------------
1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)45.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)41.3 kWh/m²/yrOK
-------------------------------------------------------------------------------------------------
2 Fabric U-values
Element         Average                 Highest
External wall   0.18 (max. 0.30)        0.18 (max. 0.70)          OK
Party wall      0.00 (max. 0.20)         -                        OK
Floor           (no floor)
Roof            0.14 (max. 0.20)        0.14 (max. 0.35)          OK
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:         3.34 (measured in this dwelling)
Maximum                                 10.0                                    OK
-------------------------------------------------------------------------------------------------
4 Heating efficiency
Main heating system:                    Boiler system with radiators or underfloor - Electric
Direct-acting boiler


Secondary heating system:               None
-------------------------------------------------------------------------------------------------
5 Cylinder insulation
Hot water storage                       Measured cylinder loss: 1.06 kWh/day
Permitted by DBSCG 1.66                         OK
Primary pipework insulated:             No primary pipework
-------------------------------------------------------------------------------------------------
6 Controls
Space heating controls:                 Time and temperature zone control       OK

Hot water controls:                     Cylinderstat                            OK


-------------------------------------------------------------------------------------------------
7 Low energy lights
Percentage of fixed lights with low-energy fittings:100%
Minimum                                 75%                                     OK
-------------------------------------------------------------------------------------------------
8 Mechanical ventilation
Continuous extract system (decentralised)
Specific fan power:                     0.1800  0.1600
Maximum                                 0.7                                     OK
-------------------------------------------------------------------------------------------------
9 Summertime temperature
Overheating risk (South East England):  Medium                                  OK
Based on:
Overshading:                            Average
Windows facing North:                   7.56 m², No overhang
Air change rate:                        2.00 ach
Blinds/curtains:                        Light-coloured curtain or roller blind, closed 100% of daylight hours
-------------------------------------------------------------------------------------------------
10 Key features
Party wall U-value                      0.00 W/m²K
Party wall U-value                      0.00 W/m²K
Air permeability                        3.3 m³/m²h
Photovoltaic array                      0.61 kW



-------------------------------------------------------------------------------------------------
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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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	50.0000 (1b)	x	2.3800 (2b)	=	119.0000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	119.0000	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(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) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.3400	
Infiltration rate		0.1670	(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) =	0.1420	(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	0.1810	0.1774	0.1739	0.1561	0.1526	0.1349	0.1349	0.1313	0.1420	0.1526	0.1597	0.1668	(22b)

Mechanical extract ventilation - decentralised
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 (Uw = 1.30)			7.5600	1.2357	9.3422			(27)
External Wall	33.5600	7.5600	26.0000	0.1800	4.6800			(29a)
Roof	50.0000		50.0000	0.1400	7.0000			(30)
Total net area of external elements Aum(A, m2)			83.5600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.0222			(33)
Corridor Wall			16.9000	0.0000	0.0000			(32)
Party			16.6600	0.0000	0.0000			(32)
Party Floor 1			50.0000					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)		8.5656	(36)
Total fabric heat loss	(33) + (36) =	29.5878	(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	19.6350	19.6350	19.6350	19.6350	19.6350	19.6350	19.6350	19.6350	19.6350	19.6350	19.6350	19.6350	(38)
Heat transfer coeff	49.2228	49.2228	49.2228	49.2228	49.2228	49.2228	49.2228	49.2228	49.2228	49.2228	49.2228	49.2228	(39)
Average = Sum(39)m / 12 =												49.2228	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9845	0.9845	0.9845	0.9845	0.9845	0.9845	0.9845	0.9845	0.9845	0.9845	0.9845	0.9845	(40)
HLP (average)												0.9845	(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	1.6901	(42)
Average daily hot water use (litres/day)	74.3399	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	81.7739	78.8003	75.8267	72.8531	69.8795	66.9059	66.9059	69.8795	72.8531	75.8267	78.8003	81.7739	(44)
Energy conte	121.2683	106.0620	109.4465	95.4181	91.5560	79.0058	73.2105	84.0101	85.0135	99.0750	108.1481	117.4419	(45)
Energy content (annual)										Total = Sum(45)m =		1169.6560	(45)
Distribution loss (46)m = 0.15 x (45)m	18.1902	15.9093	16.4170	14.3127	13.7334	11.8509	10.9816	12.6015	12.7520	14.8613	16.2222	17.6163	(46)

Water storage loss:

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume												120.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.0600	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.6360	(55)
Total storage loss													
	19.7160	17.8080	19.7160	19.0800	19.7160	19.0800	19.7160	19.7160	19.0800	19.7160	19.0800	19.7160	(56)
If cylinder contains dedicated solar storage													
	19.7160	17.8080	19.7160	19.0800	19.7160	19.0800	19.7160	19.7160	19.0800	19.7160	19.0800	19.7160	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Total heat required for water heating calculated for each month													
	140.9843	123.8700	129.1625	114.4981	111.2720	98.0858	92.9265	103.7261	104.0935	118.7910	127.2281	137.1579	(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													
	140.9843	123.8700	129.1625	114.4981	111.2720	98.0858	92.9265	103.7261	104.0935	118.7910	127.2281	137.1579	(64)
								Total per year (kWh/year) = Sum(64)m =				1401.7960	(64)
Heat gains from water heating, kWh/month													
	56.0945	49.5120	52.1638	46.9905	46.2152	41.5334	40.1153	43.7062	43.5310	48.7152	51.2233	54.8222	(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	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	13.3651	11.8708	9.6540	7.3087	5.4633	4.6124	4.9838	6.4782	8.6950	11.0403	12.8856	13.7366	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	147.2339	148.7618	144.9117	136.7153	126.3689	116.6447	110.1484	108.6205	112.4706	120.6670	131.0134	140.7376	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	(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)													
	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	(71)
Water heating gains (Table 5)													
	75.3959	73.6786	70.1126	65.2646	62.1171	57.6853	53.9184	58.7449	60.4597	65.4775	71.1434	73.6858	(72)
Total internal gains													
	287.3465	285.6627	276.0298	260.6402	245.3009	230.2939	220.4021	225.1951	232.9768	248.5363	266.3940	279.5115	(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	
North	7.5600	10.6334	0.6200	0.8500	0.7700	29.3587	(74)
Solar gains	29.3587	56.1061	95.3379	153.1371	206.2897	220.8393	206.1817	163.5789	114.6271	66.7869	36.2178	24.4749	(83)
Total gains	316.7052	341.7688	371.3677	413.7773	451.5906	451.1332	426.5838	388.7740	347.6039	315.3232	302.6118	303.9864	(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	70.5409	70.5409	70.5409	70.5409	70.5409	70.5409	70.5409	70.5409	70.5409	70.5409	70.5409	70.5409	
alpha	5.7027	5.7027	5.7027	5.7027	5.7027	5.7027	5.7027	5.7027	5.7027	5.7027	5.7027	5.7027	
util living area													
	0.9973	0.9953	0.9883	0.9581	0.8565	0.6684	0.5024	0.5710	0.8408	0.9748	0.9947	0.9979	(86)
MIT	20.0197	20.1240	20.3285	20.6143	20.8625	20.9739	20.9956	20.9914	20.9082	20.6039	20.2578	19.9859	(87)
Th 2	20.0963	20.0963	20.0963	20.0963	20.0963	20.0963	20.0963	20.0963	20.0963	20.0963	20.0963	20.0963	(88)
util rest of house													
	0.9965	0.9937	0.9842	0.9431	0.8106	0.5863	0.4021	0.4647	0.7734	0.9629	0.9926	0.9972	(89)
MIT 2	18.7859	18.9379	19.2347	19.6399	19.9624	20.0791	20.0947	20.0927	20.0217	19.6316	19.1337	18.7367	(90)
Living area fraction										fLA = Living area / (4) =		0.4800	(91)
MIT	19.3781	19.5072	19.7597	20.1076	20.3945	20.5086	20.5271	20.5240	20.4472	20.0983	19.6733	19.3363	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3781	19.5072	19.7597	20.1076	20.3945	20.5086	20.5271	20.5240	20.4472	20.0983	19.6733	19.3363	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9955	0.9924	0.9823	0.9433	0.8270	0.6249	0.4504	0.5159	0.8019	0.9629	0.9913	0.9964	(94)
Useful gains	315.2885	339.1710	364.7950	390.3051	373.4748	281.9146	192.1402	200.5816	278.7478	303.6268	299.9758	302.9000	(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													
	742.1883	719.0078	652.6815	551.6700	427.9660	290.8385	193.3040	202.9973	312.4277	467.5327	618.8927	745.0519	(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													
	317.6134	255.2504	214.1875	116.1827	40.5415	0.0000	0.0000	0.0000	0.0000	121.9460	229.6202	328.9610	(98)
Space heating												1624.3027	(98)
Space heating per m2											(98) / (4) =	32.4861	(99)

