SUMMARY FOR INPUT DATA
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	71 Avenue Road	**Issued on Date**	30/09/2022
Assessment Reference	Be lean be clean	**Prop Type Ref**	
Property	71, Avenue Road, London, NW8 6HP		

SAP Rating	88 B	**DER**	12.55	**TER**	13.39
Environmental	85 B	**% DER<TER**	6.24		
CO_2 Emissions (t/year)	12.35	**DFEE**	51.05	**TFEE**	63.32
General Requirements Compliance	Pass	**% DFEE<TFEE**	19.38		

Assessor Details	Mr. Karl Webb-Thomas, Mayfield Morrison Limited, Tel: 07910 303578, karl@mayfieldmorrison.com	**Assessor ID**	5932-0001
Client			

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	North East
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	House, Detached
2.0 Number of Storeys	4
3.0 Date Built	2022
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	82.74 m	362.23 m²	3.60 m
1st Storey:	79.68 m	299.99 m²	4.28 m
2nd Storey:	79.68 m	299.99 m²	3.70 m
3rd Storey:	73.91 m	245.01 m²	2.68 m

7.0 Living Area	57.82	m²
8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m²K

9.0 External Walls

Description	Type	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
Main Wall	Cavity Wall	0.18	687.80	570.65
Basement Wall	Cavity Wall	0.18	270.74	270.74
Dormer	Timber Frame	0.18	27.23	16.58

10.0 External Roofs

Description	Type	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
Sloped	External Slope Roof	0.13	214.06	214.06
Flat	External Flat Roof	0.13	180.47	165.41
Flat over Pool	External Flat Roof	0.13	58.57	54.68

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Heat Loss Floor 1	Ground Floor - Solid		0.15	362.23

12.0 Opening Types

SUMMARY FOR INPUT DATA
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Rooflight	Manufacturer	Roof Window	Double Low-E Hard 0.2			0.72		0.70	1.30
Door	Manufacturer	Solid Door							1.30
Half glazed door	Manufacturer	Half Glazed Door	Double Low-E Hard 0.2			0.72		0.70	1.30
Windows	Manufacturer	Window	Double Low-E Hard 0.2			0.73		0.70	1.30

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
NE	Window	[1] Main Wall	North East	None	0.00					40.37	
NE Door	Solid Door	[1] Main Wall	North East							5.37	
NE Dormer	Window	[3] Dormer	North East	None	0.00					2.98	
SE	Window	[1] Main Wall	South East	None	0.00					17.16	
SW	Window	[1] Main Wall	South West	None	0.00					29.20	
SW	Window	[3] Dormer	South West	None	0.00					4.69	
NW	Window	[1] Main Wall	North West	None	0.00					21.13	
NW	Half Glazed Door	[1] Main Wall	North West							3.92	
NW	Window	[3] Dormer	North West	None	0.00					2.98	
RL	Roof Window	[3] Flat over Pool	Horizontal	None						3.89	
RL	Roof Window	[2] Flat	Horizontal	None						15.06	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported
Independently assessed	E2 Other lintels (including other steel lintels)	59.11	0.050	Yes
Independently assessed	E3 Sill	55.66	0.009	Yes
Independently assessed	E4 Jamb	203.14	0.014	Yes
Table K1 - Default	E22 Basement floor	82.74	0.070	No
Independently assessed	E6 Intermediate floor within a dwelling	233.27	0.005	Yes
Table K1 - Approved	E11 Eaves (insulation at rafter level)	75.91	0.040	No
Table K1 - Default	E14 Flat roof	15.36	0.080	No
Table K1 - Default	E15 Flat roof with parapet	13.14	0.560	No
Independently assessed	E16 Corner (normal)	85.44	0.058	No
Table K1 - Approved	E17 Corner (inverted – internal area greater than external area)	39.12	-0.090	No
Table K1 - Default	R1 Head of roof window	17.04	0.080	Yes
Table K1 - Default	R2 Sill of roof window	17.04	0.060	Yes
Table K1 - Default	R3 Jamb of roof window	12.11	0.080	Yes
Table K1 - Default	R6 Flat ceiling	57.13	0.060	No
Table K1 - Default	R7 Flat ceiling (inverted)	9.08	0.040	No
Table K1 - Default	R9 Roof to wall (flat ceiling)	26.50	0.040	No

