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 green	**Prop Type Ref**	
Property	71, Avenue Road, London, NW8 6HP		

SAP Rating	89 B	**DER**	7.82	**TER**	20.30
Environmental	90 B	**% DER<TER**	61.48		
CO_2 Emissions (t/year)	7.63	**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	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500774
Configuration	6
MVHR Duct Insulated	Yes
Manufacturer SFP	1.15
Duct Type	Rigid
MVHR Efficiency	87.00
Wet Rooms	6

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				0
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.	103415	
Fuel Type	Electricity	
Main Heating	PER	
SAP Code	221	
In Winter	371.1	
In Summer	315.1	
Controls	CHD Time and temperature zone control	
PCDF Controls	0	
Sap Code	2207	
Boiler Compensator	Bosch Thermotechnology Ltd, Worcester, Wave	
Is MHS Pumped	Pump in heated space	
Heat Emitter	Radiators and Underfloor	

Underfloor Heating	Yes - Pipes in thin screed	
Flow Temperature	36° - 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	
Immersion Only Heating Hot Water	No	
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	
32.0 Photovoltaic Unit	One Dwelling	

PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
5.00	South	30°	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

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

Design SAP
elmhurst energy

Property Reference	71 Avenue Road	**Issued on Date**	30/09/2022
Assessment Reference	Be green	**Prop Type Ref**	
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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:Electricity
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 20.30 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 7.82 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

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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: Heat pump with radiators or underfloor - Electric
Kensa Heat Pumps Evo K150-S3H-0K

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

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

---
8 Mechanical ventilation
Continuous supply and extract system
Specific fan power: 1.15
Maximum 1.5 OK
MVHR efficiency: 87%
Minimum: 70% OK

---
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
Photovoltaic array 5.00 kW

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							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(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) =	0.1275	(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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation:	0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	73.9500	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2928	0.2896	0.2864	0.2705	0.2673	0.2514	0.2514	0.2482	0.2578	0.2673	0.2737	0.2801	(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	420.7744	416.1939	411.6135	388.7111	384.1307	361.2283	361.2283	356.6479	370.3893	384.1307	393.2916	402.4525	(38)
Heat transfer coeff	898.1301	893.5496	888.9691	866.0668	861.4863	838.5840	838.5840	834.0035	847.7449	861.4863	870.6473	879.8082	(39)
Average = Sum(39)m / 12 =												864.9217	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7440	0.7402	0.7364	0.7174	0.7136	0.6946	0.6946	0.6908	0.7022	0.7136	0.7212	0.7288	(40)
HLP (average)												0.7165	(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)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	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)
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)