8c. Space cooling requirement

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	1624.3027	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	317.6134	255.2504	214.1875	116.1827	40.5415	0.0000	0.0000	0.0000	0.0000	121.9460	229.6202	328.9610	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	317.6134	255.2504	214.1875	116.1827	40.5415	0.0000	0.0000	0.0000	0.0000	121.9460	229.6202	328.9610	(211)
Water heating requirement													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	140.9843	123.8700	129.1625	114.4981	111.2720	98.0858	92.9265	103.7261	104.0935	118.7910	127.2281	137.1579	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	140.9843	123.8700	129.1625	114.4981	111.2720	98.0858	92.9265	103.7261	104.0935	118.7910	127.2281	137.1579	(219)
Water heating fuel used												1401.7960	(219)
Annual totals kWh/year													
Space heating fuel - main system												1624.3027	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 4.2640, total flow = 21.0000, SFP = 0.2030)													
mechanical ventilation fans (SFP = 0.2030)												29.4785	(230a)
central heating pump												30.0000	(230c)
Total electricity for the above, kWh/year												59.4785	(231)
Electricity for lighting (calculated in Appendix L)												236.0326	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.61 * 951 * 1.00) =												-463.9006	(233)
Total delivered energy for all uses												2857.7092	(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	1624.3027	0.5190	843.0131	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1401.7960	0.5190	727.5321	(264)
Space and water heating			1570.5453	(265)
Pumps and fans	59.4785	0.5190	30.8693	(267)
Energy for lighting	236.0326	0.5190	122.5009	(268)
Energy saving/generation technologies				
PV Unit	-463.9006	0.5190	-240.7644	(269)
Total CO2, kg/year			1483.1511	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			29.6600	(273)

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

DER		29.6600	ZC1
Total Floor Area	TFA	50.0000	
Assumed number of occupants	N	1.6901	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.4495	ZC2
CO2 emissions from cooking, equation (L16)		3.1912	ZC3
Total CO2 emissions		50.3008	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		50.3008	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	50.0000 (1b)	x	2.3800 (2b)	=	119.0000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	119.0000	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							2 * 10 =	20.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1681	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4181	(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) =	0.3554	(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	0.4531	0.4442	0.4353	0.3909	0.3820	0.3376	0.3376	0.3287	0.3554	0.3820	0.3998	0.4175	(22b)
Effective ac	0.6026	0.5987	0.5947	0.5764	0.5730	0.5570	0.5570	0.5540	0.5631	0.5730	0.5799	0.5872	(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)			7.5600	1.3258	10.0227			(27)
External Wall	33.5600	7.5600	26.0000	0.1800	4.6800			(29a)
Roof	50.0000		50.0000	0.1300	6.5000			(30)
Total net area of external elements Aum(A, m2)			83.5600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.2027			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.0868	(36)
Total fabric heat loss					(33) + (36) =		26.2895	(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	23.6657	23.5092	23.3558	22.6352	22.5004	21.8727	21.8727	21.7565	22.1145	22.5004	22.7731	23.0582	(38)
Heat transfer coeff	49.9552	49.7987	49.6453	48.9247	48.7899	48.1623	48.1623	48.0460	48.4040	48.7899	49.0626	49.3478	(39)
Average = Sum(39)m / 12 =												48.9241	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9991	0.9960	0.9929	0.9785	0.9758	0.9632	0.9632	0.9609	0.9681	0.9758	0.9813	0.9870	(40)
HLP (average)												0.9785	(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												1.6901	(42)
Average daily hot water use (litres/day)												74.3399	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	81.7739	78.8003	75.8267	72.8531	69.8795	66.9059	66.9059	69.8795	72.8531	75.8267	78.8003	81.7739	(44)
Energy conte	121.2683	106.0620	109.4465	95.4181	91.5560	79.0058	73.2105	84.0101	85.0135	99.0750	108.1481	117.4419	(45)
Energy content (annual)										Total = Sum(45)m =		1169.6560	(45)
Distribution loss (46)m = 0.15 x (45)m	18.1902	15.9093	16.4170	14.3127	13.7334	11.8509	10.9816	12.6015	12.7520	14.8613	16.2222	17.6163	(46)
Water storage loss:													
Store volume												120.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.2247	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.6613	(55)
Total storage loss	20.5007	18.5168	20.5007	19.8394	20.5007	19.8394	20.5007	20.5007	19.8394	20.5007	19.8394	20.5007	(56)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage

	20.5007	18.5168	20.5007	19.8394	20.5007	19.8394	20.5007	20.5007	19.8394	20.5007	19.8394	20.5007	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	165.0314	145.5900	153.2096	137.7695	135.3191	121.3572	116.9736	127.7733	127.3649	142.8381	150.4995	161.2050	(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													
	165.0314	145.5900	153.2096	137.7695	135.3191	121.3572	116.9736	127.7733	127.3649	142.8381	150.4995	161.2050	(64)
								Total per year (kWh/year) = Sum(64)m =				1684.9313	(64)
Heat gains from water heating, kWh/month													
	75.3322	66.8880	71.4015	65.6076	65.4528	60.1506	59.3530	62.9439	62.1481	67.9529	69.8404	74.0599	(65)

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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	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	13.8524	12.3036	10.0059	7.5751	5.6625	4.7805	5.1655	6.7143	9.0120	11.4428	13.3554	14.2374	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	147.2339	148.7618	144.9117	136.7153	126.3689	116.6447	110.1484	108.6205	112.4706	120.6670	131.0134	140.7376	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	(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)													
	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	(71)
Water heating gains (Table 5)													
	101.2530	99.5357	95.9697	91.1217	87.9743	83.5424	79.7755	84.6020	86.3168	91.3346	97.0005	99.5429	(72)
Total internal gains													
	313.6908	311.9526	302.2388	286.7637	271.3572	256.3192	246.4409	251.2884	259.1509	274.7958	292.7208	305.8694	(73)

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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	
North	7.5600	10.6334	0.6300	0.7000	0.7700	24.5678	(74)

Solar gains	24.5678	46.9502	79.7799	128.1470	172.6258	184.8010	172.5353	136.8848	95.9213	55.8881	30.3075	20.4809	(83)
Total gains	338.2585	358.9028	382.0188	414.9107	443.9829	441.1202	418.9763	388.1731	355.0722	330.6840	323.0283	326.3503	(84)

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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	69.5067	69.7251	69.9406	70.9707	71.1669	72.0943	72.0943	72.2687	71.7342	71.1669	70.7712	70.3623	
alpha	5.6338	5.6483	5.6627	5.7314	5.7445	5.8063	5.8063	5.8179	5.7823	5.7445	5.7181	5.6908	
util living area													
	0.9963	0.9941	0.9868	0.9571	0.8608	0.6700	0.5010	0.5599	0.8252	0.9685	0.9926	0.9970	(86)
MIT	20.0396	20.1401	20.3370	20.6221	20.8612	20.9753	20.9961	20.9929	20.9204	20.6369	20.2998	20.0250	(87)
Th 2	20.0841	20.0867	20.0892	20.1013	20.1036	20.1141	20.1141	20.1160	20.1100	20.1036	20.0990	20.0942	(88)
util rest of house													
	0.9951	0.9921	0.9823	0.9418	0.8158	0.5890	0.4027	0.4572	0.7562	0.9542	0.9898	0.9960	(89)
MIT 2	18.8058	18.9539	19.2413	19.6547	19.9677	20.0977	20.1126	20.1130	20.0463	19.6826	19.1963	18.7920	(90)
Living area fraction									fLA = Living area / (4) =			0.4800	(91)
MIT	19.3980	19.5233	19.7673	20.1190	20.3966	20.5190	20.5367	20.5353	20.4659	20.1407	19.7260	19.3838	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3980	19.5233	19.7673	20.1190	20.3966	20.5190	20.5367	20.5353	20.4659	20.1407	19.7260	19.3838	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9940	0.9906	0.9803	0.9421	0.8318	0.6271	0.4500	0.5067	0.7860	0.9549	0.9883	0.9950	(94)
Useful gains	336.2123	355.5267	374.4789	390.8896	369.2843	276.6458	188.5542	196.6956	279.0871	315.7641	319.2463	324.7180	(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													
	754.2253	728.2205	658.6569	548.8884	424.3059	285.0715	189.5983	198.6867	308.1333	465.4895	619.4638	749.2879	(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													
	311.0017	250.4502	211.4285	113.7591	40.9360	0.0000	0.0000	0.0000	0.0000	111.3957	216.1566	315.8800	(98)
Space heating												1571.0079	(98)
Space heating per m2											(98) / (4) =	31.4202	(99)

8c. Space cooling requirement

Not applicable

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

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												93.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												1680.2223	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	311.0017	250.4502	211.4285	113.7591	40.9360	0.0000	0.0000	0.0000	0.0000	111.3957	216.1566	315.8800	(98)
Space heating efficiency (main heating system 1)													
	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)													
	332.6221	267.8612	226.1267	121.6675	43.7819	0.0000	0.0000	0.0000	0.0000	119.1398	231.1835	337.8396	(211)
Water heating requirement													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	165.0314	145.5900	153.2096	137.7695	135.3191	121.3572	116.9736	127.7733	127.3649	142.8381	150.4995	161.2050	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.4800	86.2487	85.6733	84.3082	82.0532	79.8000	79.8000	79.8000	79.8000	84.1599	85.7790	86.5775	(217)
Fuel for water heating, kWh/month													
	190.8319	168.8026	178.8301	163.4118	164.9163	152.0767	146.5835	160.1169	159.6051	169.7223	175.4504	186.1974	(219)
Water heating fuel used												2016.5451	(219)
Annual totals kWh/year													
Space heating fuel - main system												1680.2223	(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)												244.6374	(232)
Total delivered energy for all uses												4016.4047	(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	1680.2223	0.2160	362.9280	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2016.5451	0.2160	435.5737	(264)
Space and water heating			798.5017	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	244.6374	0.5190	126.9668	(268)
Total CO2, kg/m2/year			964.3935	(272)
Emissions per m2 for space and water heating			15.9700	(272a)
Fuel factor (electricity)			1.5500	
Emissions per m2 for lighting			2.5393	(272b)
Emissions per m2 for pumps and fans			0.7785	(272c)
Target Carbon Dioxide Emission Rate (TER) = (15.9700 * 1.55) + 2.5393 + 0.7785, rounded to 2 d.p.			28.0700	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Built)

