mes buildingsolutions
Part of the FOCUS consultancy group

L1B Energy Report
4 New Broadway, TW12 1JG

15/08/2022

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Client:

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Project:

4 New Broadway
Hampton Hill
London
TW12 1JG

Date:

15/08/2022

Author:

Jack Palmer
Sustainability Consultant

About *MES Building Solutions*

***MES Building Solutions* is an established consultancy practice specialising in providing sustainable building solutions throughout the UK.**

We offer a full range of services for both residential and commercial buildings, from small individual properties through to highly complex mixed use developments.

We are an industry leader in delivering a professional, accredited and certified service to a wide range of clients including architects, developers, builders, housing associations & the public sector.

Employing highly qualified staff, our team comes from a variety of backgrounds within the construction industry with combined knowledge of building design, engineering, assessment, construction, development, research and surveying.

We are renowned for our creative thinking and always provide a high quality, honest and diligent service. We achieve long-term relationships with our clients, with nearly all of our business coming from existing clients or recommendation.

MES Building Solutions maintains its position at the forefront of changes in building regulations as well as technological advances. Our clients, large or small, are therefore assured of a cost effective, cohesive and fully integrated professional service.

About the Author

Jack Palmer is a Sustainability Consultant within MES Building Solutions and has several years' experience in sustainable construction and is a fully qualified On Construction SAP energy assessor.

Table 1: **Standards for controlled fittings**

Fitting	**L1B Minimum Standards** (W/m^2K)
Windows, roof windows or rooflights	1.60
Doors with >50% of internal face glazed	1.80
Other Doors	1.80

Table 2: **Standards for new thermal elements**

Element	**L1B Minimum Standards** (W/m^2K)
Wall	0.28
Pitched roof - insulated at ceiling level	0.16
Pitched roof - insulated at rafter level	0.18
Flat roof or roof with integral insulation	0.18
Floors	0.22
Swimming pool basin	0.22

Table 3: **Standards for retained thermal elements**

Element	**L1B Threshold** (W/m^2K)	**L1B Improved** (W/m^2K)
Wall - cavity insulation	0.70	0.55
Wall - external or internal insulation	0.70	0.30
Floor	0.70	0.25
Pitched roof - insulated at ceiling level	0.35	0.16
Pitched roof - insulated at rafter level	0.35	0.18
Flat roof or roof with integral insulation	0.35	0.18

The below table displays the increase in SAP rating and reductions in CO2 emissions, Dwelling Carbon Dioxide Emissions Rate and Dwelling Fabric Energy Efficiency when comparing the proposed double-glazed dwelling to the retained, single-glazed shopfront dwelling.

Table 4: **Comparison for Single Glazed against Double Glazed Proposal**

Property	SAP Rating	CO2 Emissions (t/yr)	Dwelling Carbon Dioxide Emissions Rate (DER) [kgC02/yr/m²]	Dwelling Fabric Energy Efficiency Rate (DFEE) [kWh/m²/yr]
Flat with Single Glazed	71 C	1.64	46.60	147.89
Flat with Double Glazed	76 C	1.12	35.79	101.12
Reduction:		31.71%	23.20%	31.63%

In all four areas, a significant improvement is can be seen to the fabric, energy and cost efficiency of the property. The improvement in the SAP rating for the proposed double glazed flat means that the overall cost efficiency of the property will financially benefit the end user on a day-to-day basis and allow for long term cost savings. The reductions displayed in the CO2 emissions, DER and DFEE mean that the proposed property operates on a more energy efficient basis than its single glazed counterpart. This is due to there being overall less heat loss, directly as a result from the proposed double glazed windows and wall. Once again, this in turn significantly benefits the end user of the property in terms of a reduction in day-to-day and long term costs.

Please find the SAP calculations attached below.

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

Property Reference	U877-4-New-Broadway-Flat-B-NEW	**Issued on Date**	15/08/2022
Assessment Reference	New	**Prop Type Ref**	Flat B New Front
Property	Flat B New Front, 4, New Broadway, London, Hampton Hill, Greater London, TW12 1JG		

SAP Rating	76 C	**DER**	35.79	**TER**	23.65
Environmental	79 C	**% DER<TER**	-51.32		
CO_2 Emissions (t/year)	1.12	**DFEE**	101.12	**TFEE**	59.27
General Requirements Compliance	N/A	**% DFEE<TFEE**	-70.61		

Assessor Details	Mr. Jack Palmer, Jack Palmer, Tel: 01636653055, jack.palmer@mesbuildingsolutions.co.uk	**Assessor ID**	U877-0001
Client			

Regs Region: England
Elmhurst Energy Systems SAP2012 Calculator (Design System) version 4.14r10

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 DESIGNED

Ground-floor flat, total floor area 40 m²

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

1a TER and DER
Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 23.65 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 35.79 kgCO□/m²Fail
Excess emissions =12.14 kgCO□/m² (51.3%)

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)59.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)101.1 kWh/m²/yrFail
Excess energy =41.8 kWh/m²/yr (70.5%)

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2 Fabric U-values

Element	Average	Highest	
External wall	0.30 (max. 0.30)	0.30 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.25 (max. 0.25)	0.25 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.57 (max. 2.00)	1.60 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated using default y-value of 0.15

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3 Air permeability
Air permeability at 50 pascals: 15.00 (assumed) OK

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4 Heating efficiency
Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
tbc tbc

Efficiency: 89%
Minimum: 88% OK

Secondary heating system: None

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5 Cylinder insulation
Hot water storage: Measured cylinder loss: 2.24 kWh/day
Permitted by DBSCG 2.24 OK
Primary pipework insulated: Yes OK

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6 Controls
Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls: Cylinderstat OK
Independent timer for DHW OK

Boiler interlock Yes OK

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

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8 Mechanical ventilation
Not applicable