Y-value	0.019	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	m³/(h.m²) @ 50 Pa
Property Tested ?		
As Built AP_{50}		m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Windows fully open

Cross ventilation possible	No
Night Ventilation	No
Air change rate	5.00
Mechanical Ventilation	
Mechanical Ventilation System Present	No

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				16
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System	No	
22.0 Lighting		
Internal		
Total number of light fittings	50	
Total number of L.E.L. fittings	50	
Percentage of L.E.L. fittings	100.00	%
External		
External lights fitted	No	
23.0 Electricity Tariff	Standard	
24.0 Main Heating 1	Database	
Percentage of Heat	100	%
Database Ref. No.	18627	
Fuel Type	Mains gas	
Main Heating	BGB	
SAP Code	102	
In Winter	90.7	
In Summer	80.0	
Controls	CBI Time and temperature zone control	
PCDF Controls	0	
Delayed Start Stat	No	
Sap Code	2110	
Boiler Compensator	Bosch Thermotechnology Ltd, Worcester, Wave	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heat Emitter	Radiators	
Flow Temperature	Normal (> 45°C)	
25.0 Main Heating 2	None	
Community Heating	None	
28.0 Water Heating	HWP From main heating 1	
Water Heating	Main Heating 1	

Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
SAP Code	901	
29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	500.00	L
Loss	3.13	kWh/day
Pipes insulation	Fully insulated primary pipework	
31.0 Thermal Store	None	

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar photovoltaic panels, 2.5 kWp	£3,500 - £5,500	£366	B 89	

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

Design SAP
elmhurst energy

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Assessor Details	Mr. Karl Webb-Thomas, Mayfield Morrison Limited, Tel: 07910 303578, karl@mayfieldmorrison.com	**Assessor ID**	5932-0001
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 DESIGNED

Detached House, total floor area 1207 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) 13.39 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 12.55 kgCO□/m²OK
-------------------------------------------------------------------------------------------------------
1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)63.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)51.0 kWh/m²/yrOK
-------------------------------------------------------------------------------------------------------
2 Fabric U-values
Element         Average                 Highest
External wall   0.17 (max. 0.30)        0.18 (max. 0.70)          OK
Floor           0.15 (max. 0.25)        0.15 (max. 0.70)          OK
Roof            0.13 (max. 0.20)        0.13 (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:         3.00 (design value)
Maximum                                 10.0                                            OK
-------------------------------------------------------------------------------------------------------
4 Heating efficiency
Main heating system:                    Boiler system with radiators or underfloor - Mains gas
Data from database
Worcester Greenstar 8000 Life GR8300iW 50 R NG

Efficiency: 89.7% SEDBUK2009
Minimum: 88.0%                                  OK

Secondary heating system:               None
-------------------------------------------------------------------------------------------------------
5 Cylinder insulation
Hot water storage                       Measured cylinder loss: 3.13 kWh/day
Permitted by DBSCG 3.92                         OK
Primary pipework insulated:             Yes                                             OK
-------------------------------------------------------------------------------------------------------
6 Controls
Space heating controls:                 Time and temperature zone control               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
-------------------------------------------------------------------------------------------------------
9 Summertime temperature
Overheating risk (Thames Valley):       Not significant                                 OK
Based on:
Overshading:                            Average
Windows facing North East:              43.35 m², No overhang
Windows facing South East:              17.16 m², No overhang
Windows facing South West:              33.89 m², No overhang
Windows facing North West:              24.11 m², No overhang
Air change rate:                        5.00 ach
Blinds/curtains:                        None
-------------------------------------------------------------------------------------------------------
10 Key features
Thermal bridging y-value                0.019 W/m²K
Air permeability                        3.0 m³/m²h