Design SAP
elmhurst energy

Property Reference	PMCC-ROPE-1655-118	**Issued on Date**	06/08/2020
Assessment Reference	ABF	**Prop Type Ref**	
Property	10 Chalkhill Blue Apartments, 4, Salt Marsh Road, SHOREHAM-BY-SEA, West Sussex, BN43 5QP		

SAP Rating	75 C	**DER**	27.68	**TER**	25.63
Environmental	81 B	**% DER<TER**	-8.00		
CO_2 Emissions (t/year)	1.39	**DFEE**	41.01	**TFEE**	46.47
General Requirements Compliance	Fail	**% DFEE<TFEE**	11.75		

Assessor Details	Mr. Malcolm Maclean, SRE Limited, Tel: 01730 710044, malcolm@sre.co.uk	**Assessor ID**	V497-0002
Client			

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

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS BUILT

Top-floor flat, total floor area 70 m²

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

1a TER and DER
Fuel for main heating:Electricity
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 25.63 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 27.68 kgCO□/m²Fail
Excess emissions =2.05 kgCO□/m² (8.0%)

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)46.5 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)41.0 kWh/m²/yrOK
---
2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.14 (max. 0.20)	0.14 (max. 0.35)	OK
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: 2.28 (measured in this dwelling)
Maximum 10.0 OK
---
4 Heating efficiency
Main heating system: Boiler system with radiators or underfloor - Electric
Direct-acting boiler

Secondary heating system: None
---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 1.30 kWh/day
Permitted by DBSCG 1.89 OK
Primary pipework insulated: No primary pipework
---
6 Controls
Space heating controls: Time and temperature zone control OK

Hot water controls: Cylinderstat OK

---
7 Low energy lights
Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK
---
8 Mechanical ventilation
Continuous extract system (decentralised)
Specific fan power: 0.1800 0.1600
Maximum 0.7 OK
---
9 Summertime temperature
Overheating risk (South East England): Medium OK
Based on:
Overshading: Average
Windows facing North: 6.62 m², No overhang
Windows facing North East: 7.56 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: Light-coloured curtain or roller blind, closed 100% of daylight hours
---
10 Key features
Party wall U-value 0.00 W/m²K
Party wall U-value 0.00 W/m²K
Air permeability 2.3 m³/m²h
Photovoltaic array 0.85 kW

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	70.0000 (1b)	x	2.3800 (2b)	=	166.6000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	166.6000	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(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) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		2.2800	
Infiltration rate		0.1140	(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) =	0.0969	(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	0.1235	0.1211	0.1187	0.1066	0.1042	0.0921	0.0921	0.0896	0.0969	0.1042	0.1090	0.1139	(22b)
Mechanical extract ventilation - decentralised													
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 (Uw = 1.30)			14.1800	1.2357	17.5228			(27)
External Wall	38.4400	14.1800	24.2600	0.1800	4.3668			(29a)
Roof	70.0000		70.0000	0.1400	9.8000			(30)
Total net area of external elements Aum(A, m2)			108.4400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.6896			(33)
Corridor Wall			9.2800	0.0000	0.0000			(32)
Party			34.7500	0.0000	0.0000			(32)
Party Floor 1			70.0000					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)		12.1026	(36)
Total fabric heat loss	(33) + (36) =	43.7922	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.4890	27.4890	27.4890	27.4890	27.4890	27.4890	27.4890	27.4890	27.4890	27.4890	27.4890	27.4890	(38)
Heat transfer coeff	71.2812	71.2812	71.2812	71.2812	71.2812	71.2812	71.2812	71.2812	71.2812	71.2812	71.2812	71.2812	(39)
Average = Sum(39)m / 12 =												71.2812	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0183	1.0183	1.0183	1.0183	1.0183	1.0183	1.0183	1.0183	1.0183	1.0183	1.0183	1.0183	(40)
HLP (average)												1.0183	(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		2.2461 (42)
Average daily hot water use (litres/day)		87.5455 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	96.3000	92.7982	89.2964	85.7946	82.2927	78.7909	78.7909	82.2927	85.7946	89.2964	92.7982	96.3000	(44)
Energy conte	142.8101	124.9027	128.8884	112.3680	107.8198	93.0403	86.2155	98.9335	100.1151	116.6745	127.3593	138.3040	(45)
Energy content (annual)										Total = Sum(45)m =		1377.4311	(45)
Distribution loss (46)m = 0.15 x (45)m	21.4215	18.7354	19.3333	16.8552	16.1730	13.9560	12.9323	14.8400	15.0173	17.5012	19.1039	20.7456	(46)
Water storage loss:													

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3000	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.7800	(55)
Total storage loss													
	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(56)
If cylinder contains dedicated solar storage													
	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Total heat required for water heating calculated for each month													
	166.9901	146.7427	153.0684	135.7680	131.9998	116.4403	110.3955	123.1135	123.5151	140.8545	150.7593	162.4840	(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													
	166.9901	146.7427	153.0684	135.7680	131.9998	116.4403	110.3955	123.1135	123.5151	140.8545	150.7593	162.4840	(64)
Total per year (kWh/year) = Sum(64)m =												1662.1311	(64)
Heat gains from water heating, kWh/month													
	66.8284	59.0021	62.1994	56.0824	55.1941	49.6559	48.0106	52.2394	52.0083	58.1383	61.0670	65.3301	(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	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.5892	15.6226	12.7051	9.6186	7.1900	6.0701	6.5590	8.5256	11.4430	14.5296	16.9581	18.0780	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	197.2971	199.3444	194.1852	183.2019	169.3374	156.3068	147.6015	145.5542	150.7134	161.6967	175.5612	188.5918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	(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)													
	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	(71)
Water heating gains (Table 5)													
	89.8231	87.8008	83.6013	77.8922	74.1856	68.9665	64.5304	70.2142	72.2337	78.1428	84.8152	87.8092	(72)
Total internal gains													
	364.4012	362.4596	350.1835	330.4045	310.4049	291.0353	278.3828	283.9859	294.0820	314.0610	337.0264	354.1709	(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	
North	6.6200	10.6334	0.6200	0.8500	0.7700	25.7083	(74)
Northeast	7.5600	11.2829	0.6200	0.8500	0.7700	31.1521	(75)

Solar gains	56.8605	112.5410	197.7304	321.7221	432.8458	462.2586	432.0753	343.7623	239.5858	135.9761	70.9120	46.8721	(83)
Total gains	421.2617	475.0006	547.9138	652.1266	743.2507	753.2938	710.4581	627.7482	533.6678	450.0371	407.9384	401.0431	(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	68.1962	68.1962	68.1962	68.1962	68.1962	68.1962	68.1962	68.1962	68.1962	68.1962	68.1962	68.1962	
alpha	5.5464	5.5464	5.5464	5.5464	5.5464	5.5464	5.5464	5.5464	5.5464	5.5464	5.5464	5.5464	
util living area													
	0.9980	0.9956	0.9859	0.9384	0.7949	0.5902	0.4388	0.5154	0.8107	0.9744	0.9957	0.9985	(86)
MIT	19.9415	20.0725	20.3218	20.6556	20.9009	20.9841	20.9974	20.9940	20.9186	20.5837	20.1964	19.9043	(87)
Th 2	20.0681	20.0681	20.0681	20.0681	20.0681	20.0681	20.0681	20.0681	20.0681	20.0681	20.0681	20.0681	(88)
util rest of house													
	0.9973	0.9941	0.9810	0.9180	0.7412	0.5109	0.3473	0.4146	0.7377	0.9621	0.9940	0.9979	(89)
MIT 2	18.6510	18.8420	19.2031	19.6706	19.9764	20.0582	20.0672	20.0657	20.0042	19.5811	19.0234	18.5966	(90)
Living area fraction									fLA = Living area / (4) =			0.3771	(91)
MIT	19.1377	19.3061	19.6250	20.0421	20.3251	20.4074	20.4180	20.4158	20.3491	19.9592	19.4658	19.0898	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1377	19.3061	19.6250	20.0421	20.3251	20.4074	20.4180	20.4158	20.3491	19.9592	19.4658	19.0898	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9963	0.9925	0.9780	0.9173	0.7570	0.5404	0.3819	0.4528	0.7617	0.9603	0.9925	0.9972	(94)
Useful gains	419.7215	471.4301	535.8749	598.1885	562.6475	407.0828	271.3308	284.2423	406.4739	432.1818	404.8644	399.9120	(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													
	1057.6513	1026.8823	935.5641	794.2192	614.8043	413.9568	272.1521	286.2531	445.4410	667.1362	881.4469	1061.3616	(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													
	474.6198	373.2639	297.3688	141.1421	38.8047	0.0000	0.0000	0.0000	0.0000	174.8061	343.1394	492.1185	(98)
Space heating												2335.2632	(98)
Space heating per m2											(98) / (4) =	33.3609	(99)