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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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-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													
	1397.8215	1393.8985	1343.5411	1259.5283	1167.4645	1084.9841	1035.5873	1045.2232	1092.1792	1176.5040	1273.1952	1352.2039	(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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	2556.0081	3539.7337	4707.4679	6093.1084	7151.4932	7266.4749	6895.7575	6016.9149	4963.7698	3666.5404	2692.7109	2322.0705	(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	93.3436	93.8221	94.3055	96.7994	97.3140	99.9718	99.9718	100.5208	98.8914	97.3140	96.2901	95.2875	
alpha	7.2229	7.2548	7.2870	7.4533	7.4876	7.6648	7.6648	7.7014	7.5928	7.4876	7.4193	7.3525	
util living area													
	1.0000	1.0000	0.9996	0.9926	0.9259	0.7182	0.5330	0.6302	0.9424	0.9993	1.0000	1.0000	(86)
Tweekday	19.1565	19.3061	19.5543	19.9133	20.1819	20.2868	20.2931	20.2957	20.2143	19.8374	19.4508	19.1638	
Tweekend	20.4688	20.5336	20.6420	20.7949	20.9195	20.9709	20.9764	20.9753	20.9287	20.7595	20.5913	20.4671	
24 / 16	5	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	13	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	9	7	0	0	0	0	0	0	0	0	0	22	
MIT	20.7772	20.3678	20.4474	20.6798	20.8757	20.9553	20.9636	20.9619	20.8886	20.6288	20.3618	20.4671	(87)
Th 2	20.3022	20.3055	20.3088	20.3255	20.3288	20.3456	20.3456	20.3489	20.3389	20.3288	20.3221	20.3155	(88)
util rest of house													
	1.0000	1.0000	0.9994	0.9895	0.8985	0.6532	0.4549	0.5450	0.9096	0.9988	1.0000	1.0000	(89)
Tweekday	19.1565	19.3061	19.5543	19.9133	20.1819	20.2868	20.2931	20.2957	20.2143	19.8374	19.4508	19.1638	
Tweekend	19.1565	19.3061	19.5543	19.9133	20.1819	20.2868	20.2931	20.2957	20.2143	19.8374	19.4508	19.1638	
MIT 2	19.8217	19.3061	19.5543	19.9133	20.1819	20.2868	20.2931	20.2957	20.2143	19.8374	19.4508	19.1638	(90)
Living area fraction										fLA = Living area / (4) =		0.0479	(91)
MIT	19.8675	19.3569	19.5971	19.9500	20.2152	20.3188	20.3252	20.3276	20.2466	19.8753	19.4945	19.2262	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8675	19.3569	19.5971	19.9500	20.2152	20.3188	20.3252	20.3276	20.2466	19.8753	19.4945	19.2262	(93)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	1.0000	0.9999	0.9992	0.9872	0.8931	0.6504	0.4524	0.5421	0.9039	0.9984	1.0000	1.0000	(94)
Useful gains	2555.9983	3539.5194	4703.6465	6014.8757	6386.9006	4726.3469	3119.9395	3261.7812	4486.7691	3660.7202	2692.6429	2322.0652	(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	13981.6280	12917.9992	11642.9352	9570.0162	7335.7036	4795.7075	3123.8961	3275.6590	5210.7389	7990.5638	10791.2061	13220.1701	(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	8500.6685	6302.3384	5162.8308	2559.7011	705.9094	0.0000	0.0000	0.0000	0.0000	3221.4037	5830.9655	8108.1900	(98)
Space heating												40392.0074	(98)
Space heating per m2											(98) / (4) =	33.4587	(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 %)	352.5008	(206)
Efficiency of secondary/supplementary heating system, %	100.0000	(208)
Space heating requirement	11458.6986	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	8500.6685	6302.3384	5162.8308	2559.7011	705.9094	0.0000	0.0000	0.0000	0.0000	3221.4037	5830.9655	8108.1900	(98)
Space heating efficiency (main heating system 1)	352.5008	352.5008	352.5008	352.5008	352.5008	0.0000	0.0000	0.0000	0.0000	352.5008	352.5008	352.5008	(210)
Space heating fuel (main heating system)	2411.5315	1787.8932	1464.6294	726.1546	200.2575	0.0000	0.0000	0.0000	0.0000	913.8712	1654.1707	2300.1904	(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												189.0600	(216)
(217)m	189.0600	189.0600	189.0600	189.0600	189.0600	189.0600	189.0600	189.0600	189.0600	189.0600	189.0600	189.0600	(217)
Fuel for water heating, kWh/month	157.8756	139.2243	146.3864	131.4616	128.9990	115.5110	111.1696	121.6654	121.3497	136.3066	143.8336	154.1568	(219)
Water heating fuel used												1607.9396	(219)
Annual totals kWh/year													
Space heating fuel - main system												11458.6986	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.4375)													
mechanical ventilation fans (SFP = 1.4375)												7636.8359	(230a)
Total electricity for the above, kWh/year												7636.8359	(231)
Electricity for lighting (calculated in Appendix L)												1804.6032	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 5.00 * 1080 * 1.00) =										-4318.0985		-4318.0985	(233)
Total delivered energy for all uses												18189.9789	(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	11458.6986	0.5190	5947.0646	(261)
Space heating - secondary	0.0000	0.5190	0.0000	(263)
Water heating (other fuel)	1607.9396	0.5190	834.5207	(264)
Space and water heating			6781.5852	(265)
Pumps and fans	7636.8359	0.5190	3963.5178	(267)
Energy for lighting	1804.6032	0.5190	936.5891	(268)
Energy saving/generation technologies				
PV Unit	-4318.0985	0.5190	-2241.0931	(269)
Total CO2, kg/year			9440.5990	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			7.8200	(273)

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

DER		7.8200	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		13.0456	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		13.0456	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 (electricity)			1.5500	
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 * 1.55) + 0.7758 + 0.0322, rounded to 2 d.p.			20.3000	(273)