

Summary for Input Data



Property Reference	Montrose House	Issued on Date	25/10/2023
Assessment Reference	New Build	Prop Type Ref	New Build
Property	Montrose House, Coronation Road, Ascot, SL5 9LP		

SAP Rating	89 B	DER	1.92	TER	8.34
Environmental	98 A	% DER < TER			76.98
CO ₂ Emissions (t/year)	1.15	DFEE	45.53	TFEE	47.79
Compliance Check	See BREL	% DFEE < TFEE			4.73
% DPER < TPER	55.12	DPER	20.27	TPER	45.16

Assessor Details	Mr. Alexander Cotterill	Assessor ID	AV67-0001
Client			

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

Orientation	East	
Property Tenure	ND	
Transaction Type	6	
Terrain Type	Rural	
1.0 Property Type	House, Detached	
Which Floor	0	
2.0 Number of Storeys	3	
3.0 Date Built	2023	
3.0 Property Age Band	L	
4.0 Sheltered Sides	0	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	N/A	kJ/m ² K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m ²	0.00 m
Ground floor:	86.17 m	319.90 m ²	3.30 m
1st Storey:	87.88 m	328.80 m ²	3.35 m
2nd Storey:	46.42 m	106.60 m ²	3.06 m
3rd Storey:	0.00 m	0.00 m ²	0.00 m
4th Storey:	0.00 m	0.00 m ²	0.00 m
5th Storey:	0.00 m	0.00 m ²	0.00 m
6th Storey:	0.00 m	0.00 m ²	0.00 m
7th Storey:	0.00 m	0.00 m ²	0.00 m

8.0 Living Area	126.89	m ²
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9.0 External Walls	Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area(m ²)	Nett Area (m ²)	Shelter Res	Shelter	Openings	Area Calculation Type
	External Facade	Cavity Wall	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure	0.18	60.00	578.59	409.96	0.00	None	168.63	Enter Gross Area
	Ashlar Wall	Timber Frame	Timber framed wall (one layer of plasterboard)	0.18	9.00	45.28	45.28	0.00	None	0.00	Enter Gross Area
	Dormer Wall	Timber Frame	Timber framed wall (one layer of plasterboard)	0.18	9.00	29.12	16.28	0.00	None	12.84	Enter Gross Area

9.2 Internal Walls	Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
	Interna Wall - Solid	Dense block, plasterboard on dabs	75.00	540.34
	Internal Wall - Timber	Plasterboard on timber frame	9.00	731.61

10.0 External Roofs	Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area(m ²)	Nett Area (m ²)	Shelter Code	Shelter Factor	Calculation Type	Openings
	Ceiling	External Plane Roof	Plasterboard, insulated at ceiling level	0.11	9.00	222.20	222.20	None	0.00	Enter Gross Area	0.00

Summary for Input Data



Sloped Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.12	9.00	77.96	76.51	None	0.00	Enter Gross Area	1.45
Flat Roof	External Flat Roof	Plasterboard, insulated flat roof	0.12	9.00	36.45	32.45	None	0.00	Enter Gross Area	4.00

10.2 Internal Ceilings

Description	Storey	Construction	Area (m ²)
Internal Ceiling 1	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	319.90
Internal Ceiling 2	+1	Plasterboard ceiling, carpeted chipboard floor	106.60

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m ² K)	Shelter Code	Shelter Factor	Kappa (kJ/m ² K)	Area (m ²)
Ground Floor	Ground Floor - Solid	Lowest occupied	Slab on ground, screed over insulation	0.13	None	0.00	110.00	319.90
Exposed Floor	Ground Floor - Timber	+1	Suspended timber, insulation between joists	0.15	None	0.00	20.00	8.90

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m ² K)	Area (m ²)
Internal Floor 1		Plasterboard ceiling, carpeted chipboard floor	9.00	319.19
Internal Floor 2		Plasterboard ceiling, carpeted chipboard floor	9.00	106.60

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m ² K)
Windows	Manufacturer	Window	Double glazed		Air Filled	0.76	Wood	0.70	1.20
Door	Manufacturer	Half Glazed Door	Double glazed		Air Filled	0.76	Wood	0.70	1.20
Rooflight	Manufacturer	Roof Light	Double glazed		Air Filled	0.76	Wood	0.70	1.30

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m ²)	Pitch
Windows E	Windows	External Facade	East	45.81	0
Windows E	Windows	Dormer Wall	East	4.02	0
Door E	Door	External Facade	East	5.36	0
Windows W	Windows	External Facade	West	79.52	0
Windows W	Windows	Dormer Wall	West	7.49	0
Windows S	Windows	External Facade	South	30.54	0
Windows S	Windows	Dormer Wall	South	0.69	0
Windows N	Windows	External Facade	North	7.40	0
Windows N	Windows	Dormer Wall	North	0.64	0
Rooflight	Rooflight	Sloped Roof	North	1.45	30
Rooflight	Rooflight	Flat Roof	South	4.00	0

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E2 Other lintels (including other steel lintels)		78.84	0.00	0.00	No
E3 Sill		42.59	0.00	0.00	No
E4 Jamb		196.06	0.00	0.00	No
E5 Ground floor (normal)		86.17	0.00	0.00	No
E20 Exposed floor (normal)		1.71	0.00	0.00	No
E6 Intermediate floor within a dwelling		132.59	0.00	0.00	No
E10 Eaves (insulation at ceiling level)		90.22	0.00	0.00	No
E14 Flat roof		31.02	0.00	0.00	No
E16 Corner (normal)		79.00	0.00	0.00	No
E17 Corner (inverted – internal area greater than external area)		47.30	0.00	0.00	No

Y-value W/m²K

Description

18.0 Pressure Testing

Designed AP₅₀ m²/(h.m²) @ 50 Pa

Property Tested?

Test Method

19.0 Mechanical Ventilation

Mechanical Ventilation

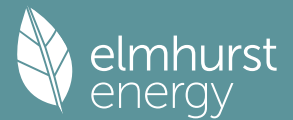
Mechanical Ventilation System Present

Approved Installation

Mechanical Ventilation data Type

Type

Summary for Input Data



MV Reference Number	500289
Configuration	7
Manufacturer SFP	1.05
Duct Type	Rigid
MVHR Efficiency	91.00
Wet Rooms	7
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 2

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System	No
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22.0 Lighting

No Fixed Lighting	No				
	Name Lighting	Efficacy 95.00	Power 12	Capacity 1140	Count 110

24.0 Main Heating 1

Database		
Percentage of Heat	100.00	%
Database Ref. No.	105069	
Fuel Type	Electricity	
SAP Code	0	
In Winter	348.76	
In Summer	169.52	
Model Name	Ecodan 14.0 kW	
Manufacturer	Mitsubishi Electric Europe B.V.	
System Type	Heat Pump	
Controls SAP Code	2207	
Delayed Start Stat	No	
HETAS approved System	No	
Oil Pump Inside	No	
FI Case	0.00	
Flue Type	None or Unknown	
Fan Assisted Flue	No	
Is MHS Pumped	Pump in unheated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators and Underfloor	
Underfloor Heating	Yes - Pipes in thin screed	
Flow Temperature	Enter value	
Flow Temperature Value	35.00	
Boiler Interlock	No	

25.0 Main Heating 2	None
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26.0 Heat Networks	None
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	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