8c. Space cooling requirement

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2335.2632	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	474.6198	373.2639	297.3688	141.1421	38.8047	0.0000	0.0000	0.0000	0.0000	174.8061	343.1394	492.1185	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	474.6198	373.2639	297.3688	141.1421	38.8047	0.0000	0.0000	0.0000	0.0000	174.8061	343.1394	492.1185	(211)
Water heating requirement													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	166.9901	146.7427	153.0684	135.7680	131.9998	116.4403	110.3955	123.1135	123.5151	140.8545	150.7593	162.4840	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	166.9901	146.7427	153.0684	135.7680	131.9998	116.4403	110.3955	123.1135	123.5151	140.8545	150.7593	162.4840	(219)
Water heating fuel used												1662.1311	(219)
Annual totals kWh/year													
Space heating fuel - main system												2335.2632	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 4.2640, total flow = 21.0000, SFP = 0.2030)													
mechanical ventilation fans (SFP = 0.2030)												41.2698	(230a)
central heating pump												30.0000	(230c)
Total electricity for the above, kWh/year												71.2698	(231)
Electricity for lighting (calculated in Appendix L)												310.6304	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.85 * 951 * 1.00) =												-646.4189	(233)
Total delivered energy for all uses												3732.8756	(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	2335.2632	0.5190	1212.0016	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1662.1311	0.5190	862.6460	(264)
Space and water heating			2074.6476	(265)
Pumps and fans	71.2698	0.5190	36.9890	(267)
Energy for lighting	310.6304	0.5190	161.2172	(268)
Energy saving/generation technologies				
PV Unit	-646.4189	0.5190	-335.4914	(269)
Total CO2, kg/year			1937.3624	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			27.6800	(273)

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

DER		27.6800	ZC1
Total Floor Area	TFA	70.0000	
Assumed number of occupants	N	2.2461	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.7020	ZC2
CO2 emissions from cooking, equation (L16)		2.4701	ZC3
Total CO2 emissions		46.8521	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		46.8521	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	70.0000 (1b)	x	2.3800 (2b)	=	166.6000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	166.6000	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							2 * 10 =	20.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1200	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3700	(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) =	0.3145	(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	0.4010	0.3932	0.3853	0.3460	0.3381	0.2988	0.2988	0.2910	0.3145	0.3381	0.3539	0.3696	(22b)
Effective ac	0.5804	0.5773	0.5742	0.5599	0.5572	0.5446	0.5446	0.5423	0.5495	0.5572	0.5626	0.5683	(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)			14.1800	1.3258	18.7992			(27)
External Wall	38.4400	14.1800	24.2600	0.1800	4.3668			(29a)
Roof	70.0000		70.0000	0.1300	9.1000			(30)
Total net area of external elements Aum(A, m2)			108.4400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.2660			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.2798	(36)
Total fabric heat loss					(33) + (36) =		39.5458	(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	31.9101	31.7385	31.5702	30.7798	30.6319	29.9435	29.9435	29.8160	30.2086	30.6319	30.9311	31.2438	(38)
Heat transfer coeff	71.4560	71.2843	71.1160	70.3256	70.1777	69.4893	69.4893	69.3618	69.7545	70.1777	70.4769	70.7897	(39)
Average = Sum(39)m / 12 =												70.3249	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0208	1.0183	1.0159	1.0047	1.0025	0.9927	0.9927	0.9909	0.9965	1.0025	1.0068	1.0113	(40)
HLP (average)												1.0046	(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												2.2461	(42)
Average daily hot water use (litres/day)												87.5455	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	96.3000	92.7982	89.2964	85.7946	82.2927	78.7909	78.7909	82.2927	85.7946	89.2964	92.7982	96.3000	(44)
Energy conte	142.8101	124.9027	128.8884	112.3680	107.8198	93.0403	86.2155	98.9335	100.1151	116.6745	127.3593	138.3040	(45)
Energy content (annual)										Total = Sum(45)m =		1377.4311	(45)
Distribution loss (46)m = 0.15 x (45)m	21.4215	18.7354	19.3333	16.8552	16.1730	13.9560	12.9323	14.8400	15.0173	17.5012	19.1039	20.7456	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage

	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)

Total heat required for water heating calculated for each month

	189.4050	166.9884	175.4833	157.4598	154.4147	138.1321	132.8104	145.5284	145.2069	163.2694	172.4512	184.8989 (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

	189.4050	166.9884	175.4833	157.4598	154.4147	138.1321	132.8104	145.5284	145.2069	163.2694	172.4512	184.8989 (64)

Total per year (kWh/year) = Sum(64)m = 1926.0485 (64)

Heat gains from water heating, kWh/month

	84.7603	75.1987	80.1313	73.4358	73.1260	67.0094	65.9426	70.1713	69.3617	76.0702	78.4205	83.2620 (65)

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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	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	17.6904	15.7125	12.7782	9.6740	7.2314	6.1050	6.5967	8.5747	11.5089	14.6132	17.0558	18.1821 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	197.2971	199.3444	194.1852	183.2019	169.3374	156.3068	147.6015	145.5542	150.7134	161.6967	175.5612	188.5918 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306 (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)

	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450 (71)

Water heating gains (Table 5)

	113.9251	111.9028	107.7034	101.9942	98.2876	93.0686	88.6325	94.3163	96.3358	102.2449	108.9173	111.9113 (72)

Total internal gains

	388.6045	386.6516	374.3587	354.5619	334.5483	315.1722	302.5226	308.1370	318.2499	338.2466	361.2261	378.3771 (73)

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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	
North	6.6200	10.6334	0.6300	0.7000	0.7700	21.5130	(74)
Northeast	7.5600	11.2829	0.6300	0.7000	0.7700	26.0685	(75)

Solar gains	47.5815	94.1757	165.4632	269.2209	362.2106	386.8236	361.5659	287.6645	200.4883	113.7865	59.3400	39.2232 (83)
Total gains	436.1860	480.8273	539.8218	623.7828	696.7589	701.9958	664.0885	595.8015	518.7382	452.0331	420.5661	417.6002 (84)

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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	68.0295	68.1933	68.3547	69.1229	69.2686	69.9548	69.9548	70.0834	69.6889	69.2686	68.9745	68.6698	
alpha	5.5353	5.5462	5.5570	5.6082	5.6179	5.6637	5.6637	5.6722	5.6459	5.6179	5.5983	5.5780	
util living area	0.9976	0.9953	0.9867	0.9463	0.8198	0.6151	0.4573	0.5282	0.8160	0.9731	0.9950	0.9981	(86)
MIT	19.9583	20.0802	20.3144	20.6408	20.8877	20.9822	20.9972	20.9940	20.9199	20.6002	20.2269	19.9368	(87)
Th 2	20.0660	20.0681	20.0701	20.0795	20.0812	20.0894	20.0894	20.0909	20.0863	20.0812	20.0777	20.0739	(88)
util rest of house	0.9968	0.9938	0.9821	0.9280	0.7688	0.5354	0.3644	0.4276	0.7446	0.9604	0.9930	0.9975	(89)
MIT 2	18.6739	18.8532	19.1941	19.6609	19.9752	20.0781	20.0884	20.0885	20.0229	19.6143	19.0749	18.6483	(90)
Living area fraction									fLA = Living area / (4) =			0.3771	(91)
MIT	19.1583	19.3160	19.6166	20.0305	20.3194	20.4191	20.4311	20.4300	20.3612	19.9861	19.5093	19.1342	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1583	19.3160	19.6166	20.0305	20.3194	20.4191	20.4311	20.4300	20.3612	19.9861	19.5093	19.1342	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9957	0.9921	0.9793	0.9268	0.7830	0.5650	0.3995	0.4657	0.7680	0.9587	0.9913	0.9966	(94)
Useful gains	434.3122	477.0114	528.6267	578.1341	545.5819	396.6276	265.3198	277.4858	398.3870	433.3839	416.9140	416.1767	(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	1061.7118	1027.6321	932.8039	782.7574	604.8869	404.3625	266.2221	279.5268	436.7470	658.6957	874.5725	1057.1899	(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	466.7853	370.0171	300.7078	147.3287	44.1229	0.0000	0.0000	0.0000	0.0000	167.6320	329.5141	476.9138	(98)
Space heating												2303.0217	(98)
Space heating per m2											(98) / (4) =	32.9003	(99)

8c. Space cooling requirement

Not applicable

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												93.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2463.1248	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	466.7853	370.0171	300.7078	147.3287	44.1229	0.0000	0.0000	0.0000	0.0000	167.6320	329.5141	476.9138	(98)
Space heating efficiency (main heating system 1)													
	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)													
	499.2356	395.7402	321.6126	157.5708	47.1902	0.0000	0.0000	0.0000	0.0000	179.2856	352.4215	510.0682	(211)
Water heating requirement													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	189.4050	166.9884	175.4833	157.4598	154.4147	138.1321	132.8104	145.5284	145.2069	163.2694	172.4512	184.8989	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.1279	86.8776	86.2387	84.6371	81.9534	79.8000	79.8000	79.8000	79.8000	84.8842	86.5147	87.2322	(217)
Fuel for water heating, kWh/month													
	217.3873	192.2111	203.4854	186.0412	188.4177	173.0979	166.4290	182.3664	181.9636	192.3437	199.3317	211.9618	(219)
Water heating fuel used												2295.0368	(219)
Annual totals kWh/year													
Space heating fuel - main system												2463.1248	(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)												312.4184	(232)
Total delivered energy for all uses												5145.5800	(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	2463.1248	0.2160	532.0350	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2295.0368	0.2160	495.7279	(264)
Space and water heating			1027.7629	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	312.4184	0.5190	162.1452	(268)
Total CO2, kg/m2/year			1228.8331	(272)
Emissions per m2 for space and water heating			14.6823	(272a)
Fuel factor (electricity)			1.5500	
Emissions per m2 for lighting			2.3164	(272b)
Emissions per m2 for pumps and fans			0.5561	(272c)
Target Carbon Dioxide Emission Rate (TER) = (14.6823 * 1.55) + 2.3164 + 0.5561, rounded to 2 d.p.			25.6300	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Built)