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9 Summertime temperature
Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing North: 8.22 m², No overhang
Windows facing South: 3.49 m², No overhang
Air change rate: 3.00 ach
Blinds/curtains: None

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10 Key features
Party wall U-value 0.00 W/m²K

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	40.1800 (1b)	x	2.9700 (2b)	=	119.3346	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	40.1800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	119.3346	(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) =	0.1676	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.9176	(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) =	0.7800	(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	0.9944	0.9749	0.9554	0.8580	0.8385	0.7410	0.7410	0.7215	0.7800	0.8385	0.8775	0.9164	(22b)
Effective ac	0.9945	0.9753	0.9564	0.8680	0.8515	0.7745	0.7745	0.7603	0.8042	0.8515	0.8850	0.9199	(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	
Door			1.9300	1.4000	2.7020			(26)
Window (Uw = 1.60)			9.8200	1.5038	14.7669			(27)
Glazed Door (Uw = 1.60)			1.8900	1.5038	2.8421			(27)
REFURB - External Ground Floor			40.1800	0.2500	10.0450	110.0000	4419.8000	(28a)
NEW - External Wall	18.6900	13.6400	5.0500	0.2800	1.4140	60.0000	303.0000	(29a)
REFURB - Wall onto Corridor	27.0500		27.0500	0.3000	8.1150	150.0000	4057.5000	(29a)
Total net area of external elements Aum(A, m2)			85.9200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.8850			(33)
Party Wall 1			39.3200	0.0000	0.0000	70.0000	2752.4000	(32)
Party Ceilings 1			40.1700			40.0000	1606.8000	(32b)
Internal Wall 1			56.6000			9.0000	509.4000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	13648.9000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		339.6939 (35)
Thermal bridges (Default value 0.150 * total exposed area)		12.8880 (36)
Total fabric heat loss	(33) + (36) =	52.7730 (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	39.1623	38.4061	37.6650	34.1838	33.5325	30.5005	30.5005	29.9390	31.6684	33.5325	34.8501	36.2276	(38)
Heat transfer coeff	91.9353	91.1792	90.4380	86.9568	86.3055	83.2735	83.2735	82.7121	84.4414	86.3055	87.6231	89.0006	(39)
Average = Sum(39)m / 12 =												86.9537	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.2881	2.2693	2.2508	2.1642	2.1480	2.0725	2.0725	2.0585	2.1016	2.1480	2.1808	2.2150	(40)
HLP (average)												2.1641	(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		1.4111 (42)
Average daily hot water use (litres/day)		67.7143 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	74.4857	71.7772	69.0686	66.3600	63.6514	60.9429	60.9429	63.6514	66.3600	69.0686	71.7772	74.4857	(44)
Energy conte	110.4602	96.6092	99.6920	86.9139	83.3960	71.9644	66.6856	76.5227	77.4366	90.2449	98.5094	106.9748	(45)
Energy content (annual)										Total = Sum(45)m =		1065.4095	(45)
Distribution loss (46)m = 0.15 x (45)m	16.5690	14.4914	14.9538	13.0371	12.5094	10.7947	10.0028	11.4784	11.6155	13.5367	14.7764	16.0462	(46)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Water storage loss:
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 2.2400 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 1.2096 (55)
Total storage loss

37.4976	33.8688	37.4976	36.2880	37.4976	36.2880	37.4976	37.4976	36.2880	37.4976	36.2880	37.4976	(56)

If cylinder contains dedicated solar storage

37.4976	33.8688	37.4976	36.2880	37.4976	36.2880	37.4976	37.4976	36.2880	37.4976	36.2880	37.4976	(57)
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)

Primary loss
Total heat required for water heating calculated for each month

171.2202	151.4892	160.4520	145.7139	144.1560	130.7644	127.4456	137.2827	136.2366	151.0049	157.3094	167.7348	(62)
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
Solar input (sum of months) = Sum(63)m = 0.0000 (63)
Output from w/h

171.2202	151.4892	160.4520	145.7139	144.1560	130.7644	127.4456	137.2827	136.2366	151.0049	157.3094	167.7348	(64)

Total per year (kWh/year) = Sum(64)m = 1780.8095 (64)
Heat gains from water heating, kWh/month

85.3360	76.0265	81.7556	75.9389	76.3372	70.9682	70.7810	74.0518	72.7877	78.6144	79.7944	84.1771	(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	70.5564	70.5564	70.5564	70.5564	70.5564	70.5564	70.5564	70.5564	70.5564	70.5564	70.5564	70.5564	(66)

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

10.8752	9.6592	7.8554	5.9471	4.4455	3.7531	4.0553	5.2713	7.0751	8.9834	10.4850	11.1774	(67)

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

121.9864	123.2522	120.0624	113.2715	104.6993	96.6426	91.2602	89.9944	93.1843	99.9751	108.5473	116.6040	(68)

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

30.0556	30.0556	30.0556	30.0556	30.0556	30.0556	30.0556	30.0556	30.0556	30.0556	30.0556	30.0556	(69)
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)

Pumps, fans
Losses e.g. evaporation (negative values) (Table 5)

-56.4451	-56.4451	-56.4451	-56.4451	-56.4451	-56.4451	-56.4451	-56.4451	-56.4451	-56.4451	-56.4451	-56.4451	(71)

Water heating gains (Table 5)

114.6989	113.1347	109.8866	105.4707	102.6037	98.5669	95.1357	99.5320	101.0940	105.6646	110.8255	113.1413	(72)

Total internal gains

294.7274	293.2131	284.9712	271.8561	258.9154	246.1295	237.6182	241.9646	248.5202	261.7900	277.0248	288.0897	(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	8.2200	10.6334	0.6300	0.7000	0.7700	26.7126	(74)
South	1.6000	46.7521	0.6300	0.7000	0.7700	22.8609	(78)
South	1.8900	46.7521	0.6300	0.7000	0.7700	27.0044	(78)