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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)	
Basement floor	362.2300	(1a)	x 3.6000	(2a) =	1304.0280	(1a) - (3a)
Ground floor	299.9900	(1b)	x 4.2800	(2b) =	1283.9572	(1b) - (3b)
First floor	299.9900	(1c)	x 3.7000	(2c) =	1109.9630	(1c) - (3c)
Second floor	245.0100	(1d)	x 2.6800	(2d) =	656.6268	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	1207.2200					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	4354.5750	(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							16 * 10 =	160.0000	(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) =	160.0000 / (5) =	0.0367	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1867	(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) =	0.1587	(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	0.2024	0.1984	0.1944	0.1746	0.1706	0.1508	0.1508	0.1468	0.1587	0.1706	0.1786	0.1865	(22b)
Effective ac	0.5205	0.5197	0.5189	0.5152	0.5146	0.5114	0.5114	0.5108	0.5126	0.5146	0.5159	0.5174	(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			5.3700	1.3000	6.9810			(26)
Half glazed door			3.9200	1.3000	5.0960			(26a)
Windows (Uw = 1.30)			118.5100	1.2357	146.4477			(27)
Rooflight (Uw = 1.30)			18.9500	1.2357	23.4173			(27a)
Heat Loss Floor 1			362.2300	0.1500	54.3345			(28a)
Main Wall	687.8000	117.1500	570.6500	0.1800	102.7170			(29a)
Basement Wall	270.7400		270.7400	0.1641	44.4160			(29a)
Dormer	27.2300	10.6500	16.5800	0.1800	2.9844			(29a)
Sloped	214.0600		214.0600	0.1300	27.8278			(30)
Flat	180.4700	15.0600	165.4100	0.1300	21.5033			(30)
Flat over Pool	58.5700	3.8900	54.6800	0.1300	7.1084			(30)
Total net area of external elements Aum(A, m2)			1801.1000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	442.8334			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)		34.5223	(36)
Total fabric heat loss	(33) + (36) =	477.3557	(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	747.9339	746.7912	745.6710	740.4098	739.4254	734.8430	734.8430	733.9945	736.6081	739.4254	741.4168	743.4986	(38)
Heat transfer coeff	1225.2896	1224.1468	1223.0267	1217.7654	1216.7811	1212.1987	1212.1987	1211.3501	1213.9638	1216.7811	1218.7724	1220.8543	(39)
Average = Sum(39)m / 12 =												1217.7607	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0150	1.0140	1.0131	1.0087	1.0079	1.0041	1.0041	1.0034	1.0056	1.0079	1.0096	1.0113	(40)
HLP (average)												1.0087	(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	4.3113	(42)
Average daily hot water use (litres/day)	136.5938	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	150.2531	144.7894	139.3256	133.8619	128.3981	122.9344	122.9344	128.3981	133.8619	139.3256	144.7894	150.2531	(44)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy conte	222.8211	194.8807	201.0994	175.3234	168.2269	145.1671	134.5186	154.3621	156.2057	182.0426	198.7138	215.7903	(45)
Energy content (annual)										Total = Sum(45)m =		2149.1516	(45)
Distribution loss (46)m = 0.15 x (45)m													
	33.4232	29.2321	30.1649	26.2985	25.2340	21.7751	20.1778	23.1543	23.4308	27.3064	29.8071	32.3685	(46)
Water storage loss:													
Store volume												500.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												3.1300	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.6902	(55)
Total storage loss													
	52.3962	47.3256	52.3962	50.7060	52.3962	50.7060	52.3962	52.3962	50.7060	52.3962	50.7060	52.3962	(56)
If cylinder contains dedicated solar storage													
	52.3962	47.3256	52.3962	50.7060	52.3962	50.7060	52.3962	52.3962	50.7060	52.3962	50.7060	52.3962	(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													
	298.4797	263.2175	276.7580	248.5414	243.8855	218.3851	210.1772	230.0207	229.4237	257.7012	271.9318	291.4489	(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													
	298.4797	263.2175	276.7580	248.5414	243.8855	218.3851	210.1772	230.0207	229.4237	257.7012	271.9318	291.4489	(64)
									Total per year (kWh/year) = Sum(64)m =			3039.9706	(64)
Heat gains from water heating, kWh/month													
	134.6149	119.4673	127.3924	116.8694	116.4623	106.8424	105.2543	111.8523	110.5128	121.0561	124.6467	132.2772	(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	215.5658	215.5658	215.5658	215.5658	215.5658	215.5658	215.5658	215.5658	215.5658	215.5658	215.5658	215.5658	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	102.1841	90.7590	73.8102	55.8791	41.7703	35.2642	38.1042	49.5293	66.4781	84.4093	98.5181	105.0241	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	1027.0337	1037.6911	1010.8348	953.6609	881.4892	813.6579	768.3424	757.6851	784.5413	841.7152	913.8870	981.7182	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	44.5566	44.5566	44.5566	44.5566	44.5566	44.5566	44.5566	44.5566	44.5566	44.5566	44.5566	44.5566	(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)													
	-172.4526	-172.4526	-172.4526	-172.4526	-172.4526	-172.4526	-172.4526	-172.4526	-172.4526	-172.4526	-172.4526	-172.4526	(71)
Water heating gains (Table 5)													
	180.9340	177.7787	171.2264	162.3186	156.5354	148.3923	141.4709	150.3391	153.4900	162.7098	173.1205	177.7919	(72)
Total internal gains													
	1400.8215	1396.8985	1346.5411	1262.5283	1170.4645	1087.9841	1038.5873	1048.2232	1095.1792	1179.5040	1276.1952	1355.2039	(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	
Horizontal	18.9500	26.0000	0.7200	0.7000	1.0000	223.4887	(82)
Northeast	43.3500	11.2829	0.7300	0.7000	0.7700	173.2070	(75)
Southeast	17.1600	36.7938	0.7300	0.7000	0.7700	223.5869	(77)
Southwest	33.8900	36.7938	0.7300	0.7000	0.7700	441.5712	(79)
Northwest	24.1100	11.2829	0.7300	0.7000	0.7700	96.3327	(81)