28.0 Water Heating

Water Heating	Main Heating 1
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Summary for Input Data

SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	Yes
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
Summer Immersion	No
Cold Water Source	From mains
Bath Count	2
Supplementary Immersion	No
Immersion Only Heating Hot Water	Yes

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Vented hot water system	7.00		Yes	Instantaneous System 1

28.3 Waste Water Heat Recovery System Instantaneous System 1

Database ID	80147
Brand Model	Recoup, Pipe HEX-Rd
Details	Year: 2019 + current Efficiency: 64.95 Utilisation factor: 0.973

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	2.09	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	

31.0 Thermal Store

None

32.0 Photovoltaic Unit

One Dwelling	
Export Capable Meter?	Yes
Connected To Dwelling	Yes
Diverter	Yes
Battery Capacity [kWh]	5.00

PV Cells kWp	Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
6.00	South	30°	None Or Little	No	No	1.00		

34.0 Small-scale Hydro

None		
Electricity Generated	0.00	kWh/Year
Apportioned	0.00	
Connected to dwelling's electricity meter	Yes	
Electricity Generation	Annual	

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Recommendations

Lower cost measures	None
Further measures to achieve even higher standards	None

Full SAP Calculation Printout



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Compliance Check	See BREL	% DFEE < TFEE			4.73
% DPER < TPER	55.12	DPER	20.27	TPER	45.16
Assessor Details	Mr. Alexander Cotterill			Assessor ID	AV67-0001
Client					

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
 CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	319.9000 (1b)	x 3.3000 (2b)	= 1055.6700 (1b) - (3b)
First floor	328.8000 (1c)	x 3.3500 (2c)	= 1101.4800 (1c) - (3c)
Second floor	106.6000 (1d)	x 3.0600 (2d)	= 326.1960 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	755.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 2483.3460 (5)

2. Ventilation rate

		m ³ per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		4.0000 (17)
Infiltration rate		0.2000 (18)
Number of sides sheltered		0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2000 (21)
Wind speed	Jan 5.1000, Feb 5.0000, Mar 4.9000, Apr 4.4000, May 4.3000, Jun 3.8000, Jul 3.8000, Aug 3.7000, Sep 4.0000, Oct 4.3000, Nov 4.5000, Dec 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	0.2550, 0.2500, 0.2450, 0.2200, 0.2150, 0.1900, 0.1900, 0.1850, 0.2000, 0.2150, 0.2250, 0.2350	(22b)
Balanced mechanical ventilation with heat recovery		
If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		72.8000 (23c)
Effective ac	0.3910, 0.3860, 0.3810, 0.3560, 0.3510, 0.3260, 0.3260, 0.3210, 0.3360, 0.3510, 0.3610, 0.3710	(25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.20)			176.1100	1.1450	201.6527		(27)
Door			5.3600	1.2000	6.4320		(26a)
Rooflight			1.4500	1.2357	1.7918		(27a)
Rooflight			4.0000	1.2357	4.9430		(27a)
Ground Floor			319.9000	0.1300	41.5870	110.0000	35189.0000 (28a)
Exposed Floor			8.9000	0.1500	1.3350	20.0000	178.0000 (28a)
External Facade	578.5900	168.6300	409.9600	0.1800	73.7928	60.0000	24597.6000 (29a)
Ashlar Wall	45.2800		45.2800	0.1800	8.1504	9.0000	407.5200 (29a)
Dormer Wall	29.1200	12.8400	16.2800	0.1800	2.9304	9.0000	146.5200 (29a)
Ceiling	222.2000		222.2000	0.1100	24.4420	9.0000	1999.8000 (30)
Sloped Roof	77.9600	1.4500	76.5100	0.1200	9.1812	9.0000	688.5900 (30)
Flat Roof	36.4500	4.0000	32.4500	0.1200	3.8940	9.0000	292.0500 (30)
Total net area of external elements Aum(A, m ²)			1318.4000				(31)

Full SAP Calculation Printout



Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	380.1323		(33)
Internal Wall - Solid	540.3400		75.0000	40525.5000 (32c)
Internal Wall - Timber	731.6100		9.0000	6584.4900 (32c)
Internal Floor 1	319.1900		18.0000	5745.4200 (32d)
Internal Floor 2	106.6000		18.0000	1918.8000 (32d)
Internal Ceiling 1	319.9000		9.0000	2879.1000 (32e)
Internal Ceiling 2	106.6000		9.0000	959.4000 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	122111.7900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		161.6732 (35)
Thermal bridges (User defined value 0.040 * total exposed area)		52.7360 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	432.8683 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	320.4261	316.3286	312.2311	291.7435	287.6460	267.1584	267.1584	263.0608	275.3534	287.6460	295.8410	304.0361	(38)
Average = Sum(39)m / 12 =													
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9973	0.9919	0.9865	0.9594	0.9539	0.9268	0.9268	0.9214	0.9377	0.9539	0.9648	0.9756	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.7238 (42)
Hot water usage for mixer showers	86.6563	85.3540	83.4563	79.8255	77.1460	74.1579	72.4594	74.3427	76.4072	79.6155	83.3244	86.3243	(42a)
Hot water usage for baths	37.3883	36.8330	36.0511	34.6093	33.5297	32.3327	31.6861	32.4626	33.3080	34.5889	36.0603	37.2619	(42b)
Hot water usage for other uses	52.7656	50.8469	48.9281	47.0094	45.0906	43.1719	43.1719	45.0906	47.0094	48.9281	50.8469	52.7656	(42c)
Average daily hot water use (litres/day)													162.5278 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	176.8102	173.0339	168.4355	161.4442	155.7664	149.6625	147.3174	151.8959	156.7246	163.1326	170.2316	176.3518	(44)
Energy content (annual)	280.0241	246.3980	258.8791	221.0090	209.6915	184.0275	178.1676	188.0789	193.2571	221.3693	242.5261	276.1243	(45)
Distribution loss (46)m = 0.15 x (45)m													Total = Sum(45)m = 2699.5525
Water storage loss:	42.0036	36.9597	38.8319	33.1514	31.4537	27.6041	26.7251	28.2118	28.9886	33.2054	36.3789	41.4186	(46)
Store volume													500.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													2.0900 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.1286 (55)
Total storage loss	34.9866	31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866	(56)
If cylinder contains dedicated solar storage	34.9866	31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866	(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)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	338.2731	299.0100	317.1281	277.3790	267.9405	240.3975	236.4166	246.3279	249.6271	279.6183	298.8961	334.3733	(62)
WWHRS	-70.9627	-62.7600	-65.7186	-54.4176	-50.7153	-43.3974	-40.6782	-43.2571	-44.9006	-52.9329	-59.9666	-69.6486	(63a)
FV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
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	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	267.3104	236.2500	251.4095	222.9614	217.2252	197.0000	195.7385	203.0707	204.7264	226.6854	238.9295	264.7247	(64)
12Total per year (kWh/year)													Total per year (kWh/year) = Sum(64)m = 2726.0319 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Heat gains from water heating, kWh/month	139.7072	124.0169	132.6765	118.5815	116.3216	106.2851	105.8399	109.1354	109.3540	120.2045	125.7359	138.4105	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	186.1910	186.1910	186.1910	186.1910	186.1910	186.1910	186.1910	186.1910	186.1910	186.1910	186.1910	186.1910	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	387.5675	429.0926	387.5675	400.4864	387.5675	400.4864	387.5675	387.5675	400.4864	387.5675	400.4864	387.5675	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	768.3959	776.3695	756.2764	713.5006	659.5039	608.7546	574.8509	566.8773	586.9704	629.7462	683.7429	734.4923	(68)
Pumps, fans	41.6191	41.6191	41.6191	41.6191	41.6191	41.6191	41.6191	41.6191	41.6191	41.6191	41.6191	41.6191	(69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	(71)
Total internal gains	187.7785	184.5490	178.3286	164.6965	156.3463	147.6182	142.2580	146.6874	151.8805	161.5652	174.6332	186.0356	(72)
Total internal gains	1422.5993	1468.8684	1401.0299	1357.5409	1282.2750	1235.7165	1183.5337	1179.9896	1218.1947	1257.7362	1337.7199	1386.9527	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
	m2	Table 6a	Specific data	Specific data	factor	W
		W/m2	or Table 6b	or Table 6c	Table 6d	
North	8.0400	10.6334	0.7600	0.7000	0.7700	31.5190 (74)
East	49.8300	19.6403	0.7600	0.7000	0.7700	360.8137 (76)
South	31.2300	46.7521	0.7600	0.7000	0.7700	538.2917 (78)
West	87.0100	19.6403	0.7600	0.7000	0.7700	630.0302 (80)
North	1.4500	16.7973	0.7600	0.7000	1.0000	11.6617 (82)