76.5778	132.7155	190.7734	256.9093	310.2165	318.8435	302.8023	260.7144	212.9655	148.8522	92.0607	65.3571	(83)
371.3052	425.9286	475.7446	528.7655	569.1319	564.9730	540.4205	502.6790	461.4858	410.6422	369.0855	353.4467	(84)

Solar gains
Total gains

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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	41.2395	41.5814	41.9222	43.6005	43.9295	45.5290	45.5290	45.8381	44.8993	43.9295	43.2690	42.5993	
alpha	3.7493	3.7721	3.7948	3.9067	3.9286	4.0353	4.0353	4.0559	3.9933	3.9286	3.8846	3.8400	
util living area	0.9963	0.9933	0.9863	0.9650	0.9077	0.7774	0.6250	0.6782	0.8808	0.9743	0.9932	0.9970	(86)
MIT	19.1730	19.3581	19.6737	20.1373	20.5437	20.8490	20.9539	20.9362	20.7174	20.2065	19.6475	19.1922	(87)
Th 2	19.1482	19.1599	19.1714	19.2261	19.2365	19.2854	19.2854	19.2946	19.2665	19.2365	19.2155	19.1938	(88)
util rest of house	0.9945	0.9900	0.9789	0.9439	0.8466	0.6338	0.4068	0.4637	0.7767	0.9544	0.9892	0.9955	(89)
MIT 2	17.5870	17.7793	18.1000	18.5912	18.9675	19.2338	19.2794	19.2844	19.1416	18.6727	18.1091	17.6395	(90)
Living area fraction									fLA = Living area / (4) =			0.5470	(91)
MIT	18.4546	18.6430	18.9609	19.4370	19.8298	20.1174	20.1954	20.1880	20.0036	19.5118	18.9507	18.4889	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.3046	18.4930	18.8109	19.2870	19.6798	19.9674	20.0454	20.0380	19.8536	19.3618	18.8007	18.3389	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9933	0.9883	0.9769	0.9448	0.8653	0.6984	0.5107	0.5662	0.8198	0.9563	0.9878	0.9945	(94)
Useful gains	368.8022	420.9242	464.7436	499.5895	492.4667	394.5975	276.0041	284.6183	378.3042	392.7127	364.5911	351.5041	(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	1287.5149	1239.3959	1113.3716	903.2215	688.6987	446.9609	286.9099	300.9043	485.8427	756.1884	1025.2495	1258.3695	(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	683.5222	550.0130	482.5792	290.6150	145.9966	0.0000	0.0000	0.0000	0.0000	270.4259	475.6740	674.7078	(98)
Space heating												3573.5337	(98)
Space heating per m2											(98) / (4) =	88.9381	(99)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	89.0000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	4015.2064	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	683.5222	550.0130	482.5792	290.6150	145.9966	0.0000	0.0000	0.0000	0.0000	270.4259	475.6740	674.7078	(98)
Space heating efficiency (main heating system 1)													
	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)													
	768.0025	617.9921	542.2238	326.5337	164.0411	0.0000	0.0000	0.0000	0.0000	303.8493	534.4652	758.0987	(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													
	171.2202	151.4892	160.4520	145.7139	144.1560	130.7644	127.4456	137.2827	136.2366	151.0049	157.3094	167.7348	(64)
Efficiency of water heater												89.0000	(216)
(217)m	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	(217)
Fuel for water heating, kWh/month													
	192.3822	170.2126	180.2832	163.7235	161.9730	146.9263	143.1973	154.2502	153.0748	169.6684	176.7521	188.4660	(219)
Water heating fuel used												2000.9095	(219)
Annual totals kWh/year													
Space heating fuel - main system												4015.2064	(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)												192.0590	(232)
Total delivered energy for all uses												6283.1749	(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	4015.2064	0.2160	867.2846	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2000.9095	0.2160	432.1965	(264)
Space and water heating			1299.4810	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	192.0590	0.5190	99.6786	(268)
Total CO2, kg/year			1438.0847	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			35.7900	(273)