Design SAP
elmhurst energy

Property Reference	PMCC-ROPE-1655-119	**Issued on Date**	06/08/2020
Assessment Reference	ABF	**Prop Type Ref**	
Property	11 Chalkhill Blue Apartments, 4, Salt Marsh Road, SHOREHAM-BY-SEA, West Sussex, BN43 5QP		

SAP Rating	75 C	**DER**	25.08	**TER**	24.12
Environmental	82 B	**% DER<TER**	-3.99		
CO_2 Emissions (t/year)	1.42	**DFEE**	38.76	**TFEE**	44.95
General Requirements Compliance	Fail	**% DFEE<TFEE**	13.76		

Assessor Details	Mr. Malcolm Maclean, SRE Limited, Tel: 01730 710044, malcolm@sre.co.uk	**Assessor ID**	V497-0002
Client			

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

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS BUILT

Top-floor flat, total floor area 80 m²

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

1a TER and DER
Fuel for main heating:Electricity
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 24.12 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 25.08 kgCO□/m²Fail
Excess emissions =0.96 kgCO□/m² (4.0%)

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)45.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)38.8 kWh/m²/yrOK
---
2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.14 (max. 0.20)	0.14 (max. 0.35)	OK
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: 2.32 (measured in this dwelling)
Maximum 10.0 OK
---
4 Heating efficiency
Main heating system: Boiler system with radiators or underfloor - Electric
Direct-acting boiler

Secondary heating system: None
---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 1.30 kWh/day
Permitted by DBSCG 1.89 OK
Primary pipework insulated: No primary pipework
---
6 Controls
Space heating controls: Time and temperature zone control OK

Hot water controls: Cylinderstat OK

---
7 Low energy lights
Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK
---
8 Mechanical ventilation
Continuous extract system (decentralised)
Specific fan power: 0.1800 0.1600
Maximum 0.7 OK
---
9 Summertime temperature
Overheating risk (South East England): Medium OK
Based on:
Overshading: Average
Windows facing North East: 12.18 m², No overhang
Windows facing South: 6.62 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: Light-coloured curtain or roller blind, closed 100% of daylight hours
---
10 Key features
Party wall U-value 0.00 W/m²K
Party wall U-value 0.00 W/m²K
Air permeability 2.3 m³/m²h
Photovoltaic array 0.97 kW

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	80.0000 (1b)	x	2.3800 (2b)	=	190.4000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	190.4000	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(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) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		2.3200	
Infiltration rate		0.1160	(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) =	0.0986	(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	0.1257	0.1233	0.1208	0.1085	0.1060	0.0937	0.0937	0.0912	0.0986	0.1060	0.1109	0.1159	(22b)
Mechanical extract ventilation - decentralised													
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 (Uw = 1.30)			18.8000	1.2357	23.2319			(27)
External Wall	47.8400	18.8000	29.0400	0.1800	5.2272			(29a)
Roof	80.0000		80.0000	0.1400	11.2000			(30)
Total net area of external elements Aum(A, m2)			127.8400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.6591			(33)
Corridor Wall			3.5700	0.0000	0.0000			(32)
Party			47.9600	0.0000	0.0000			(32)
Party Floor 1			80.0000					(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.1046	(36)
Total fabric heat loss					(33) + (36) =		53.7637	(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	31.4160	31.4160	31.4160	31.4160	31.4160	31.4160	31.4160	31.4160	31.4160	31.4160	31.4160	31.4160	(38)
Heat transfer coeff	85.1797	85.1797	85.1797	85.1797	85.1797	85.1797	85.1797	85.1797	85.1797	85.1797	85.1797	85.1797	(39)
Average = Sum(39)m / 12 =												85.1797	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0647	1.0647	1.0647	1.0647	1.0647	1.0647	1.0647	1.0647	1.0647	1.0647	1.0647	1.0647	(40)
HLP (average)												1.0647	(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		2.4629 (42)
Average daily hot water use (litres/day)		92.6930 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	101.9622	98.2545	94.5468	90.8391	87.1314	83.4237	83.4237	87.1314	90.8391	94.5468	98.2545	101.9622	(44)
Energy conte	151.2071	132.2467	136.4667	118.9750	114.1593	98.5108	91.2848	104.7506	106.0017	123.5347	134.8478	146.4360	(45)
Energy content (annual)										Total = Sum(45)m =		1458.4211	(45)
Distribution loss (46)m = 0.15 x (45)m	22.6811	19.8370	20.4700	17.8462	17.1239	14.7766	13.6927	15.7126	15.9002	18.5302	20.2272	21.9654	(46)
Water storage loss:													

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3000	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.7800	(55)
Total storage loss													
	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(56)
If cylinder contains dedicated solar storage													
	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Total heat required for water heating calculated for each month													
	175.3871	154.0867	160.6467	142.3750	138.3393	121.9108	115.4648	128.9306	129.4017	147.7147	158.2478	170.6160	(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													
	175.3871	154.0867	160.6467	142.3750	138.3393	121.9108	115.4648	128.9306	129.4017	147.7147	158.2478	170.6160	(64)
								Total per year (kWh/year) = Sum(64)m =				1743.1211	(64)
Heat gains from water heating, kWh/month													
	69.6203	61.4440	64.7192	58.2792	57.3020	51.4748	49.6962	54.1736	53.9655	60.4193	63.5569	68.0340	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	19.5633	17.3759	14.1311	10.6981	7.9970	6.7514	7.2951	9.4825	12.7273	16.1603	18.8614	20.1070	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.4405	221.7177	215.9794	203.7634	188.3429	173.8497	164.1674	161.8903	167.6286	179.8446	195.2651	209.7582	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	(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)													
	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	(71)
Water heating gains (Table 5)													
	93.5757	91.4345	86.9881	80.9433	77.0188	71.4928	66.7959	72.8139	74.9522	81.2087	88.2735	91.4435	(72)
Total internal gains													
	395.5225	393.4711	380.0415	358.3477	336.3015	315.0369	301.2014	307.1296	318.2510	340.1565	365.3429	384.2517	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	12.1800	11.2829	0.6200	0.8500	0.7700	50.1896	(75)
South	6.6200	46.7521	0.6200	0.8500	0.7700	113.0323	(78)

Solar gains	163.2219	287.2801	419.8713	568.7994	684.0551	700.4636	666.3828	576.6674	470.6134	324.5174	197.1333	138.6577	(83)
Total gains	558.7444	680.7512	799.9128	927.1471	1020.3566	1015.5005	967.5842	883.7970	788.8644	664.6739	562.4762	522.9093	(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	65.2216	65.2216	65.2216	65.2216	65.2216	65.2216	65.2216	65.2216	65.2216	65.2216	65.2216	65.2216	
alpha	5.3481	5.3481	5.3481	5.3481	5.3481	5.3481	5.3481	5.3481	5.3481	5.3481	5.3481	5.3481	
util living area													
	0.9959	0.9880	0.9631	0.8835	0.7203	0.5277	0.3859	0.4401	0.6985	0.9359	0.9901	0.9971	(86)
MIT	19.9673	20.1667	20.4459	20.7477	20.9318	20.9890	20.9983	20.9966	20.9562	20.6855	20.2522	19.9153	(87)
Th 2	20.0297	20.0297	20.0297	20.0297	20.0297	20.0297	20.0297	20.0297	20.0297	20.0297	20.0297	20.0297	(88)
util rest of house													
	0.9946	0.9842	0.9519	0.8517	0.6617	0.4517	0.3016	0.3490	0.6177	0.9104	0.9864	0.9961	(89)
MIT 2	18.6602	18.9490	19.3467	19.7531	19.9697	20.0231	20.0291	20.0284	19.9987	19.6837	19.0752	18.5845	(90)
Living area fraction									fLA = Living area / (4) =			0.4538	(91)
MIT	19.2533	19.5015	19.8455	20.2044	20.4062	20.4614	20.4689	20.4678	20.4331	20.1383	19.6092	19.1883	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2533	19.5015	19.8455	20.2044	20.4062	20.4614	20.4689	20.4678	20.4331	20.1383	19.6092	19.1883	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9931	0.9816	0.9493	0.8580	0.6853	0.4860	0.3399	0.3905	0.6527	0.9137	0.9842	0.9950	(94)
Useful gains	554.8994	668.2057	759.3716	795.4618	699.2378	493.5131	328.8654	345.0786	514.9120	607.3262	553.6079	520.2922	(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													
	1273.7151	1243.7550	1136.7645	962.9066	741.5928	499.2709	329.5507	346.4906	539.4558	812.4669	1065.5345	1276.7027	(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													
	534.7988	386.7691	280.7803	120.5602	31.5121	0.0000	0.0000	0.0000	0.0000	152.6247	368.5872	562.7695	(98)
Space heating												2438.4019	(98)
Space heating per m2											(98) / (4) =	30.4800	(99)