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South			4.0000	26.0000	0.7600	0.7000	1.0000	49.7952 (82)				
Solar gains	1622.1115	3005.8830	4642.3712	6451.2800	7727.6803	7856.0464	7500.0764	6543.7583	5280.8578	3476.0798	1989.9341	1356.2509 (83)
Total gains	3044.7108	4474.7514	6043.4010	7808.8209	9009.9552	9091.7629	8683.6101	7723.7479	6499.0525	4733.8160	3327.6541	2743.2036 (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	45.0288	45.2751	45.5241	46.8112	47.0774	48.4552	48.4552	48.7405	47.8945	47.0774	46.5480	46.0303
alpha	4.0019	4.0183	4.0349	4.1207	4.1385	4.2303	4.2303	4.2494	4.1930	4.1385	4.1032	4.0687
util living area	0.9974	0.9882	0.9553	0.8483	0.6721	0.4799	0.3518	0.4087	0.6789	0.9392	0.9930	0.9983 (86)
Living	19.4568	19.7478	20.1485	20.5924	20.8251	20.9087	20.9231	20.9202	20.8522	20.4518	19.8672	19.4344
Non living	18.2407	18.6155	19.1239	19.6785	19.9375	20.0387	20.0492	20.0526	19.9840	19.5280	18.7865	18.2255
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	31	0	0	0	0	0	0	0	0	0	0	14
16 / 9	0	28	31	0	0	0	0	0	0	0	21	17
MIT	21.0000	20.2908	20.5177	20.5924	20.8251	20.9087	20.9231	20.9202	20.8522	20.4518	20.2111	20.5138 (87)
Th 2	20.0855	20.0901	20.0946	20.1173	20.1219	20.1448	20.1448	20.1494	20.1356	20.1219	20.1128	20.1037 (88)
util rest of house	0.9968	0.9856	0.9458	0.8205	0.6242	0.4202	0.2847	0.3356	0.6139	0.9216	0.9911	0.9979 (89)
MIT 2	20.0855	19.4392	19.6661	19.6785	19.9375	20.0387	20.0492	20.0526	19.9840	19.5280	19.3051	19.6491 (90)
Living area fraction	FLA = Living area / (4) =											
MIT	20.2392	19.5823	19.8092	19.8320	20.0866	20.1848	20.1960	20.1983	20.1299	19.6832	19.4573	19.7943 (92)
Temperature adjustment	0.0000											
adjusted MIT	20.2392	19.5823	19.8092	19.8320	20.0866	20.1848	20.1960	20.1983	20.1299	19.6832	19.4573	19.7943 (93)

8. Space heating requirement

Utilisation	0.9969	0.9838	0.9423	0.8104	0.6222	0.4230	0.2888	0.3399	0.6134	0.9107	0.9893	0.9978 (94)
Useful gains	3035.3286	4402.4563	5694.5912	6328.5405	5605.6349	3846.0413	2507.8223	2625.0499	3986.6644	4310.9812	3292.1298	2737.0533 (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	12006.8908	10999.9322	9916.6788	7921.4561	6042.6980	3909.5401	2517.3288	2643.3725	4270.4715	6544.5828	9004.9077	11491.5375 (97)
Space heating kWh	6674.8422	4433.5038	3141.2332	1146.8993	325.1750	0.0000	0.0000	0.0000	0.0000	1661.7996	4113.2001	6513.3363 (98a)
Space heating requirement - total per year (kWh/year)												28009.9894
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	6674.8422	4433.5038	3141.2332	1146.8993	325.1750	0.0000	0.0000	0.0000	0.0000	1661.7996	4113.2001	6513.3363 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												28009.9894
Space heating per m2												(98c) / (4) = 37.0846 (99)

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 %)												348.7625 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	6674.8422	4433.5038	3141.2332	1146.8993	325.1750	0.0000	0.0000	0.0000	0.0000	1661.7996	4113.2001	6513.3363 (98)
Space heating efficiency (main heating system 1)	348.7625	348.7625	348.7625	348.7625	348.7625	0.0000	0.0000	0.0000	0.0000	348.7625	348.7625	348.7625 (210)
Space heating fuel (main heating system)	1913.8648	1271.2101	900.6798	328.8482	93.2368	0.0000	0.0000	0.0000	0.0000	476.4847	1179.3700	1867.5565 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	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	267.3104	236.2500	251.4095	222.9614	217.2252	197.0000	195.7385	203.0707	204.7264	226.6854	238.9295	264.7247 (64)
Efficiency of water heater (217)m	169.5203	169.5203	169.5203	169.5203	169.5203	169.5203	169.5203	169.5203	169.5203	169.5203	169.5203	169.5203 (216)
Fuel for water heating, kWh/month	157.6863	139.3638	148.3064	131.5249	128.1411	116.2103	115.4661	119.7914	120.7681	133.7217	140.9445	156.1610 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	337.7266	305.0433	337.7266	326.8321	337.7266	326.8321	337.7266	337.7266	326.8321	337.7266	326.8321	337.7266 (231)
Lighting	76.1107	61.0589	54.9767	40.2783	31.1121	25.4189	28.3815	36.8914	47.9183	62.8713	71.0130	78.2261 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-146.7307	-238.6189	-389.8900	-483.9274	-554.1774	-525.7519	-520.3699	-470.3071	-387.3129	-292.6933	-171.7068	-123.1816 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-3.5288	-12.1210	-37.1487	-88.3887	-152.8710	-169.3892	-165.5847	-129.0148	-82.0763	-27.8443	-6.5227	-2.5599 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												8031.2511 (211)
Space heating fuel - main system 2												0.0000 (213)