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

DER		35.7900	ZC1
Total Floor Area	TFA	40.1800	
Assumed number of occupants	N	1.4111	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.9907	ZC2
CO2 emissions from cooking, equation (L16)		3.8046	ZC3
Total CO2 emissions		57.5852	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		57.5852	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	40.1800 (1b)	x	2.9700 (2b)	=	119.3346	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	40.1800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	119.3346	(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) =	0.1676	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4176	(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) =	0.3550	(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	0.4526	0.4437	0.4348	0.3905	0.3816	0.3372	0.3372	0.3283	0.3550	0.3816	0.3993	0.4171	(22b)
Effective ac	0.6024	0.5984	0.5945	0.5762	0.5728	0.5569	0.5569	0.5539	0.5630	0.5728	0.5797	0.5870	(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 Opaque door			1.9300	1.0000	1.9300			(26)
TER Opening Type (Uw = 1.40)			8.1200	1.3258	10.7652			(27)
REFURB - External Ground Floor			40.1800	0.1300	5.2234			(28a)
NEW - External Wall	18.6900	10.0500	8.6400	0.1800	1.5552			(29a)
REFURB - Wall onto Corridor	27.0500		27.0500	0.1800	4.8690			(29a)
Total net area of external elements Aum(A, m2)			85.9200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	24.3428			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (User defined value 0.050 * total exposed area)							4.2960	(36)
Total fabric heat loss						(33) + (36) =	28.6388	(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	23.7231	23.5665	23.4130	22.6920	22.5571	21.9292	21.9292	21.8129	22.1711	22.5571	22.8300	23.1153	(38)
Heat transfer coeff	52.3619	52.2053	52.0518	51.3308	51.1959	50.5679	50.5679	50.4516	50.8098	51.1959	51.4688	51.7541	(39)
Average = Sum(39)m / 12 =												51.3301	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3032	1.2993	1.2955	1.2775	1.2742	1.2585	1.2585	1.2556	1.2646	1.2742	1.2810	1.2881	(40)
HLP (average)												1.2775	(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		1.4111 (42)
Average daily hot water use (litres/day)		67.7143 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	74.4857	71.7772	69.0686	66.3600	63.6514	60.9429	60.9429	63.6514	66.3600	69.0686	71.7772	74.4857	(44)
Energy conte	110.4602	96.6092	99.6920	86.9139	83.3960	71.9644	66.6856	76.5227	77.4366	90.2449	98.5094	106.9748	(45)
Energy content (annual)										Total = Sum(45)m =		1065.4095	(45)
Distribution loss (46)m = 0.15 x (45)m	16.5690	14.4914	14.9538	13.0371	12.5094	10.7947	10.0028	11.4784	11.6155	13.5367	14.7764	16.0462	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6525	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8924	(55)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss
27.6637 24.9865 27.6637 26.7713 27.6637 26.7713 27.6637 27.6637 26.7713 27.6637 26.7713 27.6637 (56)
If cylinder contains dedicated solar storage
27.6637 24.9865 27.6637 26.7713 27.6637 26.7713 27.6637 27.6637 26.7713 27.6637 26.7713 27.6637 (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
161.3862 142.6069 150.6181 136.1972 134.3220 121.2477 117.6116 127.4487 126.7199 141.1710 147.7926 157.9009 (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
161.3862 142.6069 150.6181 136.1972 134.3220 121.2477 117.6116 127.4487 126.7199 141.1710 147.7926 157.9009 (64)
Total per year (kWh/year) = Sum(64)m = 1665.0229 (64)
Heat gains from water heating, kWh/month
77.4689 68.9207 73.8885 68.3255 68.4700 63.3548 62.9138 66.1846 65.1743 70.7473 72.1810 76.3100 (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	70.5564	70.5564	70.5564	70.5564	70.5564	70.5564	70.5564	70.5564	70.5564	70.5564	70.5564	70.5564	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	10.9403	9.7171	7.9025	5.9827	4.4721	3.7755	4.0796	5.3028	7.1174	9.0372	10.5478	11.2444	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	121.9864	123.2522	120.0624	113.2715	104.6993	96.6426	91.2602	89.9944	93.1843	99.9751	108.5473	116.6040	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.0556	30.0556	30.0556	30.0556	30.0556	30.0556	30.0556	30.0556	30.0556	30.0556	30.0556	30.0556	(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)													
	-56.4451	-56.4451	-56.4451	-56.4451	-56.4451	-56.4451	-56.4451	-56.4451	-56.4451	-56.4451	-56.4451	-56.4451	(71)
Water heating gains (Table 5)													
	104.1248	102.5606	99.3124	94.8965	92.0296	87.9928	84.5616	88.9579	90.5199	95.0904	100.2514	102.5672	(72)
Total internal gains													
	284.2184	282.6968	274.4442	261.3176	248.3679	235.5778	227.0683	231.4220	237.9885	251.2697	266.5134	277.5825	(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	5.7000	10.6334	0.6300	0.7000	0.7700	18.5233	(74)
South	2.4200	46.7521	0.6300	0.7000	0.7700	34.5771	(78)

Solar gains	53.1004	92.0273	132.2859	178.1463	215.1111	221.0934	209.9700	180.7850	147.6745	103.2168	63.8365	45.3197	(83)
Total gains	337.3188	374.7241	406.7301	439.4640	463.4790	456.6712	437.0383	412.2070	385.6630	354.4865	330.3499	322.9022	(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	53.2883	53.4482	53.6058	54.3588	54.5020	55.1788	55.1788	55.3060	54.9161	54.5020	54.2130	53.9142	
alpha	4.5526	4.5632	4.5737	4.6239	4.6335	4.6786	4.6786	4.6871	4.6611	4.6335	4.6142	4.5943	
util living area													
	0.9919	0.9860	0.9718	0.9311	0.8334	0.6607	0.4983	0.5457	0.7820	0.9435	0.9846	0.9933	(86)
MIT	19.7724	19.9281	20.1814	20.5159	20.7946	20.9497	20.9891	20.9836	20.8878	20.5475	20.1093	19.7489	(87)
Th 2	19.8383	19.8414	19.8444	19.8585	19.8611	19.8735	19.8735	19.8757	19.8687	19.8611	19.8558	19.8502	(88)
util rest of house													
	0.9893	0.9814	0.9622	0.9069	0.7774	0.5634	0.3762	0.4209	0.6956	0.9186	0.9787	0.9912	(89)
MIT 2	18.2400	18.4674	18.8331	19.3099	19.6685	19.8419	19.8698	19.8695	19.7855	19.3640	18.7416	18.2141	(90)
Living area fraction									fLA = Living area / (4) =			0.5470	(91)
MIT	19.0783	19.2665	19.5707	19.9696	20.2845	20.4479	20.4821	20.4790	20.3885	20.0114	19.4898	19.0537	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0783	19.2665	19.5707	19.9696	20.2845	20.4479	20.4821	20.4790	20.3885	20.0114	19.4898	19.0537	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9870	0.9785	0.9595	0.9096	0.8000	0.6149	0.4433	0.4894	0.7383	0.9225	0.9762	0.9891	(94)
Useful gains	332.9326	366.6497	390.2393	399.7501	370.7636	280.8079	193.7250	201.7415	284.7261	327.0126	322.4981	319.3933	(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													
	773.8190	750.0050	680.3534	568.2138	439.4925	295.7179	196.3098	205.7916	319.5160	481.8262	637.6865	768.7403	(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													
	328.0194	257.6148	215.8449	121.2938	51.1343	0.0000	0.0000	0.0000	0.0000	115.1813	226.9356	334.3142	(98)
Space heating												1650.3383	(98)
Space heating per m2											(98) / (4) =	41.0736	(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												1765.0678	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	328.0194	257.6148	215.8449	121.2938	51.1343	0.0000	0.0000	0.0000	0.0000	115.1813	226.9356	334.3142	(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)													
	350.8229	275.5238	230.8501	129.7260	54.6891	0.0000	0.0000	0.0000	0.0000	123.1886	242.7119	357.5553	(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													
	161.3862	142.6069	150.6181	136.1972	134.3220	121.2477	117.6116	127.4487	126.7199	141.1710	147.7926	157.9009	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.6679	86.3733	85.7731	84.5065	82.4891	79.8000	79.8000	79.8000	79.8000	84.2770	85.9545	86.7678	(217)
Fuel for water heating, kWh/month													
	186.2122	165.1053	175.6007	161.1676	162.8362	151.9394	147.3830	159.7102	158.7969	167.5082	171.9430	181.9810	(219)
Water heating fuel used												1990.1838	(219)
Annual totals kWh/year													
Space heating fuel - main system												1765.0678	(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)												193.2090	(232)
Total delivered energy for all uses												4023.4605	(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	1765.0678	0.2160	381.2546	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1990.1838	0.2160	429.8797	(264)
Space and water heating			811.1343	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	193.2090	0.5190	100.2754	(268)
Total CO2, kg/m2/year			950.3348	(272)
Emissions per m2 for space and water heating			20.1875	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.4957	(272b)
Emissions per m2 for pumps and fans			0.9688	(272c)
Target Carbon Dioxide Emission Rate (TER) = (20.1875 * 1.00) + 2.4957 + 0.9688, rounded to 2 d.p.			23.6500	(273)