8c. Space cooling requirement

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2438.4019	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	534.7988	386.7691	280.7803	120.5602	31.5121	0.0000	0.0000	0.0000	0.0000	152.6247	368.5872	562.7695	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	534.7988	386.7691	280.7803	120.5602	31.5121	0.0000	0.0000	0.0000	0.0000	152.6247	368.5872	562.7695	(211)
Water heating requirement													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	175.3871	154.0867	160.6467	142.3750	138.3393	121.9108	115.4648	128.9306	129.4017	147.7147	158.2478	170.6160	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	175.3871	154.0867	160.6467	142.3750	138.3393	121.9108	115.4648	128.9306	129.4017	147.7147	158.2478	170.6160	(219)
Water heating fuel used												1743.1211	(219)
Annual totals kWh/year													
Space heating fuel - main system												2438.4019	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 4.2640, total flow = 21.0000, SFP = 0.2030)													
mechanical ventilation fans (SFP = 0.2030)												47.1655	(230a)
central heating pump												30.0000	(230c)
Total electricity for the above, kWh/year												77.1655	(231)
Electricity for lighting (calculated in Appendix L)												345.4937	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.97 * 951 * 1.00) =												-737.6780	(233)
Total delivered energy for all uses												3866.5042	(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	2438.4019	0.5190	1265.5306	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1743.1211	0.5190	904.6798	(264)
Space and water heating			2170.2104	(265)
Pumps and fans	77.1655	0.5190	40.0489	(267)
Energy for lighting	345.4937	0.5190	179.3112	(268)
Energy saving/generation technologies				
PV Unit	-737.6780	0.5190	-382.8549	(269)
Total CO2, kg/year			2006.7157	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			25.0800	(273)

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

DER		25.0800	ZC1
Total Floor Area	TFA	80.0000	
Assumed number of occupants	N	2.4629	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.2545	ZC2
CO2 emissions from cooking, equation (L16)		2.2264	ZC3
Total CO2 emissions		43.5608	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		43.5608	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	80.0000 (1b)	x	2.3800 (2b)	=	190.4000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	190.4000	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							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) =	0.1576	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4076	(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) =	0.3464	(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	0.4417	0.4330	0.4244	0.3811	0.3724	0.3291	0.3291	0.3204	0.3464	0.3724	0.3897	0.4071	(22b)
Effective ac	0.5975	0.5938	0.5900	0.5726	0.5693	0.5542	0.5542	0.5513	0.5600	0.5693	0.5759	0.5828	(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)			18.8000	1.3258	24.9242			(27)
External Wall	47.8400	18.8000	29.0400	0.1800	5.2272			(29a)
Roof	80.0000		80.0000	0.1300	10.4000			(30)
Total net area of external elements Aum(A, m2)			127.8400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.5514			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.2618	(36)
Total fabric heat loss					(33) + (36) =		48.8132	(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	37.5451	37.3071	37.0738	35.9781	35.7731	34.8187	34.8187	34.6420	35.1863	35.7731	36.1878	36.6214	(38)
Heat transfer coeff	86.3584	86.1204	85.8871	84.7913	84.5863	83.6320	83.6320	83.4552	83.9996	84.5863	85.0011	85.4346	(39)
Average = Sum(39)m / 12 =												84.7903	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0795	1.0765	1.0736	1.0599	1.0573	1.0454	1.0454	1.0432	1.0500	1.0573	1.0625	1.0679	(40)
HLP (average)												1.0599	(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												2.4629	(42)
Average daily hot water use (litres/day)												92.6930	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	101.9622	98.2545	94.5468	90.8391	87.1314	83.4237	83.4237	87.1314	90.8391	94.5468	98.2545	101.9622	(44)
Energy conte	151.2071	132.2467	136.4667	118.9750	114.1593	98.5108	91.2848	104.7506	106.0017	123.5347	134.8478	146.4360	(45)
Energy content (annual)										Total = Sum(45)m =		1458.4211	(45)
Distribution loss (46)m = 0.15 x (45)m	22.6811	19.8370	20.4700	17.8462	17.1239	14.7766	13.6927	15.7126	15.9002	18.5302	20.2272	21.9654	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage

	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)

Total heat required for water heating calculated for each month

	197.8020	174.3324	183.0616	164.0668	160.7542	143.6027	137.8797	151.3455	151.0935	170.1296	179.9396	193.0309 (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

	197.8020	174.3324	183.0616	164.0668	160.7542	143.6027	137.8797	151.3455	151.0935	170.1296	179.9396	193.0309 (64)

Total per year (kWh/year) = Sum(64)m = 2007.0385 (64)

Heat gains from water heating, kWh/month

	87.5523	77.6406	82.6511	75.6327	75.2339	68.8283	67.6281	72.1055	71.3190	78.3512	80.9104	85.9659 (65)

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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	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	19.5633	17.3759	14.1311	10.6981	7.9970	6.7514	7.2951	9.4825	12.7273	16.1603	18.8614	20.1070	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	219.4405	221.7177	215.9794	203.7634	188.3429	173.8497	164.1674	161.8903	167.6286	179.8446	195.2651	209.7582	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	(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)

	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	(71)

Water heating gains (Table 5)

	117.6778	115.5366	111.0902	105.0454	101.1208	95.5949	90.8980	96.9160	99.0542	105.3108	112.3755	115.5455	(72)

Total internal gains

	419.6245	417.5731	404.1436	382.4498	360.4036	339.1389	325.3035	331.2317	342.3530	364.2585	389.4450	408.3537	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	12.1800	11.2829	0.6300	0.7000	0.7700	41.9992	(75)
South	6.6200	46.7521	0.6300	0.7000	0.7700	94.5868	(78)

Solar gains	136.5861	240.3995	351.3534	475.9782	572.4256	586.1564	557.6372	482.5623	393.8150	271.5601	164.9635	116.0304	(83)
Total gains	556.2106	657.9726	755.4970	858.4280	932.8292	925.2954	882.9407	813.7940	736.1680	635.8186	554.4085	524.3841	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	64.3314	64.5092	64.6844	65.5203	65.6791	66.4286	66.4286	66.5693	66.1379	65.6791	65.3587	65.0270	
alpha	5.2888	5.3006	5.3123	5.3680	5.3786	5.4286	5.4286	5.4380	5.4092	5.3786	5.3572	5.3351	
util living area	0.9960	0.9898	0.9711	0.9076	0.7636	0.5656	0.4147	0.4675	0.7287	0.9447	0.9907	0.9970	(86)
MIT	19.9437	20.1251	20.3908	20.7054	20.9112	20.9857	20.9978	20.9959	20.9484	20.6668	20.2457	19.9126	(87)
Th 2	20.0176	20.0201	20.0225	20.0337	20.0358	20.0457	20.0457	20.0475	20.0419	20.0358	20.0316	20.0271	(88)
util rest of house	0.9947	0.9865	0.9619	0.8801	0.7067	0.4868	0.3259	0.3729	0.6489	0.9218	0.9872	0.9961	(89)
MIT 2	18.6171	18.8820	19.2645	19.7042	19.9556	20.0369	20.0449	20.0459	20.0044	19.6650	19.0672	18.5786	(90)
Living area fraction									fLA = Living area / (4) =			0.4538	(91)
MIT	19.2191	19.4461	19.7756	20.1585	20.3892	20.4675	20.4773	20.4770	20.4327	20.1195	19.6020	19.1839	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2191	19.4461	19.7756	20.1585	20.3892	20.4675	20.4773	20.4770	20.4327	20.1195	19.6020	19.1839	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9933	0.9841	0.9591	0.8841	0.7286	0.5222	0.3662	0.4160	0.6831	0.9241	0.9851	0.9949	(94)
Useful gains	552.4725	647.5018	724.5654	758.9212	679.6356	483.2134	323.3692	338.5107	502.8727	587.5780	546.1537	521.7273	(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	1288.3851	1252.7124	1140.1986	954.6197	734.9858	490.7071	324.2630	340.2434	531.9474	805.2229	1062.6821	1280.1419	(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	547.5189	406.7015	309.2311	140.9030	41.1805	0.0000	0.0000	0.0000	0.0000	161.9277	371.9005	564.2605	(98)
Space heating												2543.6237	(98)
Space heating per m2											(98) / (4) =	31.7953	(99)

8c. Space cooling requirement

Not applicable

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												93.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2720.4531	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	547.5189	406.7015	309.2311	140.9030	41.1805	0.0000	0.0000	0.0000	0.0000	161.9277	371.9005	564.2605	(98)
Space heating efficiency (main heating system 1)													
	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)													
	585.5817	434.9749	330.7284	150.6984	44.0433	0.0000	0.0000	0.0000	0.0000	173.1847	397.7545	603.4871	(211)
Water heating requirement													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	197.8020	174.3324	183.0616	164.0668	160.7542	143.6027	137.8797	151.3455	151.0935	170.1296	179.9396	193.0309	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.3902	86.9999	86.2019	84.4110	81.7716	79.8000	79.8000	79.8000	79.8000	84.6824	86.7090	87.5091	(217)
Fuel for water heating, kWh/month													
	226.3434	200.3822	212.3637	194.3666	196.5893	179.9532	172.7815	189.6560	189.3402	200.9031	207.5214	220.5837	(219)
Water heating fuel used												2390.7843	(219)
Annual totals kWh/year													
Space heating fuel - main system												2720.4531	(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)												345.4937	(232)
Total delivered energy for all uses												5531.7311	(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	2720.4531	0.2160	587.6179	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2390.7843	0.2160	516.4094	(264)
Space and water heating			1104.0273	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	345.4937	0.5190	179.3112	(268)
Total CO2, kg/m2/year			1322.2635	(272)
Emissions per m2 for space and water heating			13.8003	(272a)
Fuel factor (electricity)			1.5500	
Emissions per m2 for lighting			2.2414	(272b)
Emissions per m2 for pumps and fans			0.4866	(272c)
Target Carbon Dioxide Emission Rate (TER) = (13.8003 * 1.55) + 2.2414 + 0.4866, rounded to 2 d.p.			24.1200	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Built)