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Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	169.5203
Water heating fuel used	1608.0854 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.3125)	
mechanical ventilation fans (SFP = 1.3125)	3976.4578 (230a)
Total electricity for the above, kWh/year	3976.4578 (231)
Electricity for lighting (calculated in Appendix L)	614.2573 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-5181.7182 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	9048.3334 (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	8031.2511	0.1569	1259.7887 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1608.0854	0.1407	226.2500 (264)
Space and water heating			1486.0386 (265)
Pumps, fans and electric keep-hot	3976.4578	0.1387	551.5837 (267)
Energy for lighting	614.2573	0.1443	88.6563 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-4304.6679	0.1326	-570.6928
PV Unit electricity exported	-877.0503	0.1168	-102.4045
Total			-673.0973 (269)
Total CO2, kg/year			1453.1814 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.9200 (273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	8031.2511	1.5807	12694.7483 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1608.0854	1.5202	2444.6588 (278)
Space and water heating			15139.4070 (279)
Pumps, fans and electric keep-hot	3976.4578	1.5128	6015.5853 (281)
Energy for lighting	614.2573	1.5338	942.1684 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-4304.6679	1.4899	-6413.4043
PV Unit electricity exported	-877.0503	0.4281	-375.4321
Total			-6788.8365 (283)
Total Primary energy kWh/year			15308.3243 (286)
Dwelling Primary energy Rate (DPER)			20.2700 (287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	319.9000 (1b)	x 3.3000 (2b)	= 1055.6700 (1b) - (3b)
First floor	328.8000 (1c)	x 3.3500 (2c)	= 1101.4800 (1c) - (3c)
Second floor	106.6000 (1d)	x 3.0600 (2d)	= 326.1960 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	755.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 2483.3460 (5)

2. Ventilation rate

Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract 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)+(6c)+(6d)+(6e)+(6f)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0161 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000 (17)	
Infiltration rate		0.2661 (18)

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Number of sides sheltered

0 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 1.0000 (20)
 Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.2661 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.3393	0.3326	0.3260	0.2927	0.2861	0.2528	0.2528	0.2461	0.2661	0.2861	0.2994	0.3127 (22b)
	0.5576	0.5553	0.5531	0.5428	0.5409	0.5320	0.5320	0.5303	0.5354	0.5409	0.5448	0.5489 (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 Semi-glazed door			5.3600	1.0000	5.3600		(26a)
TER Opening Type (Uw = 1.20)			176.1100	1.1450	201.6527		(27)
Rooflight			1.4500	2.0221	2.9320		(27a)
Rooflight			4.0000	2.0221	8.0882		(27a)
Ground Floor			319.9000	0.1300	41.5870		(28a)
Exposed Floor			8.9000	0.1300	1.1570		(28a)
External Facade	578.5900	168.6300	409.9600	0.1800	73.7928		(29a)
Ashlar Wall	45.2800		45.2800	0.1800	8.1504		(29a)
Dormer Wall	29.1200	12.8400	16.2800	0.1800	2.9304		(29a)
Ceiling	222.2000		222.2000	0.1100	24.4420		(30)
Sloped Roof	77.9600	1.4500	76.5100	0.1100	8.4161		(30)
Flat Roof	36.4500	4.0000	32.4500	0.1100	3.5695		(30)
Total net area of external elements Aum (A, m2)			1318.4000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	382.0781	(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 161.6732 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	78.8400	0.0500	3.9420
E3 Sill	42.5900	0.0500	2.1295
E4 Jamb	196.0600	0.0500	9.8030
E5 Ground floor (normal)	86.1700	0.1600	13.7872
E20 Exposed floor (normal)	1.7100	0.3200	0.5472
E6 Intermediate floor within a dwelling	132.5900	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	90.2200	0.0600	5.4132
E14 Flat roof	31.0200	0.0800	2.4816
E16 Corner (normal)	79.0000	0.0900	7.1100
E17 Corner (inverted - internal area greater than external area)	47.3000	-0.0900	-4.2570

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 40.9567 (36)

Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 423.0348 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	456.9209	455.0893	453.2939	444.8612	443.2835	435.9389	435.9389	434.5787	438.7679	443.2835	446.4752	449.8120 (38)
Average = Sum(39)m / 12 =	879.9557	878.1241	876.3287	867.8960	866.3183	858.9737	858.9737	857.6135	861.8027	866.3183	869.5100	872.8468 (39)
												867.8885

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1650	1.1626	1.1602	1.1491	1.1470	1.1373	1.1373	1.1355	1.1410	1.1470	1.1512	1.1556 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage for mixer showers	86.6563	85.3540	83.4563	79.8255	77.1460	74.1579	72.4594	74.3427	76.4072	79.6155	83.3244	86.3243 (42a)
Hot water usage for baths	37.3883	36.8330	36.0511	34.6093	33.5297	32.3327	31.6861	32.4626	33.3080	34.5889	36.0603	37.2619 (42b)
Hot water usage for other uses	52.7656	50.8469	48.9281	47.0094	45.0906	43.1719	43.1719	45.0906	47.0094	48.9281	50.8469	52.7656 (42c)
Average daily hot water use (litres/day)												162.5278 (43)
Daily hot water use	176.8102	173.0339	168.4355	161.4442	155.7664	149.6625	147.3174	151.8959	156.7246	163.1326	170.2316	176.3518 (44)
Energy conte	280.0241	246.3980	258.8791	221.0090	209.6915	184.0275	178.1676	188.0789	193.2571	221.3693	242.5261	276.1243 (45)
Energy content (annual)												Total = Sum(45)m = 2699.5525
Distribution loss (46)m = 0.15 x (45)m	42.0036	36.9597	38.8319	33.1514	31.4537	27.6041	26.7251	28.2118	28.9886	33.2054	36.3789	41.4186 (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												
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)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	351.8472	311.2704	330.7023	290.5153	281.5146	253.5337	249.9908	259.9020	262.7633	293.1925	312.0323	347.9474 (62)
WWHRS	-39.6156	-35.0364	-36.6881	-30.3792	-28.3123	-24.2270	-22.7090	-24.1487	-25.0662	-29.5503	-33.4769	-38.8820 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
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 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	312.2316	276.2340	294.0142	260.1361	253.2023	229.3066	227.2818	235.7533	237.6971	263.6421	278.5554	309.0654 (64)
12Total per year (kWh/year)												Total per year (kWh/year) = Sum(64)m = 3177.1198 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												

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150.5665 133.8253 143.5358 129.0905 127.1809 116.7941 116.6992 119.9947 119.8630 131.0638 136.2449 149.2698 (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	186.1910	186.1910	186.1910	186.1910	186.1910	186.1910	186.1910	186.1910	186.1910	186.1910	186.1910	186.1910
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	387.5675	429.0926	387.5675	400.4864	387.5675	400.4864	387.5675	387.5675	400.4864	387.5675	400.4864	387.5675
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	768.3959	776.3695	756.2764	713.5006	659.5039	608.7546	574.8509	566.8773	586.9704	629.7462	683.7429	734.4923
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	41.6191	41.6191	41.6191	41.6191	41.6191	41.6191	41.6191	41.6191	41.6191	41.6191	41.6191	41.6191
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000
Losses e.g. evaporation (negative values) (Table 5)	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528
Water heating gains (Table 5)	202.3743	199.1448	192.9245	179.2923	170.9421	162.2141	156.8538	161.2832	166.4763	176.1610	189.2291	200.6315
Total internal gains	1440.1951	1486.4642	1418.6257	1375.1367	1299.8708	1250.3123	1198.1295	1194.5854	1232.7905	1275.3320	1355.3157	1404.5485