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

Property Reference	U877-4-New-Broadway-Flat-B-RET	**Issued on Date**	15/08/2022
Assessment Reference	Retained	**Prop Type Ref**	Flat B Retained Front
Property	Flat B Retained Front, 4, New Broadway, London, Hampton Hill, Greater London, TW12 1JG		

SAP Rating	71 C	**DER**	46.60	**TER**	22.72
Environmental	71 C	**% DER<TER**	-105.15		
CO_2 Emissions (t/year)	1.64	**DFEE**	147.89	**TFEE**	57.98
General Requirements Compliance	N/A	**% DFEE<TFEE**	-155.06		

Assessor Details	Mr. Jack Palmer, Jack Palmer, Tel: 01636653055, jack.palmer@mesbuildingsolutions.co.uk	**Assessor ID**	U877-0001
Client			

Regs Region: England
Elmhurst Energy Systems SAP2012 Calculator (Design System) version 4.14r10

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 DESIGNED

Ground-floor flat, total floor area 44 m²

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

1a TER and DER
Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 22.72 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 46.60 kgCO□/m²Fail
Excess emissions =23.88 kgCO□/m² (105.0%)

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)58.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)147.9 kWh/m²/yrFail
Excess energy =89.9 kWh/m²/yr (155.0%)

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2 Fabric U-values

Element	Average	Highest	
External wall	0.79 (max. 0.30)	2.10 (max. 0.70)	Fail
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.25 (max. 0.25)	0.25 (max. 0.70)	OK
Roof	(no roof)		
Openings	3.70 (max. 2.00)	4.80 (max. 3.30)	Fail

2a Thermal bridging
Thermal bridging calculated using default y-value of 0.15

---

3 Air permeability
Air permeability at 50 pascals: 15.00 (assumed) OK

---

4 Heating efficiency
Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
tbc tbc

Efficiency: 89%
Minimum: 88% OK

Secondary heating system: None

---

5 Cylinder insulation
Hot water storage: Measured cylinder loss: 2.24 kWh/day
Permitted by DBSCG 2.24 OK
Primary pipework insulated: Yes OK

---

6 Controls
Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls: Cylinderstat OK
Independent timer for DHW OK

Boiler interlock Yes OK

---

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

---

8 Mechanical ventilation
Not applicable

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9 Summertime temperature
Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing North: 8.31 m², No overhang
Windows facing South: 4.34 m², No overhang
Air change rate: 3.00 ach
Blinds/curtains: None

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10 Key features
Party wall U-value 0.00 W/m²K

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	43.6600 (1b)	x	2.9700 (2b)	=	129.6702	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.6600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	129.6702	(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) =	0.1542	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.9042	(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) =	0.7686	(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	0.9800	0.9608	0.9415	0.8455	0.8262	0.7302	0.7302	0.7110	0.7686	0.8262	0.8647	0.9031	(22b)
Effective ac	0.9802	0.9615	0.9432	0.8574	0.8413	0.7666	0.7666	0.7527	0.7954	0.8413	0.8738	0.9078	(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	
Shopfront Window (Uw = 4.80)			6.3800	4.0268	25.6913			(27)
Glazed Door (Uw = 4.80)			1.9300	4.0268	7.7718			(27)
Window (Uw = 1.60)			4.3400	1.5038	6.5263			(27)
REFURB - External Ground Floor			43.6600	0.2500	10.9150	110.0000	4802.6000	(28a)
RETAINED - External Wall	18.5800	8.3100	10.2700	2.1000	21.5670	110.0000	1129.7000	(29a)
REFURB - Wall onto Corridor	15.3100		15.3100	0.3000	4.5930	150.0000	2296.5000	(29a)
REFURB - External Wall	16.3500	4.3400	12.0100	0.3000	3.6030	110.0000	1321.1000	(29a)
Total net area of external elements Aum(A, m2)			93.9000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		80.6674			(33)
Party Wall 1			41.0100	0.0000	0.0000	70.0000	2870.7000	(32)
Party Ceilings 1			43.6600			40.0000	1746.4000	(32b)
Internal Wall 1			54.0500			9.0000	486.4500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	14653.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		335.6264 (35)
Thermal bridges (Default value 0.150 * total exposed area)		14.0850 (36)
Total fabric heat loss	(33) + (36) =	94.7524 (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	41.9425	41.1447	40.3626	36.6893	36.0020	32.8027	32.8027	32.2102	34.0350	36.0020	37.3923	38.8459	(38)
Heat transfer coeff	136.6949	135.8971	135.1150	131.4417	130.7544	127.5551	127.5551	126.9626	128.7874	130.7544	132.1447	133.5983	(39)
Average = Sum(39)m / 12 =												131.4384	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	3.1309	3.1126	3.0947	3.0106	2.9948	2.9216	2.9216	2.9080	2.9498	2.9948	3.0267	3.0600	(40)
HLP (average)												3.0105	(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	1.5067 (42)
Average daily hot water use (litres/day)	69.9830 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	76.9813	74.1820	71.3826	68.5833	65.7840	62.9847	62.9847	65.7840	68.5833	71.3826	74.1820	76.9813	(44)
Energy conte	114.1610	99.8460	103.0321	89.8259	86.1901	74.3755	68.9198	79.0865	80.0310	93.2684	101.8098	110.5588	(45)
Energy content (annual)										Total = Sum(45)m =		1101.1048	(45)