Design SAP
elmhurst energy

Property Reference	PMCC-ROPE-1655-120	**Issued on Date**	06/08/2020
Assessment Reference	ABF	**Prop Type Ref**	
Property	12 Chalkhill Blue Apartments, 4, Salt Marsh Road, SHOREHAM-BY-SEA, West Sussex, BN43 5QP		

SAP Rating	80 C	**DER**	20.24	**TER**	21.13
Environmental	86 B	**% DER<TER**	4.22		
CO_2 Emissions (t/year)	1.02	**DFEE**	26.61	**TFEE**	30.89
General Requirements Compliance	Pass	**% DFEE<TFEE**	13.88		

Assessor Details	Mr. Malcolm Maclean, SRE Limited, Tel: 01730 710044, malcolm@sre.co.uk	**Assessor ID**	V497-0002
Client			

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

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS BUILT

Top-floor flat, total floor area 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:Electricity
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 21.13 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 20.24 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)30.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)26.6 kWh/m²/yrOK

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2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.14 (max. 0.20)	0.14 (max. 0.35)	OK
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: 2.53 (measured in this dwelling)
Maximum 10.0 OK

---
4 Heating efficiency
Main heating system: Boiler system with radiators or underfloor - Electric
Direct-acting boiler

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Measured cylinder loss: 1.30 kWh/day
Permitted by DBSCG 1.89 OK
Primary pipework insulated: No primary pipework

---
6 Controls
Space heating controls: Time and temperature zone control OK

Hot water controls: Cylinderstat OK

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

---
8 Mechanical ventilation
Continuous extract system (decentralised)
Specific fan power: 0.1900 0.1800
Maximum 0.7 OK

---
9 Summertime temperature
Overheating risk (South East England): Medium OK
Based on:
Overshading: Average
Windows facing South: 11.35 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: Light-coloured curtain or roller blind, closed 100% of daylight hours

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10 Key features
Party wall U-value 0.00 W/m²K
Party wall U-value 0.00 W/m²K
Air permeability 2.5 m³/m²h
Photovoltaic array 0.86 kW

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	71.0000 (1b)	x	2.3800 (2b)	=	168.9800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	168.9800	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(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) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		2.5300	
Infiltration rate		0.1265	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.0980	(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	0.1250	0.1225	0.1201	0.1078	0.1054	0.0931	0.0931	0.0907	0.0980	0.1054	0.1103	0.1152	(22b)

Mechanical extract ventilation - decentralised
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 (Uw = 1.30)			11.3500	1.2357	14.0257			(27)
External Wall	24.1100	11.3500	12.7600	0.1800	2.2968			(29a)
Roof	71.0000		71.0000	0.1400	9.9400			(30)
Total net area of external elements Aum(A, m2)			95.1100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.2625			(33)
Corridor Wall			36.4600	0.0000	0.0000			(32)
Party			29.7500	0.0000	0.0000			(32)
Party Floor 1			71.0000					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	10.7472	(36)
Total fabric heat loss (33) + (36) =	37.0097	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.8817	27.8817	27.8817	27.8817	27.8817	27.8817	27.8817	27.8817	27.8817	27.8817	27.8817	27.8817	(38)
Heat transfer coeff	64.8914	64.8914	64.8914	64.8914	64.8914	64.8914	64.8914	64.8914	64.8914	64.8914	64.8914	64.8914	(39)

Average = Sum(39)m / 12 = 64.8914 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9140	0.9140	0.9140	0.9140	0.9140	0.9140	0.9140	0.9140	0.9140	0.9140	0.9140	0.9140	(40)
HLP (average)												0.9140	(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	2.2702 (42)
Average daily hot water use (litres/day)	88.1162 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	96.9278	93.4032	89.8785	86.3539	82.8292	79.3046	79.3046	82.8292	86.3539	89.8785	93.4032	96.9278	(44)
Energy conte	143.7412	125.7169	129.7286	113.1005	108.5227	93.6468	86.7775	99.5785	100.7678	117.4351	128.1896	139.2056	(45)
Energy content (annual)										Total = Sum(45)m =		1386.4109	(45)

Distribution loss (46)m = 0.15 x (45)m

	21.5612	18.8575	19.4593	16.9651	16.2784	14.0470	13.0166	14.9368	15.1152	17.6153	19.2284	20.8808	(46)

Water storage loss:

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3000	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.7800	(55)
Total storage loss													
	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(56)
If cylinder contains dedicated solar storage													
	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Total heat required for water heating calculated for each month													
	167.9212	147.5569	153.9086	136.5005	132.7027	117.0468	110.9575	123.7585	124.1678	141.6151	151.5896	163.3856	(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													
	167.9212	147.5569	153.9086	136.5005	132.7027	117.0468	110.9575	123.7585	124.1678	141.6151	151.5896	163.3856	(64)
								Total per year (kWh/year) = Sum(64)m =				1671.1109	(64)
Heat gains from water heating, kWh/month													
	67.1379	59.2729	62.4788	56.3259	55.4278	49.8576	48.1975	52.4538	52.2253	58.3912	61.3430	65.6299	(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	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.9825	15.9719	12.9892	9.8337	7.3508	6.2058	6.7056	8.7162	11.6989	14.8544	17.3373	18.4823	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	199.6196	201.6911	196.4711	185.3585	171.3309	158.1468	149.3391	147.2676	152.4876	163.6002	177.6279	190.8119	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	(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)													
	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	(71)
Water heating gains (Table 5)													
	90.2392	88.2037	83.9768	78.2305	74.4997	69.2466	64.7816	70.5025	72.5351	78.4828	85.1987	88.2122	(72)
Total internal gains													
	367.8936	365.9190	353.4895	333.4750	313.2337	293.6516	280.8787	286.5387	296.7739	316.9897	340.2162	357.5587	(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	11.3500	46.7521	0.6200	0.8500	0.7700	193.7941	(78)

Solar gains	193.7941	317.3848	404.2919	456.9376	476.1573	458.2366	447.7250	434.8030	422.3306	342.3293	229.7121	167.4559	(83)
Total gains	561.6877	683.3037	757.7814	790.4126	789.3909	751.8882	728.6037	721.3417	719.1045	659.3190	569.9283	525.0146	(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	75.9817	75.9817	75.9817	75.9817	75.9817	75.9817	75.9817	75.9817	75.9817	75.9817	75.9817	75.9817	
alpha	6.0654	6.0654	6.0654	6.0654	6.0654	6.0654	6.0654	6.0654	6.0654	6.0654	6.0654	6.0654	
util living area													
	0.9910	0.9723	0.9332	0.8556	0.7230	0.5455	0.3911	0.4127	0.6089	0.8683	0.9763	0.9938	(86)
MIT	20.2715	20.4742	20.6768	20.8495	20.9547	20.9929	20.9992	20.9989	20.9863	20.8585	20.5224	20.2143	(87)
Th 2	20.1556	20.1556	20.1556	20.1556	20.1556	20.1556	20.1556	20.1556	20.1556	20.1556	20.1556	20.1556	(88)
util rest of house													
	0.9883	0.9647	0.9162	0.8224	0.6698	0.4766	0.3165	0.3375	0.5400	0.8308	0.9685	0.9919	(89)
MIT 2	19.1965	19.4861	19.7672	19.9930	20.1153	20.1512	20.1553	20.1552	20.1463	20.0093	19.5580	19.1139	(90)
Living area fraction									fLA = Living area / (4) =			0.3113	(91)
MIT	19.5311	19.7937	20.0504	20.2596	20.3765	20.4132	20.4180	20.4178	20.4078	20.2736	19.8582	19.4564	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5311	19.7937	20.0504	20.2596	20.3765	20.4132	20.4180	20.4178	20.4078	20.2736	19.8582	19.4564	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9857	0.9608	0.9138	0.8268	0.6842	0.4979	0.3397	0.3610	0.5610	0.8365	0.9651	0.9899	(94)
Useful gains	553.6679	656.5507	692.4524	653.5402	540.1382	374.3392	247.5200	260.3729	403.4292	551.5524	550.0638	519.6925	(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													
	988.3679	966.4696	879.3019	737.1402	563.0323	377.2266	247.7557	260.7204	409.3192	627.7331	827.8974	990.0091	(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													
	323.4167	208.2655	139.0160	60.1920	17.0332	0.0000	0.0000	0.0000	0.0000	56.6784	200.0402	349.9155	(98)
Space heating												1354.5577	(98)
Space heating per m2											(98) / (4) =	19.0783	(99)