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
North	8.0400	10.6334	0.6300	0.7000	0.7700	26.1276 (74)						
East	49.8300	19.6403	0.6300	0.7000	0.7700	299.0956 (76)						
South	31.2300	46.7521	0.6300	0.7000	0.7700	446.2155 (78)						
West	87.0100	19.6403	0.6300	0.7000	0.7700	522.2619 (80)						
North	1.4500	16.7973	0.6300	0.7000	1.0000	9.6669 (82)						
South	4.0000	26.0000	0.6300	0.7000	1.0000	41.2776 (82)						
Solar gains	1344.6450	2491.7188	3848.2814	5347.7716	6405.8402	6512.2490	6217.1686	5424.4312	4377.5532	2881.4872	1649.5507	1124.2606
Total gains	2784.8401	3978.1830	5266.9070	6722.9083	7705.7110	7762.5613	7415.2981	6619.0166	5610.3437	4156.8192	3004.8664	2528.8092

7. Mean internal temperature (heating season)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	38.5473	38.6277	38.7069	39.0830	39.1541	39.4889	39.4889	39.5515	39.3593	39.1541	39.0104	38.8613
alpha	3.5698	3.5752	3.5805	3.6055	3.6103	3.6326	3.6326	3.6368	3.6240	3.6103	3.6007	3.5908
util living area	0.9979	0.9923	0.9745	0.9173	0.8002	0.6342	0.4871	0.5557	0.8059	0.9660	0.9950	0.9985
MIT	18.6622	18.9996	19.5123	20.1462	20.6274	20.8866	20.9669	20.9472	20.7188	20.0158	19.2092	18.6129
Th 2	19.9481	19.9500	19.9519	19.9610	19.9626	19.9705	19.9705	19.9720	19.9675	19.9626	19.9592	19.9557
util rest of house	0.9973	0.9904	0.9683	0.8971	0.7534	0.5543	0.3825	0.4473	0.7413	0.9543	0.9935	0.9981
MIT 2	17.1809	17.6135	18.2662	19.0589	19.6205	19.8918	19.9556	19.9459	19.7401	18.9146	17.8888	17.1224
Living area fraction										FLA = Living area / (4) =		
MIT	17.4298	17.8464	18.4755	19.2416	19.7897	20.0589	20.1255	20.1141	19.9045	19.0996	18.1106	17.3728
Temperature adjustment												0.0000
adjusted MIT	17.4298	17.8464	18.4755	19.2416	19.7897	20.0589	20.1255	20.1141	19.9045	19.0996	18.1106	17.3728

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9953	0.9846	0.9559	0.8797	0.7445	0.5616	0.3989	0.4632	0.7367	0.9405	0.9894	0.9966
Useful gains	2771.6631	3917.1074	5034.7641	5913.9010	5737.0384	4359.7003	2957.9742	3065.6756	4133.2891	3909.3475	2972.9326	2520.2225
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	11553.6053	11368.5191	10494.4922	8975.4391	7008.2117	4689.0708	3028.3373	3185.2930	5002.3738	7363.3476	9573.8605	11497.8118
Space heating kWh	6533.7650	5007.3487	4062.0377	2204.3074	945.7529	0.0000	0.0000	0.0000	0.0000	2569.7761	4752.6681	6679.3264
Space heating requirement - total per year (kWh/year)												32754.9824
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	6533.7650	5007.3487	4062.0377	2204.3074	945.7529	0.0000	0.0000	0.0000	0.0000	2569.7761	4752.6681	6679.3264
Space heating requirement after solar contribution - total per year (kWh/year)												32754.9824
Space heating per m ²												(98c) / (4) =

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000
Fraction of space heat from main system(s)												1.0000
Efficiency of main space heating system 1 (in %)												92.3000
Efficiency of main space heating system 2 (in %)												0.0000
Efficiency of secondary/supplementary heating system, %												0.0000
Space heating requirement	6533.7650	5007.3487	4062.0377	2204.3074	945.7529	0.0000	0.0000	0.0000	0.0000	2569.7761	4752.6681	6679.3264
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000
Space heating fuel (main heating system)	7078.8353	5425.0798	4400.9076	2388.1987	1024.6511	0.0000	0.0000	0.0000	0.0000	2784.1561	5149.1529	7236.5400
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Space heating fuel (main heating system 2)												

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Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)	
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating requirement	312.2316	276.2340	294.0142	260.1361	253.2023	229.3066	227.2818	235.7533	237.6971	263.6421	278.5554	309.0654	(64)	
Efficiency of water heater (217)m	88.3456	88.2795	88.1291	87.7553	86.7342	79.8000	79.8000	79.8000	79.8000	87.8778	88.2490	79.8000	(216)	
Fuel for water heating, kWh/month	353.4208	312.9086	333.6174	296.4335	291.9291	287.3517	284.8142	295.4302	297.8660	300.0099	315.6473	349.7826	(219)	
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)	
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	(231)	
Lighting	80.5289	64.6033	58.1681	42.6164	32.9181	26.8944	30.0290	39.0329	50.6998	66.5209	75.1353	82.7670	(232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-230.0032	-294.5627	-384.6392	-390.9621	-388.6904	-350.4910	-344.7854	-339.8328	-329.0524	-313.6395	-241.3047	-202.3771	(233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)	
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-238.3933	-483.1286	-928.9951	-1353.1422	-1751.2310	-1747.1995	-1727.8109	-1480.9678	-1109.4050	-677.6271	-313.5159	-190.1018	(233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)	
Annual totals kWh/year														
Space heating fuel - main system 1													35487.5216	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													79.8000	
Water heating fuel used													3719.2112	(219)
Space cooling fuel													0.0000	(221)
Electricity for pumps and fans:														
Total electricity for the above, kWh/year													86.0000	(231)
Electricity for lighting (calculated in Appendix L)													649.9141	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-15811.8590	(233)
Wind generation													0.0000	(234)
Hydro-electric generation (Appendix N)													0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)													0.0000	(235)
Appendix Q - special features														
Energy saved or generated													-0.0000	(236)
Energy used													0.0000	(237)
Total delivered energy for all uses													24130.7880	(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	35487.5216	0.2100	7452.3795 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3719.2112	0.2100	781.0344 (264)
Space and water heating			8233.4139 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	649.9141	0.1443	93.8027 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-3810.3407	0.1368	-521.3003
PV Unit electricity exported	-12001.5183	0.1268	-1521.9063
Total			-2043.2066 (269)
Total CO2, kg/year			6295.9392 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.3400 (273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	35487.5216	1.1300	40100.8994 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3719.2112	1.1300	4202.7087 (278)
Space and water heating			44303.6081 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	649.9141	1.5338	996.8600 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-3810.3407	1.5058	-5737.4377
PV Unit electricity exported	-12001.5183	0.4655	-5586.9024
Total			-11324.3401 (283)
Total Primary energy kWh/year			34106.2288 (286)
Target Primary Energy Rate (TPER)			45.1600 (287)