Solar gains	1158.1866	2145.8352	3363.9268	4833.5801	5984.0286	6181.4907	5860.1703	4971.6918	3871.5906	2490.0364	1419.5156	969.8666	(83)
Total gains	2559.0081	3542.7337	4710.4679	6096.1084	7154.4932	7269.4749	6898.7575	6019.9149	4966.7698	3669.5404	2695.7109	2325.0705	(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	68.4203	68.4842	68.5469	68.8431	68.8988	69.1592	69.1592	69.2077	69.0587	68.8988	68.7862	68.6689	
alpha	5.5614	5.5656	5.5698	5.5895	5.5933	5.6106	5.6106	5.6138	5.6039	5.5933	5.5857	5.5779	
util living area													
	1.0000	0.9999	0.9995	0.9958	0.9702	0.8749	0.7225	0.8142	0.9775	0.9993	1.0000	1.0000	(86)
MIT	19.5721	19.7104	19.9608	20.3081	20.6506	20.8883	20.9721	20.9464	20.7187	20.2822	19.8627	19.5486	(87)
Th 2	20.0709	20.0717	20.0724	20.0761	20.0767	20.0799	20.0799	20.0805	20.0787	20.0767	20.0754	20.0739	(88)
util rest of house													
	1.0000	0.9999	0.9994	0.9938	0.9544	0.8080	0.5958	0.6993	0.9590	0.9989	1.0000	1.0000	(89)
MIT 2	18.1125	18.3156	18.6828	19.1929	19.6832	19.9899	20.0673	20.0514	19.7867	19.1567	18.5414	18.0803	(90)
Living area fraction									fLA = Living area / (4) =			0.0479	(91)
MIT	18.1824	18.3824	18.7440	19.2463	19.7295	20.0329	20.1106	20.0943	19.8314	19.2106	18.6047	18.1506	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1824	18.3824	18.7440	19.2463	19.7295	20.0329	20.1106	20.0943	19.8314	19.2106	18.6047	18.1506	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	1.0000	0.9999	0.9989	0.9910	0.9463	0.8039	0.6005	0.7014	0.9515	0.9982	0.9999	1.0000	(94)
Useful gains	2558.9502	3542.2027	4705.3207	6041.2650	6769.9672	5843.5703	4142.4853	4222.1733	4725.8235	3662.7901	2695.4932	2325.0404	(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													
	17009.9394	16504.4753	14974.7217	12599.3560	9770.2020	6585.7537	4255.5462	4475.0547	6957.6646	10477.2119	14021.5718	17031.6902	(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													