8c. Space cooling requirement

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												1354.5577	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	323.4167	208.2655	139.0160	60.1920	17.0332	0.0000	0.0000	0.0000	0.0000	56.6784	200.0402	349.9155	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	323.4167	208.2655	139.0160	60.1920	17.0332	0.0000	0.0000	0.0000	0.0000	56.6784	200.0402	349.9155	(211)
Water heating requirement													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	167.9212	147.5569	153.9086	136.5005	132.7027	117.0468	110.9575	123.7585	124.1678	141.6151	151.5896	163.3856	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	167.9212	147.5569	153.9086	136.5005	132.7027	117.0468	110.9575	123.7585	124.1678	141.6151	151.5896	163.3856	(219)
Water heating fuel used												1671.1109	(219)
Annual totals kWh/year													
Space heating fuel - main system												1354.5577	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 5.0830, total flow = 21.0000, SFP = 0.2420)													
mechanical ventilation fans (SFP = 0.2420)												49.8995	(230a)
central heating pump												30.0000	(230c)
Total electricity for the above, kWh/year												79.8995	(231)
Electricity for lighting (calculated in Appendix L)												317.5762	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.86 * 951 * 1.00) =												-654.0238	(233)
Total delivered energy for all uses												2769.1204	(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	1354.5577	0.5190	703.0154	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1671.1109	0.5190	867.3066	(264)
Space and water heating			1570.3220	(265)
Pumps and fans	79.8995	0.5190	41.4678	(267)
Energy for lighting	317.5762	0.5190	164.8220	(268)
Energy saving/generation technologies				
PV Unit	-654.0238	0.5190	-339.4384	(269)
Total CO2, kg/year			1437.1735	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			20.2400	(273)

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

DER		20.2400	ZC1
Total Floor Area	TFA	71.0000	
Assumed number of occupants	N	2.2702	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.6606	ZC2
CO2 emissions from cooking, equation (L16)		2.4434	ZC3
Total CO2 emissions		39.3441	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		39.3441	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	71.0000 (1b)	x	2.3800 (2b)	=	168.9800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	168.9800	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							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) =	0.1775	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4275	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3313	(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	0.4225	0.4142	0.4059	0.3645	0.3562	0.3148	0.3148	0.3065	0.3313	0.3562	0.3728	0.3893	(22b)
Effective ac	0.5892	0.5858	0.5824	0.5664	0.5634	0.5495	0.5495	0.5470	0.5549	0.5634	0.5695	0.5758	(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)			11.3500	1.3258	15.0473			(27)
External Wall	24.1100	11.3500	12.7600	0.1800	2.2968			(29a)
Roof	71.0000		71.0000	0.1300	9.2300			(30)
Total net area of external elements Aum(A, m2)			95.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.5741			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.1266	(36)
Total fabric heat loss					(33) + (36) =		32.7007	(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	32.8578	32.6646	32.4752	31.5855	31.4191	30.6443	30.6443	30.5008	30.9427	31.4191	31.7558	32.1078	(38)
Heat transfer coeff	65.5585	65.3653	65.1759	64.2863	64.1199	63.3450	63.3450	63.2015	63.6435	64.1199	64.4566	64.8086	(39)
Average = Sum(39)m / 12 =												64.2855	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9234	0.9206	0.9180	0.9054	0.9031	0.8922	0.8922	0.8902	0.8964	0.9031	0.9078	0.9128	(40)
HLP (average)												0.9054	(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												2.2702	(42)
Average daily hot water use (litres/day)												88.1162	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	96.9278	93.4032	89.8785	86.3539	82.8292	79.3046	79.3046	82.8292	86.3539	89.8785	93.4032	96.9278	(44)
Energy conte	143.7412	125.7169	129.7286	113.1005	108.5227	93.6468	86.7775	99.5785	100.7678	117.4351	128.1896	139.2056	(45)
Energy content (annual)										Total = Sum(45)m =		1386.4109	(45)
Distribution loss (46)m = 0.15 x (45)m	21.5612	18.8575	19.4593	16.9651	16.2784	14.0470	13.0166	14.9368	15.1152	17.6153	19.2284	20.8808	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage

	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)

Total heat required for water heating calculated for each month

	190.3361	167.8026	176.3235	158.1924	155.1176	138.7387	133.3724	146.1734	145.8596	164.0300	173.2815	185.8005	(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

	190.3361	167.8026	176.3235	158.1924	155.1176	138.7387	133.3724	146.1734	145.8596	164.0300	173.2815	185.8005	(64)

Total per year (kWh/year) = Sum(64)m = 1935.0283 (64)

Heat gains from water heating, kWh/month

	85.0699	75.4695	80.4107	73.6794	73.3597	67.2110	66.1295	70.3858	69.5788	76.3231	78.6965	83.5618	(65)

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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	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	18.5697	16.4934	13.4134	10.1548	7.5908	6.4085	6.9246	9.0008	12.0809	15.3395	17.9035	19.0858	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	199.6196	201.6911	196.4711	185.3585	171.3309	158.1468	149.3391	147.2676	152.4876	163.6002	177.6279	190.8119	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	(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)

	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	(71)

Water heating gains (Table 5)

	114.3412	112.3057	108.0789	102.3325	98.6018	93.3487	88.8837	94.6045	96.6372	102.5848	109.3007	112.3142	(72)

Total internal gains

	392.5829	390.5426	378.0157	357.8981	337.5758	317.9563	305.1997	310.9254	321.2580	341.5768	364.8844	382.2643	(73)

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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	11.3500	46.7521	0.6300	0.7000	0.7700	162.1692	(78)

Solar gains	162.1692	265.5914	338.3164	382.3709	398.4542	383.4579	374.6617	363.8484	353.4114	286.4653	192.2259	140.1292	(83)
Total gains	554.7521	656.1340	716.3321	740.2691	736.0299	701.4142	679.8614	674.7738	674.6694	628.0421	557.1102	522.3934	(84)

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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	75.2084	75.4308	75.6500	76.6968	76.8959	77.8365	77.8365	78.0132	77.4715	76.8959	76.4942	76.0787	
alpha	6.0139	6.0287	6.0433	6.1131	6.1264	6.1891	6.1891	6.2009	6.1648	6.1264	6.0996	6.0719	
util living area	0.9917	0.9774	0.9471	0.8798	0.7557	0.5696	0.4090	0.4295	0.6340	0.8841	0.9784	0.9939	(86)
MIT	20.2485	20.4325	20.6318	20.8247	20.9444	20.9919	20.9991	20.9988	20.9842	20.8454	20.5145	20.2126	(87)
Th 2	20.1477	20.1500	20.1523	20.1629	20.1649	20.1741	20.1741	20.1759	20.1706	20.1649	20.1608	20.1566	(88)
util rest of house	0.9892	0.9710	0.9328	0.8497	0.7036	0.4998	0.3328	0.3533	0.5646	0.8493	0.9712	0.9921	(89)
MIT 2	19.1571	19.4227	19.7040	19.9702	20.1144	20.1690	20.1738	20.1754	20.1596	20.0027	19.5512	19.1121	(90)

Living area fraction fLA = Living area / (4) = 0.3113 (91)

MIT	19.4968	19.7370	19.9928	20.2362	20.3727	20.4251	20.4307	20.4317	20.4163	20.2650	19.8510	19.4546	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4968	19.7370	19.9928	20.2362	20.3727	20.4251	20.4307	20.4317	20.4163	20.2650	19.8510	19.4546	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9867	0.9672	0.9297	0.8526	0.7172	0.5213	0.3565	0.3771	0.5857	0.8539	0.9679	0.9901	(94)
Useful gains	547.3619	634.6302	666.0038	631.1484	527.8587	365.6782	242.3895	254.4290	395.1461	536.2715	539.2316	517.2147	(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	996.2790	969.8268	879.4073	728.7612	556.0949	368.9938	242.6552	254.8074	401.9888	619.7205	821.8883	988.6322	(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	333.9944	225.2521	158.7722	70.2812	21.0078	0.0000	0.0000	0.0000	0.0000	62.0860	203.5129	350.7347	(98)

Space heating 1425.6412 (98)

Space heating per m2 (98) / (4) = 20.0795 (99)

8c. Space cooling requirement

Not applicable

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

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												93.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												1524.7499	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	333.9944	225.2521	158.7722	70.2812	21.0078	0.0000	0.0000	0.0000	0.0000	62.0860	203.5129	350.7347	(98)
Space heating efficiency (main heating system 1)													
	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)													
	357.2132	240.9113	169.8098	75.1671	22.4682	0.0000	0.0000	0.0000	0.0000	66.4022	217.6608	375.1173	(211)
Water heating requirement													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	190.3361	167.8026	176.3235	158.1924	155.1176	138.7387	133.3724	146.1734	145.8596	164.0300	173.2815	185.8005	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.2995	85.6000	84.5357	82.8118	80.9415	79.8000	79.8000	79.8000	79.8000	82.4775	85.2436	86.4843	(217)
Fuel for water heating, kWh/month													
	220.5530	196.0312	208.5789	191.0263	191.6417	173.8580	167.1334	183.1747	182.7815	198.8785	203.2780	214.8374	(219)
Water heating fuel used												2331.7725	(219)
Annual totals kWh/year													
Space heating fuel - main system												1524.7499	(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)												327.9464	(232)
Total delivered energy for all uses												4259.4688	(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	1524.7499	0.2160	329.3460	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2331.7725	0.2160	503.6629	(264)
Space and water heating			833.0088	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	327.9464	0.5190	170.2042	(268)
Total CO2, kg/m2/year			1042.1380	(272)
Emissions per m2 for space and water heating			11.7325	(272a)
Fuel factor (electricity)			1.5500	
Emissions per m2 for lighting			2.3972	(272b)
Emissions per m2 for pumps and fans			0.5482	(272c)
Target Carbon Dioxide Emission Rate (TER) = (11.7325 * 1.55) + 2.3972 + 0.5482, rounded to 2 d.p.			21.1300	(273)