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Property Reference	Montrose House		Issued on Date	25/10/2023	
Assessment Reference	New Build	Prop Type Ref	New Build		
Property	Montrose House, Coronation Road, Ascot, SL5 9LP				
SAP Rating	89 B	DER	1.92	TER	8.34
Environmental	98 A	% DER < TER			76.98
CO ₂ Emissions (t/year)	1.15	DFEE	45.53	TFEE	47.79
Compliance Check	See BREL	% DFEE < TFEE			4.73
% DPER < TPER	55.12	DPER	20.27	TPER	45.16
Assessor Details	Mr. Alexander Cotterill			Assessor ID	AV67-0001
Client					

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	319.9000 (1b)	x 3.3000 (2b)	= 1055.6700 (1b) - (3b)
First floor	328.8000 (1c)	x 3.3500 (2c)	= 1101.4800 (1c) - (3c)
Second floor	106.6000 (1d)	x 3.0600 (2d)	= 326.1960 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	755.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 2483.3460 (5)

2. Ventilation rate

	m3 per hour												
Number of open chimneys	0 * 80 = 0.0000 (6a)												
Number of open flues	0 * 20 = 0.0000 (6b)												
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)												
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)												
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)												
Number of blocked chimneys	0 * 20 = 0.0000 (6f)												
Number of intermittent extract 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)												
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	40.0000 / (5) = 0.0161 (8)												
Pressure test	Yes												
Pressure Test Method	Blower Door												
Measured/design AP50	4.0000 (17)												
Infiltration rate	0.2161 (18)												
Number of sides sheltered	0 (19)												
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)												
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2161 (21)												
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	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)
Adj infilt rate	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)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.2755	0.2701	0.2647	0.2377	0.2323	0.2053	0.2053	0.1999	0.2161	0.2323	0.2431	0.2539	(22b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.5380	0.5365	0.5350	0.5283	0.5270	0.5211	0.5211	0.5200	0.5234	0.5270	0.5296	0.5322	(23c)
Effective ac													(25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.20)			176.1100	1.1450	201.6527		(27)
Door			5.3600	1.2000	6.4320		(26a)
Rooflight			1.4500	1.2357	1.7918		(27a)
Rooflight			4.0000	1.2357	4.9430		(27a)
Ground Floor			319.9000	0.1300	41.5870	110.0000	35189.0000 (28a)
Exposed Floor			8.9000	0.1500	1.3350	20.0000	178.0000 (28a)
External Facade	578.5900	168.6300	409.9600	0.1800	73.7928	60.0000	24597.6000 (29a)
Ashlar Wall	45.2800		45.2800	0.1800	8.1504	9.0000	407.5200 (29a)
Dormer Wall	29.1200	12.8400	16.2800	0.1800	2.9304	9.0000	146.5200 (29a)
Ceiling	222.2000		222.2000	0.1100	24.4420	9.0000	1999.8000 (30)
Sloped Roof	77.9600	1.4500	76.5100	0.1200	9.1812	9.0000	688.5900 (30)
Flat Roof	36.4500	4.0000	32.4500	0.1200	3.8940	9.0000	292.0500 (30)
Total net area of external elements Aum(A, m ²)			1318.4000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	380.1323		(33)
Internal Wall - Solid			540.3400			75.0000	40525.5000 (32c)
Internal Wall - Timber			731.6100			9.0000	6584.4900 (32c)

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Internal Floor 1	319.1900	18.0000	5745.4200 (32d)
Internal Floor 2	106.6000	18.0000	1918.8000 (32d)
Internal Ceiling 1	319.9000	9.0000	2879.1000 (32e)
Internal Ceiling 2	106.6000	9.0000	959.4000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 122111.7900 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 161.6732 (35)
 Thermal bridges (User defined value 0.040 * total exposed area) 52.7360 (36)
 Point Thermal bridges 0.0000 (36a) =
 Total fabric heat loss (33) + (36) + (36a) = 432.8683 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	440.8607	439.6527	438.4686	432.9071	431.8666	427.0227	427.0227	426.1257	428.8885	431.8666	433.9716	436.1723 (38)
Average = Sum(39)m / 12 =	873.7289	872.5210	871.3369	865.7754	864.7348	859.8909	859.8909	858.9939	861.7567	864.7348	866.8398	869.0405 (39)
												865.7704

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1568	1.1552	1.1536	1.1463	1.1449	1.1385	1.1385	1.1373	1.1409	1.1449	1.1477	1.1506 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 3.7238 (42)

Hot water usage for mixer showers 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (42a)

Hot water usage for baths 37.3883 36.8330 36.0511 34.6093 33.5297 32.3327 31.6861 32.4626 33.3080 34.5889 36.0603 37.2619 (42b)

Hot water usage for other uses 52.7656 50.8469 48.9281 47.0094 45.0906 43.1719 43.1719 45.0906 47.0094 48.9281 50.8469 52.7656 (42c)

Average daily hot water use (litres/day) 82.6336 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	90.1539	87.6799	84.9792	81.6187	78.6204	75.5046	74.8580	77.5532	80.3174	83.5170	86.9072	90.0275 (44)
Energy content (annual)	142.7817	124.8550	130.6099	111.7319	105.8381	92.8417	90.5342	96.0271	99.0393	113.3318	123.8152	140.9613 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Total heat required for water heating calculated for each month	121.3645	106.1267	111.0184	94.9721	89.9624	78.9154	76.9541	81.6230	84.1834	96.3320	105.2430	119.8171 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
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 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	121.3645	106.1267	111.0184	94.9721	89.9624	78.9154	76.9541	81.6230	84.1834	96.3320	105.2430	119.8171 (64)
12Total per year (kWh/year)												1166.5122 (64)
Electric shower(s)	69.3972	61.8335	67.5198	64.4333	65.6424	62.6165	64.7037	65.6424	64.4333	67.5198	66.2502	69.3972 (64a)
Heat gains from water heating, kWh/month	47.6904	41.9901	44.6346	39.8514	38.9012	35.3830	35.4145	36.8164	37.1542	40.9630	42.8733	47.3036 (65)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 789.3896 (64a)

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

Metabolic gains (Table 5), Watts

(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	186.1910	186.1910	186.1910	186.1910	186.1910	186.1910	186.1910	186.1910	186.1910	186.1910	186.1910	186.1910 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	387.5675	429.0926	387.5675	400.4864	387.5675	400.4864	387.5675	387.5675	400.4864	387.5675	400.4864	387.5675 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	768.3959	776.3695	756.2764	713.5006	659.5039	608.7546	574.8509	566.8773	586.9704	629.7462	683.7429	734.4923 (68)
Pumps, fans	41.6191	41.6191	41.6191	41.6191	41.6191	41.6191	41.6191	41.6191	41.6191	41.6191	41.6191	41.6191 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528 (71)
Total internal gains	64.1000	62.4852	59.9927	55.3491	52.2866	49.1430	47.6001	49.4843	51.6031	55.0578	59.5462	63.5801 (72)
	1298.9208	1346.8046	1282.6939	1248.1935	1178.2153	1137.2413	1088.8758	1082.7865	1117.9172	1151.2288	1222.6329	1264.4972 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	8.0400	10.6334	0.7600	0.7000	0.7700	31.5190 (74)
East	49.8300	19.6403	0.7600	0.7000	0.7700	360.8137 (76)
South	31.2300	46.7521	0.7600	0.7000	0.7700	538.2917 (78)
West	87.0100	19.6403	0.7600	0.7000	0.7700	630.0302 (80)
North	1.4500	16.7973	0.7600	0.7000	1.0000	11.6617 (82)
South	4.0000	26.0000	0.7600	0.7000	1.0000	49.7952 (82)