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

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	17.1242	14.9769	15.4548	13.4739	12.9285	11.1563	10.3380	11.8630	12.0047	13.9903	15.2715	16.5838	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												2.2400	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.2096	(55)
Total storage loss													
	37.4976	33.8688	37.4976	36.2880	37.4976	36.2880	37.4976	37.4976	36.2880	37.4976	36.2880	37.4976	(56)
If cylinder contains dedicated solar storage													
	37.4976	33.8688	37.4976	36.2880	37.4976	36.2880	37.4976	37.4976	36.2880	37.4976	36.2880	37.4976	(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													
	174.9210	154.7260	163.7921	148.6259	146.9501	133.1755	129.6798	139.8465	138.8310	154.0284	160.6098	171.3188	(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													
	174.9210	154.7260	163.7921	148.6259	146.9501	133.1755	129.6798	139.8465	138.8310	154.0284	160.6098	171.3188	(64)
								Total per year (kWh/year) = Sum(64)m =				1816.5048	(64)
Heat gains from water heating, kWh/month													
	86.5665	77.1028	82.8662	76.9071	77.2662	71.7698	71.5238	74.9043	73.6503	79.6198	80.8918	85.3688	(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	75.3326	75.3326	75.3326	75.3326	75.3326	75.3326	75.3326	75.3326	75.3326	75.3326	75.3326	75.3326	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	11.6641	10.3599	8.4253	6.3785	4.7680	4.0253	4.3495	5.6537	7.5883	9.6351	11.2456	11.9883	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	130.8357	132.1934	128.7721	121.4886	112.2945	103.6534	97.8805	96.5229	99.9442	107.2276	116.4217	125.0629	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.5333	30.5333	30.5333	30.5333	30.5333	30.5333	30.5333	30.5333	30.5333	30.5333	30.5333	30.5333	(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)													
	-60.2661	-60.2661	-60.2661	-60.2661	-60.2661	-60.2661	-60.2661	-60.2661	-60.2661	-60.2661	-60.2661	-60.2661	(71)
Water heating gains (Table 5)													
	116.3529	114.7363	111.3793	106.8154	103.8524	99.6803	96.1342	100.6778	102.2921	107.0158	112.3497	114.7430	(72)
Total internal gains													
	307.4524	305.8894	297.1764	283.2823	269.5147	255.9588	246.9640	251.4541	258.4244	272.4784	288.6168	300.3940	(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	6.3800	10.6334	0.6300	0.7000	0.7700	20.7331	(74)
North	1.9300	10.6334	0.0000	0.7000	0.7700	0.0000	(74)
South	4.3400	46.7521	0.6300	0.7000	0.7700	62.0101	(78)