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	10751.5359	8710.6472	7640.4343	4721.8255	2232.1747	0.0000	0.0000	0.0000	0.0000	5069.9298	8154.7766	10941.7475	(98)
Space heating												58223.0715	(98)
Space heating per m2											(98) / (4) =	48.2290	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												93.7000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												62137.7497	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	10751.5359	8710.6472	7640.4343	4721.8255	2232.1747	0.0000	0.0000	0.0000	0.0000	5069.9298	8154.7766	10941.7475	(98)
Space heating efficiency (main heating system 1)													
	93.7000	93.7000	93.7000	93.7000	93.7000	0.0000	0.0000	0.0000	0.0000	93.7000	93.7000	93.7000	(210)
Space heating fuel (main heating system)													
	11474.4247	9296.3151	8154.1455	5039.3015	2382.2568	0.0000	0.0000	0.0000	0.0000	5410.8108	8703.0700	11677.4252	(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													
	298.4797	263.2175	276.7580	248.5414	243.8855	218.3851	210.1772	230.0207	229.4237	257.7012	271.9318	291.4489	(64)
Efficiency of water heater												80.0000	(216)
(217)m	90.3735	90.3456	90.2779	90.0974	89.5207	80.0000	80.0000	80.0000	80.0000	90.1170	90.3102	90.3863	(217)
Fuel for water heating, kWh/month													
	330.2734	291.3453	306.5623	275.8585	272.4350	272.9813	262.7215	287.5259	286.7796	285.9630	301.1086	322.4479	(219)
Water heating fuel used												3496.0022	(219)
Annual totals kWh/year													
Space heating fuel - main system												62137.7497	(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)												1804.6032	(232)
Total delivered energy for all uses												67513.3552	(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	62137.7497	0.2160	13421.7539	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	3496.0022	0.2160	755.1365	(264)
Space and water heating			14176.8904	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	1804.6032	0.5190	936.5891	(268)
Total CO2, kg/year			15152.4045	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			12.5500	(273)