Solar gains	1622.1115	3005.8830	4642.3712	6451.2800	7727.6803	7856.0464	7500.0764	6543.7583	5280.8578	3476.0798	1989.9341	1356.2509 (83)
Total gains	2921.0323	4352.6876	5925.0650	7699.4734	8905.8955	8993.2877	8588.9522	7626.5448	6398.7750	4627.3085	3212.5671	2620.7481 (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	38.8220	38.8758	38.9286	39.1787	39.2258	39.4468	39.4468	39.4880	39.3614	39.2258	39.1306	39.0315
alpha	3.5881	3.5917	3.5952	3.6119	3.6151	3.6298	3.6298	3.6325	3.6241	3.6151	3.6087	3.6021
util living area	0.9975	0.9897	0.9640	0.8851	0.7417	0.5674	0.4276	0.4941	0.7541	0.9539	0.9938	0.9983 (86)
MIT	18.7043	19.0845	19.6380	20.2783	20.7168	20.9209	20.9782	20.9638	20.7788	20.0971	19.2549	18.6404 (87)
Th 2	19.9547	19.9560	19.9573	19.9632	19.9643	19.9695	19.9695	19.9705	19.9675	19.9643	19.9621	19.9597 (88)
util rest of house	0.9969	0.9873	0.9556	0.8595	0.6903	0.4901	0.3330	0.3932	0.6838	0.9387	0.9920	0.9979 (89)
MIT 2	17.8382	18.2176	18.7642	19.3797	19.7674	19.9282	19.9621	19.9571	19.8331	19.2241	18.3931	17.7780 (90)
Living area fraction	fLA = Living area / (4) =											0.1680 (91)
MIT	17.9837	18.3632	18.9110	19.5307	19.9269	20.0950	20.1328	20.1262	19.9920	19.3708	18.5379	17.9229 (92)
Temperature adjustment												0.0000
adjusted MIT	17.9837	18.3632	18.9110	19.5307	19.9269	20.0950	20.1328	20.1262	19.9920	19.3708	18.5379	17.9229 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9952	0.9820	0.9445	0.8471	0.6883	0.5000	0.3484	0.4091	0.6856	0.9272	0.9884	0.9967 (94)
Useful gains	2906.9571	4274.4039	5596.4016	6521.8813	6129.5257	4496.6059	2992.3390	3120.0387	4387.1076	4290.5231	3175.1570	2612.0250 (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	11955.8589	11746.9182	10814.1363	9203.7846	7114.0684	4725.0710	3037.8550	3200.7686	5077.4332	7584.3741	9914.8122	11925.7199 (97)
Space heating kWh	6732.3829	5021.5296	3881.9946	1930.9704	732.4997	0.0000	0.0000	0.0000	0.0000	2450.6251	4852.5518	6929.3889 (98a)
Space heating requirement - total per year (kWh/year)												32531.9430
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	6732.3829	5021.5296	3881.9946	1930.9704	732.4997	0.0000	0.0000	0.0000	0.0000	2450.6251	4852.5518	6929.3889 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												32531.9430
Space heating per m2												(98c) / (4) = 43.0716 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	8082.9749	6363.1930	6528.3539	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8654	0.9146	0.8792	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	6995.1232	5819.9053	5740.0516	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	10224.2235	9763.9617	8662.4499	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	2324.9522	2934.3779	2174.2644	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) =											1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	581.2381	733.5945	543.5661	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												1858.3986 (107)
Energy for space heating												43.0716 (99)
Energy for space cooling												2.4605 (108)
Total												45.5320 (109)
Fabric Energy Efficiency (DFEE)												45.5 (109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	319.9000 (1b)	x 3.3000 (2b)	= 1055.6700 (1b) - (3b)
First floor	328.8000 (1c)	x 3.3500 (2c)	= 1101.4800 (1c) - (3c)
Second floor	106.6000 (1d)	x 3.0600 (2d)	= 326.1960 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	755.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 2483.3460 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)

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Number of flueless gas fires												0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											40.0000 / (5) =	0.0161 (8)
Pressure test												Yes	
Pressure Test Method												Blower Door	
Measured/design AP50												5.0000	(17)
Infiltration rate												0.2661	(18)
Number of sides sheltered												0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =											1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =											0.2661	(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	0.3393	0.3326	0.3260	0.2927	0.2861	0.2528	0.2528	0.2461	0.2661	0.2861	0.2994	0.3127 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.5576	0.5553	0.5531	0.5428	0.5409	0.5320	0.5320	0.5303	0.5354	0.5409	0.5448	0.5489 (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 Semi-glazed door			5.3600	1.0000	5.3600		(26a)
TER Opening Type (Uw = 1.20)			176.1100	1.1450	201.6527		(27)
Rooflight			1.4500	2.0221	2.9320		(27a)
Rooflight			4.0000	2.0221	8.0882		(27a)
Ground Floor			319.9000	0.1300	41.5870		(28a)
Exposed Floor			8.9000	0.1300	1.1570		(28a)
External Facade	578.5900	168.6300	409.9600	0.1800	73.7928		(29a)
Ashlar Wall	45.2800		45.2800	0.1800	8.1504		(29a)
Dormer Wall	29.1200	12.8400	16.2800	0.1800	2.9304		(29a)
Ceiling	222.2000		222.2000	0.1100	24.4420		(30)
Sloped Roof	77.9600	1.4500	76.5100	0.1100	8.4161		(30)
Flat Roof	36.4500	4.0000	32.4500	0.1100	3.5695		(30)
Total net area of external elements Aum(A, m2)			1318.4000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	382.0781	(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 161.6732 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	78.8400	0.0500	3.9420
E3 Sill	42.5900	0.0500	2.1295
E4 Jamb	196.0600	0.0500	9.8030
E5 Ground floor (normal)	86.1700	0.1600	13.7872
E20 Exposed floor (normal)	1.7100	0.3200	0.5472
E6 Intermediate floor within a dwelling	132.5900	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	90.2200	0.0600	5.4132
E14 Flat roof	31.0200	0.0800	2.4816
E16 Corner (normal)	79.0000	0.0900	7.1100
E17 Corner (inverted - internal area greater than external area)	47.3000	-0.0900	-4.2570

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 40.9567 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 423.0348 (37)

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

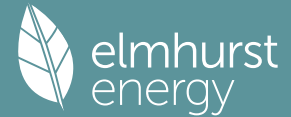
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	456.9209	455.0893	453.2939	444.8612	443.2835	435.9389	435.9389	434.5787	438.7679	443.2835	446.4752	449.8120 (38)
Heat transfer coeff	879.9557	878.1241	876.3287	867.8960	866.3183	858.9737	858.9737	857.6135	861.8027	866.3183	869.5100	872.8468 (39)
Average = Sum(39)m / 12 =												867.8885