Solar gains	82.7432	141.1786	196.6925	254.3558	298.0420	302.5826	288.8679	254.6471	216.0865	156.7031	99.0801	70.8666	(83)
Total gains	390.1956	447.0679	493.8689	537.6381	567.5567	558.5414	535.8320	506.1012	474.5109	429.1815	387.6969	371.2605	(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	29.7773	29.9521	30.1255	30.9674	31.1301	31.9109	31.9109	32.0599	31.6056	31.1301	30.8026	30.4675	
alpha	2.9852	2.9968	3.0084	3.0645	3.0753	3.1274	3.1274	3.1373	3.1070	3.0753	3.0535	3.0312	
util living area													
	0.9957	0.9932	0.9881	0.9759	0.9464	0.8782	0.7750	0.8096	0.9282	0.9801	0.9932	0.9964	(86)
MIT	18.5026	18.6961	19.0525	19.5757	20.0912	20.5601	20.8029	20.7643	20.3969	19.7426	19.0634	18.5089	(87)
Th 2	18.6860	18.6947	18.7034	18.7447	18.7526	18.7897	18.7897	18.7967	18.7753	18.7526	18.7367	18.7203	(88)
util rest of house													
	0.9936	0.9896	0.9812	0.9592	0.8997	0.7407	0.4864	0.5459	0.8380	0.9627	0.9888	0.9946	(89)
MIT 2	16.6045	16.8026	17.1622	17.7047	18.2017	18.6268	18.7645	18.7588	18.5001	17.8786	17.1969	16.6330	(90)
Living area fraction									fLA = Living area / (4) =			0.5875	(91)
MIT	17.7196	17.9150	18.2727	18.8039	19.3117	19.7626	19.9621	19.9371	19.6145	18.9737	18.2935	17.7351	(92)
Temperature adjustment												-0.1500	
adjusted MIT	17.5696	17.7650	18.1227	18.6539	19.1617	19.6126	19.8121	19.7871	19.4645	18.8237	18.1435	17.5851	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9920	0.9874	0.9787	0.9583	0.9112	0.8063	0.6485	0.6934	0.8760	0.9635	0.9871	0.9932	(94)
Useful gains	387.0698	441.4557	483.3383	515.2154	517.1523	450.3255	347.5007	350.9422	415.6876	413.5095	382.7010	368.7494	(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													
	1813.8859	1748.3161	1570.4071	1282.0686	975.6532	639.3851	409.7141	430.0292	690.8769	1075.2876	1459.3366	1788.2254	(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													
	1061.5512	878.2102	808.7792	552.1343	341.1247	0.0000	0.0000	0.0000	0.0000	492.3630	775.1777	1056.0901	(98)
Space heating												5965.4303	(98)
Space heating per m2											(98) / (4) =	136.6338	(99)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	89.0000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	6702.7307	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	1061.5512	878.2102	808.7792	552.1343	341.1247	0.0000	0.0000	0.0000	0.0000	492.3630	775.1777	1056.0901	(98)
Space heating efficiency (main heating system 1)													
	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)													
	1192.7541	986.7530	908.7407	620.3756	383.2861	0.0000	0.0000	0.0000	0.0000	553.2168	870.9861	1186.6181	(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													
	174.9210	154.7260	163.7921	148.6259	146.9501	133.1755	129.6798	139.8465	138.8310	154.0284	160.6098	171.3188	(64)
Efficiency of water heater												89.0000	(216)
(217)m	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	(217)
Fuel for water heating, kWh/month													
	196.5405	173.8494	184.0360	166.9954	165.1124	149.6354	145.7076	157.1309	155.9899	173.0657	180.4604	192.4931	(219)
Water heating fuel used												2041.0167	(219)
Annual totals kWh/year													
Space heating fuel - main system												6702.7307	(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)												205.9916	(232)
Total delivered energy for all uses												9024.7389	(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	6702.7307	0.2160	1447.7898	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2041.0167	0.2160	440.8596	(264)
Space and water heating			1888.6494	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	205.9916	0.5190	106.9096	(268)
Total CO2, kg/year			2034.4841	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			46.6000	(273)

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

DER		46.6000	ZC1
Total Floor Area	TFA	43.6600	
Assumed number of occupants	N	1.5067	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.7578	ZC2
CO2 emissions from cooking, equation (L16)		3.5538	ZC3
Total CO2 emissions		67.9116	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		67.9116	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	43.6600 (1b)	x	2.9700 (2b)	=	129.6702	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.6600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	129.6702	(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) =	0.1542	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4042	(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) =	0.3436	(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	0.4381	0.4295	0.4209	0.3780	0.3694	0.3264	0.3264	0.3178	0.3436	0.3694	0.3866	0.4037	(22b)
Effective ac	0.5960	0.5922	0.5886	0.5714	0.5682	0.5533	0.5533	0.5505	0.5590	0.5682	0.5747	0.5815	(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)			10.9100	1.3258	14.4640			(27)
REFURB - External Ground Floor			43.6600	0.1300	5.6758			(28a)
RETAINED - External Wall	18.5800	7.1700	11.4100	0.1800	2.0538			(29a)
REFURB - Wall onto Corridor	15.3100		15.3100	0.1800	2.7558			(29a)
REFURB - External Wall	16.3500	3.7400	12.6100	0.1800	2.2698			(29a)
Total net area of external elements Aum(A, m2)			93.9000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.2192			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (User defined value 0.050 * total exposed area)							4.6950	(36)
Total fabric heat loss						(33) + (36) =	31.9142	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	25.5019	25.3425	25.1862	24.4521	24.3147	23.6753	23.6753	23.5569	23.9216	24.3147	24.5926	24.8831	(38)
Heat transfer coeff	57.4161	57.2567	57.1004	56.3663	56.2289	55.5895	55.5895	55.4711	55.8358	56.2289	56.5068	56.7973	(39)
Average = Sum(39)m / 12 =												56.3656	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3151	1.3114	1.3078	1.2910	1.2879	1.2732	1.2732	1.2705	1.2789	1.2879	1.2942	1.3009	(40)
HLP (average)												1.2910	(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		1.5067 (42)
Average daily hot water use (litres/day)		69.9830 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	76.9813	74.1820	71.3826	68.5833	65.7840	62.9847	62.9847	65.7840	68.5833	71.3826	74.1820	76.9813	(44)
Energy conte	114.1610	99.8460	103.0321	89.8259	86.1901	74.3755	68.9198	79.0865	80.0310	93.2684	101.8098	110.5588	(45)
Energy content (annual)										Total = Sum(45)m =		1101.1048	(45)
Distribution loss (46)m = 0.15 x (45)m	17.1242	14.9769	15.4548	13.4739	12.9285	11.1563	10.3380	11.8630	12.0047	13.9903	15.2715	16.5838	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6525	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8924	(55)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss
27.6637 24.9865 27.6637 26.7713 27.6637 26.7713 27.6637 27.6637 26.7713 27.6637 26.7713 27.6637 (56)
If cylinder contains dedicated solar storage
27.6637 24.9865 27.6637 26.7713 27.6637 26.7713 27.6637 27.6637 26.7713 27.6637 26.7713 27.6637 (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
165.0871 145.8437 153.9582 139.1092 137.1161 123.6588 119.8459 130.0126 129.3143 144.1945 151.0931 161.4849 (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
165.0871 145.8437 153.9582 139.1092 137.1161 123.6588 119.8459 130.0126 129.3143 144.1945 151.0931 161.4849 (64)
Total per year (kWh/year) = Sum(64)m = 1700.7183 (64)
Heat gains from water heating, kWh/month
78.6994 69.9970 74.9990 69.2937 69.3991 64.1565 63.6567 67.0371 66.0370 71.7526 73.2784 77.5017 (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	75.3326	75.3326	75.3326	75.3326	75.3326	75.3326	75.3326	75.3326	75.3326	75.3326	75.3326	75.3326	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	11.6641	10.3599	8.4253	6.3785	4.7680	4.0253	4.3495	5.6537	7.5883	9.6351	11.2456	11.9883	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	130.8357	132.1934	128.7721	121.4886	112.2945	103.6534	97.8805	96.5229	99.9442	107.2276	116.4217	125.0629	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.5333	30.5333	30.5333	30.5333	30.5333	30.5333	30.5333	30.5333	30.5333	30.5333	30.5333	30.5333	(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)													
	-60.2661	-60.2661	-60.2661	-60.2661	-60.2661	-60.2661	-60.2661	-60.2661	-60.2661	-60.2661	-60.2661	-60.2661	(71)
Water heating gains (Table 5)													
	105.7788	104.1622	100.8051	96.2413	93.2783	89.1062	85.5601	90.1036	91.7180	96.4417	101.7755	104.1689	(72)
Total internal gains													
	296.8783	295.3153	286.6023	272.7082	258.9406	245.3847	236.3899	240.8800	247.8503	261.9042	278.0427	289.8199	(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	7.1700	10.6334	0.6300	0.7000	0.7700	23.3004	(74)
South	3.7400	46.7521	0.6300	0.7000	0.7700	53.4373	(78)