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

DER		12.5500	ZC1
Total Floor Area	TFA	1207.2200	
Assumed number of occupants	N	4.3113	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		5.0413	ZC2
CO2 emissions from cooking, equation (L16)		0.1843	ZC3
Total CO2 emissions		17.7756	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		17.7756	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)	
Basement floor	362.2300	(1a)	x 3.6000	(2a) =	1304.0280	(1a) - (3a)
Ground floor	299.9900	(1b)	x 4.2800	(2b) =	1283.9572	(1b) - (3b)
First floor	299.9900	(1c)	x 3.7000	(2c) =	1109.9630	(1c) - (3c)
Second floor	245.0100	(1d)	x 2.6800	(2d) =	656.6268	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	1207.2200					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	4354.5750	(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							4 * 10 =	40.0000	(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) =	40.0000 / (5) =	0.0092	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.2592	(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) =	0.2203	(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	0.2809	0.2754	0.2699	0.2423	0.2368	0.2093	0.2093	0.2038	0.2203	0.2368	0.2478	0.2589	(22b)
Effective ac	0.5395	0.5379	0.5364	0.5294	0.5280	0.5219	0.5219	0.5208	0.5243	0.5280	0.5307	0.5335	(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			5.3700	1.0000	5.3700			(26)
TER Semi-glazed door			3.9200	1.2000	4.7040			(26a)
TER Opening Type (Uw = 1.40)			118.5100	1.3258	157.1155			(27)
TER Room Window (Uw = 1.70)			18.9500	1.5918	30.1639			(27a)
Heat Loss Floor 1			362.2300	0.1300	47.0899			(28a)
Main Wall	687.8000	117.1500	570.6500	0.1800	102.7170			(29a)
Basement Wall	270.7400		270.7400	0.1800	48.7332			(29a)
Dormer	27.2300	10.6500	16.5800	0.1800	2.9844			(29a)
Sloped	214.0600		214.0600	0.1300	27.8278			(30)
Flat	180.4700	15.0600	165.4100	0.1300	21.5033			(30)
Flat over Pool	58.5700	3.8900	54.6800	0.1300	7.1084			(30)
Total net area of external elements Aum(A, m2)			1801.1000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	455.3174			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	45.6851	(36)
Total fabric heat loss (33) + (36) =	501.0025	(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	775.1954	772.9940	770.8362	760.7013	758.8050	749.9778	749.9778	748.3431	753.3779	758.8050	762.6411	766.6515	(38)
Heat transfer coeff	1276.1978	1273.9965	1271.8387	1261.7037	1259.8075	1250.9803	1250.9803	1249.3456	1254.3804	1259.8075	1263.6436	1267.6540	(39)
Average = Sum(39)m / 12 =												1261.6947	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0571	1.0553	1.0535	1.0451	1.0436	1.0362	1.0362	1.0349	1.0391	1.0436	1.0467	1.0501	(40)
HLP (average)												1.0451	(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	4.3113 (42)
Average daily hot water use (litres/day)	136.5938 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	150.2531	144.7894	139.3256	133.8619	128.3981	122.9344	122.9344	128.3981	133.8619	139.3256	144.7894	150.2531	(44)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Energy conte	222.8211	194.8807	201.0994	175.3234	168.2269	145.1671	134.5186	154.3621	156.2057	182.0426	198.7138	215.7903	(45)
Energy content (annual)										Total = Sum(45)m =		2149.1516	(45)
Distribution loss (46)m = 0.15 x (45)m													
	33.4232	29.2321	30.1649	26.2985	25.2340	21.7751	20.1778	23.1543	23.4308	27.3064	29.8071	32.3685	(46)
Water storage loss:													
Store volume												500.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												2.9009	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.5665	(55)
Total storage loss													
	48.5607	43.8613	48.5607	46.9942	48.5607	46.9942	48.5607	48.5607	46.9942	48.5607	46.9942	48.5607	(56)
If cylinder contains dedicated solar storage													
	48.5607	43.8613	48.5607	46.9942	48.5607	46.9942	48.5607	48.5607	46.9942	48.5607	46.9942	48.5607	(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													
	294.6442	259.7532	272.9226	244.8296	240.0501	214.6733	206.3417	226.1852	225.7119	253.8657	268.2200	287.6134	(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													
	294.6442	259.7532	272.9226	244.8296	240.0501	214.6733	206.3417	226.1852	225.7119	253.8657	268.2200	287.6134	(64)
									Total per year (kWh/year) = Sum(64)m =			2994.8109	(64)
Heat gains from water heating, kWh/month													
	131.5465	116.6958	124.3241	113.9000	113.3939	103.8730	102.1859	108.7839	107.5434	117.9877	121.6773	129.2088	(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	215.5658	215.5658	215.5658	215.5658	215.5658	215.5658	215.5658	215.5658	215.5658	215.5658	215.5658	215.5658	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	102.1841	90.7590	73.8102	55.8791	41.7703	35.2642	38.1042	49.5293	66.4781	84.4093	98.5181	105.0241	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	1027.0337	1037.6911	1010.8348	953.6609	881.4892	813.6579	768.3424	757.6851	784.5413	841.7152	913.8870	981.7182	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	44.5566	44.5566	44.5566	44.5566	44.5566	44.5566	44.5566	44.5566	44.5566	44.5566	44.5566	44.5566	(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)													
	-172.4526	-172.4526	-172.4526	-172.4526	-172.4526	-172.4526	-172.4526	-172.4526	-172.4526	-172.4526	-172.4526	-172.4526	(71)
Water heating gains (Table 5)													
	176.8098	173.6545	167.1022	158.1945	152.4112	144.2681	137.3467	146.2149	149.3658	158.5856	168.9963	173.6677	(72)
Total internal gains													
	1396.6973	1392.7743	1342.4169	1258.4042	1166.3404	1083.8600	1034.4631	1044.0990	1091.0550	1175.3798	1272.0710	1351.0798	(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	43.3500	11.2829	0.6300	0.7000	0.7700	149.4801	(75)
Southeast	17.1600	36.7938	0.6300	0.7000	0.7700	192.9586	(77)
Southwest	33.8900	36.7938	0.6300	0.7000	0.7700	381.0820	(79)
Northwest	24.1100	11.2829	0.6300	0.7000	0.7700	83.1364	(81)
Horizontal	18.9500	26.0000	0.6300	0.7000	1.0000	195.5526	(82)