Solar gains	76.7376	132.0447	187.1448	247.5334	295.0173	301.6229	287.0915	249.7169	207.4275	147.3997	92.0854	65.5991	(83)
Total gains	373.6160	427.3599	473.7470	520.2415	553.9578	547.0076	523.4814	490.5969	455.2778	409.3040	370.1281	355.4189	(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	52.8065	52.9535	53.0985	53.7900	53.9214	54.5417	54.5417	54.6581	54.3011	53.9214	53.6563	53.3819	
alpha	4.5204	4.5302	4.5399	4.5860	4.5948	4.6361	4.6361	4.6439	4.6201	4.5948	4.5771	4.5588	
util living area													
	0.9913	0.9833	0.9645	0.9121	0.7968	0.6164	0.4598	0.5078	0.7474	0.9326	0.9829	0.9930	(86)
MIT	19.7711	19.9518	20.2242	20.5648	20.8289	20.9609	20.9918	20.9873	20.9054	20.5739	20.1162	19.7412	(87)
Th 2	19.8290	19.8319	19.8347	19.8479	19.8503	19.8619	19.8619	19.8640	19.8574	19.8503	19.8453	19.8401	(88)
util rest of house													
	0.9885	0.9779	0.9528	0.8833	0.7358	0.5207	0.3447	0.3886	0.6577	0.9040	0.9763	0.9907	(89)
MIT 2	18.2316	18.4943	18.8852	19.3639	19.6946	19.8381	19.8592	19.8593	19.7896	19.3890	18.7438	18.1960	(90)
Living area fraction									fLA = Living area / (4) =			0.5875	(91)
MIT	19.1360	19.3506	19.6718	20.0694	20.3610	20.4978	20.5246	20.5220	20.4451	20.0851	19.5501	19.1038	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1360	19.3506	19.6718	20.0694	20.3610	20.4978	20.5246	20.5220	20.4451	20.0851	19.5501	19.1038	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9863	0.9751	0.9508	0.8895	0.7647	0.5757	0.4125	0.4588	0.7065	0.9108	0.9742	0.9888	(94)
Useful gains	368.5071	416.7242	450.4410	462.7713	423.5904	314.8904	215.9511	225.0807	321.6446	372.7909	360.5860	351.4412	(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													
	851.8277	827.3924	752.1162	629.5785	486.9998	327.8541	218.1669	228.6524	354.2850	533.3375	703.5126	846.4966	(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													
	359.5906	275.9690	224.4463	120.1012	47.1766	0.0000	0.0000	0.0000	0.0000	119.4467	246.9071	368.3212	(98)
Space heating												1761.9588	(98)
Space heating per m2											(98) / (4) =	40.3564	(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												1884.4479	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	359.5906	275.9690	224.4463	120.1012	47.1766	0.0000	0.0000	0.0000	0.0000	119.4467	246.9071	368.3212	(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)													
	384.5889	295.1540	240.0496	128.4505	50.4563	0.0000	0.0000	0.0000	0.0000	127.7505	264.0718	393.9264	(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													
	165.0871	145.8437	153.9582	139.1092	137.1161	123.6588	119.8459	130.0126	129.3143	144.1945	151.0931	161.4849	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.8364	86.4903	85.8183	84.4249	82.2906	79.8000	79.8000	79.8000	79.8000	84.3166	86.1164	86.9466	(217)
Fuel for water heating, kWh/month													
	190.1127	168.6244	179.4002	164.7727	166.6243	154.9609	150.1828	162.9230	162.0480	171.0156	175.4521	185.7289	(219)
Water heating fuel used												2031.8457	(219)
Annual totals kWh/year													
Space heating fuel - main system												1884.4479	(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)												205.9916	(232)
Total delivered energy for all uses												4197.2852	(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	1884.4479	0.2160	407.0407	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2031.8457	0.2160	438.8787	(264)
Space and water heating			845.9194	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	205.9916	0.5190	106.9096	(268)
Total CO2, kg/m2/year			991.7541	(272)
Emissions per m2 for space and water heating			19.3752	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.4487	(272b)
Emissions per m2 for pumps and fans			0.8915	(272c)
Target Carbon Dioxide Emission Rate (TER) = (19.3752 * 1.00) + 2.4487 + 0.8915, rounded to 2 d.p.			22.7200	(273)