Solar gains	1002.2097	1857.4489	2913.0059	4186.9004	5184.0806	5355.3174	5076.8800	4306.8139	3353.0843	2155.7356	1228.4615	839.1718	(83)
Total gains	2398.9070	3250.2232	4255.4228	5445.3046	6350.4210	6439.1773	6111.3431	5350.9129	4444.1393	3331.1154	2500.5325	2190.2516	(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	65.6910	65.8045	65.9162	66.4456	66.5457	67.0152	67.0152	67.1029	66.8336	66.5457	66.3436	66.1338	
alpha	5.3794	5.3870	5.3944	5.4297	5.4364	5.4677	5.4677	5.4735	5.4556	5.4364	5.4229	5.4089	
util living area													
	1.0000	1.0000	0.9997	0.9976	0.9833	0.9213	0.7980	0.8740	0.9870	0.9996	1.0000	1.0000	(86)
MIT	19.5033	19.6336	19.8765	20.2200	20.5659	20.8352	20.9501	20.9150	20.6611	20.2247	19.8056	19.4861	(87)
Th 2	20.0360	20.0375	20.0390	20.0459	20.0472	20.0532	20.0532	20.0544	20.0509	20.0472	20.0446	20.0418	(88)
util rest of house													
	1.0000	0.9999	0.9996	0.9964	0.9734	0.8687	0.6721	0.7714	0.9752	0.9993	1.0000	1.0000	(89)
MIT 2	17.9864	18.1784	18.5352	19.0426	19.5436	19.9103	20.0285	20.0034	19.6868	19.0511	18.4354	17.9654	(90)
Living area fraction									fLA = Living area / (4) =			0.0479	(91)
MIT	18.0591	18.2481	18.5994	19.0990	19.5926	19.9546	20.0726	20.0471	19.7335	19.1073	18.5010	18.0382	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.0591	18.2481	18.5994	19.0990	19.5926	19.9546	20.0726	20.0471	19.7335	19.1073	18.5010	18.0382	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	1.0000	0.9999	0.9993	0.9946	0.9666	0.8616	0.6751	0.7704	0.9689	0.9988	0.9999	1.0000	(94)
Useful gains	2398.8607	3249.8697	4252.4235	5415.7352	6138.0608	5547.8347	4125.8414	4122.4326	4305.8664	3327.1143	2500.3773	2190.2267	(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													
	17559.3183	17005.3706	15388.5436	12868.1354	9943.0948	6698.5444	4344.2118	4556.4516	7066.5493	10717.5286	14406.8515	17542.0898	(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													

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	11279.3805	9243.6966	8285.2733	5365.7281	2830.9453	0.0000	0.0000	0.0000	0.0000	5498.4682	8572.6614	11421.7862 (98)
Space heating												62497.9396 (98)
Space heating per m2											(98) / (4) =	51.7701 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
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												66842.7161	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	11279.3805	9243.6966	8285.2733	5365.7281	2830.9453	0.0000	0.0000	0.0000	0.0000	5498.4682	8572.6614	11421.7862	(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)													
	12063.5085	9886.3065	8861.2549	5738.7466	3027.7490	0.0000	0.0000	0.0000	0.0000	5880.7147	9168.6218	12215.8141	(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													
	294.6442	259.7532	272.9226	244.8296	240.0501	214.6733	206.3417	226.1852	225.7119	253.8657	268.2200	287.6134	(64)
Efficiency of water heater												79.8000	(216)
(217)m	90.1921	90.1695	90.1147	89.9736	89.5613	79.8000	79.8000	79.8000	79.8000	89.9676	90.1333	90.2029	(217)
Fuel for water heating, kWh/month													
	326.6850	288.0720	302.8614	272.1129	268.0288	269.0142	258.5736	283.4401	282.8470	282.1746	297.5813	318.8515	(219)
Water heating fuel used												3450.2424	(219)
Annual totals kWh/year													
Space heating fuel - main system												66842.7161	(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)												1804.6032	(232)
Total delivered energy for all uses												72172.5617	(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	66842.7161	0.2160	14438.0267	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	3450.2424	0.2160	745.2523	(264)
Space and water heating			15183.2790	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	1804.6032	0.5190	936.5891	(268)
Total CO2, kg/m2/year			16158.7931	(272)
Emissions per m2 for space and water heating			12.5771	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			0.7758	(272b)
Emissions per m2 for pumps and fans			0.0322	(272c)
Target Carbon Dioxide Emission Rate (TER) = (12.5771 * 1.00) + 0.7758 + 0.0322, rounded to 2 d.p.			13.3900	(273)