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1650	1.1626	1.1602	1.1491	1.1470	1.1373	1.1373	1.1355	1.1410	1.1470	1.1512	1.1556 (40)
HLP (average)												1.1491
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												3.7238 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths	37.3883	36.8330	36.0511	34.6093	33.5297	32.3327	31.6861	32.4626	33.3080	34.5889	36.0603	37.2619 (42b)
Hot water usage for other uses	52.7656	50.8469	48.9281	47.0094	45.0906	43.1719	43.1719	45.0906	47.0094	48.9281	50.8469	52.7656 (42c)
Average daily hot water use (litres/day)												82.6336 (43)
Daily hot water use	90.1539	87.6799	84.9792	81.6187	78.6204	75.5046	74.8580	77.5532	80.3174	83.5170	86.9072	90.0275 (44)
Energy content (annual)	142.7817	124.8550	130.6099	111.7319	105.8381	92.8417	90.5342	96.0271	99.0393	113.3318	123.8152	140.9613 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1372.3673
Water storage loss:												0.0000 (46)
Total storage loss												0.0000 (56)
If cylinder contains dedicated solar storage												0.0000 (57)
Primary loss												0.0000 (59)
Combi loss												0.0000 (61)
Total heat required for water heating calculated for each month	121.3645	106.1267	111.0184	94.9721	89.9624	78.9154	76.9541	81.6230	84.1834	96.3320	105.2430	119.8171 (62)
WWHRS												0.0000 (63a)
PV diverter												0.0000 (63b)
Solar input												0.0000 (63c)
FGHRS												0.0000 (63d)
Output from w/h	121.3645	106.1267	111.0184	94.9721	89.9624	78.9154	76.9541	81.6230	84.1834	96.3320	105.2430	119.8171 (64)

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12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m = 1166.5122 (64)										
Electric shower(s)	1167 (64)										
69.3972	61.8335	67.5198	64.4333	65.6424	62.6165	64.7037	65.6424	64.4333	67.5198	66.2502	69.3972 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 789.3896 (64a)											
Heat gains from water heating, kWh/month	47.6904 41.9901 44.6346 39.8514 38.9012 35.3830 35.4145 36.8164 37.1542 40.9630 42.8733 47.3036 (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	186.1910	186.1910	186.1910	186.1910	186.1910	186.1910	186.1910	186.1910	186.1910	186.1910	186.1910	186.1910 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	387.5675	429.0926	387.5675	400.4864	387.5675	400.4864	387.5675	387.5675	400.4864	387.5675	400.4864	387.5675 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	768.3959	776.3695	756.2764	713.5006	659.5039	608.7546	574.8509	566.8773	586.9704	629.7462	683.7429	734.4923 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	41.6191	41.6191	41.6191	41.6191	41.6191	41.6191	41.6191	41.6191	41.6191	41.6191	41.6191	41.6191 (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)	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528 (71)
Water heating gains (Table 5)	64.1000	62.4852	59.9927	55.3491	52.2866	49.1430	47.6001	49.4843	51.6031	55.0578	59.5462	63.5801 (72)
Total internal gains	1298.9208	1346.8046	1282.6939	1248.1935	1178.2153	1137.2413	1088.8758	1082.7865	1117.9172	1151.2288	1222.6329	1264.4972 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W						
North	8.0400	10.6334	0.6300	0.7000	0.7700	26.1276 (74)						
East	49.8300	19.6403	0.6300	0.7000	0.7700	299.0956 (76)						
South	31.2300	46.7521	0.6300	0.7000	0.7700	446.2155 (78)						
West	87.0100	19.6403	0.6300	0.7000	0.7700	522.2619 (80)						
North	1.4500	16.7973	0.6300	0.7000	1.0000	9.6669 (82)						
South	4.0000	26.0000	0.6300	0.7000	1.0000	41.2776 (82)						
Solar gains	1344.6450	2491.7188	3848.2814	5347.7716	6405.8402	6512.2490	6217.1686	5424.4312	4377.5532	2881.4872	1649.5507	1124.2606 (83)
Total gains	2643.5658	3838.5234	5130.9752	6595.9650	7584.0555	7649.4903	7306.0444	6507.2177	5495.4704	4032.7159	2872.1836	2388.7578 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains for living area, nil,m (see Table 9a)	0.9982	0.9931	0.9764	0.9212	0.8061	0.6410	0.4934	0.5634	0.8135	0.9689	0.9957	0.9988 (86)
MIT	18.6347	18.9730	19.4882	20.1283	20.6171	20.8826	20.9655	20.9448	20.7087	19.9944	19.1836	18.5855 (87)
Th 2	19.9481	19.9500	19.9519	19.9610	19.9626	19.9705	19.9705	19.9720	19.9675	19.9626	19.9592	19.9557 (88)
util rest of house	0.9978	0.9914	0.9706	0.9017	0.7599	0.5609	0.3879	0.4542	0.7500	0.9580	0.9944	0.9985 (89)
MIT 2	17.7642	18.1028	18.6147	19.2415	19.6877	19.9068	19.9584	19.9506	19.7829	19.1255	18.3203	17.7203 (90)
Living area fraction	fLA = Living area / (4) = 0.1680 (91)											
MIT	17.9104	18.2490	18.7614	19.3905	19.8439	20.0707	20.1276	20.1177	19.9385	19.2715	18.4653	17.8657 (92)
Temperature adjustment	0.0000											
adjusted MIT	17.9104	18.2490	18.7614	19.3905	19.8439	20.0707	20.1276	20.1177	19.9385	19.2715	18.4653	17.8657 (93)

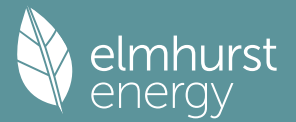
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	2634.1901	3790.5361	4934.2452	5860.8677	5717.9757	4354.3910	2956.3479	3062.2635	4110.2381	3823.1351	2848.2909	2382.8201 (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	11976.5633	11722.0574	10745.0467	9104.6742	7055.1850	4699.1918	3030.0980	3188.3172	5031.6095	7512.2591	9882.2578	11928.0296 (97)
Space heating kWh	6950.7256	5329.9824	4323.2363	2335.5407	994.8837	0.0000	0.0000	0.0000	0.0000	2744.7082	5064.4562	7101.6359 (98a)
Space heating requirement - total per year (kWh/year)												34845.1691
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	6950.7256	5329.9824	4323.2363	2335.5407	994.8837	0.0000	0.0000	0.0000	0.0000	2744.7082	5064.4562	7101.6359 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												34845.1691
Space heating per m2												(98c) / (4) = 46.1342 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	8074.3524	6356.4050	6517.8629	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8111	0.8740	0.8295	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	6548.7386	5555.6301	5406.5382	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	8668.1512	8278.1659	7365.2366	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1525.9771	2025.5667	1457.2716	0.0000	0.0000	0.0000	0.0000 (104)

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Cooled fraction												FC = cooled area / (4) =	1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500		0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	381.4943	506.3917	364.3179	0.0000	0.0000	0.0000		0.0000 (107)
Space cooling requirement												1252.2038 (107)	
Energy for space heating												46.1342 (99)	
Energy for space cooling												1.6579 (108)	
Total												47.7921 (109)	
Fabric Energy Efficiency (TFEE)												47.8 (109)	

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Property Reference	Montrose House		Issued on Date	25/10/2023	
Assessment Reference	New Build	Prop Type Ref	New Build		
Property	Montrose House, Coronation Road, Ascot, SL5 9LP				
SAP Rating	89 B	DER	1.92	TER	8.34
Environmental	98 A	% DER < TER			76.98
CO ₂ Emissions (t/year)	1.15	DFEE	45.53	TFEE	47.79
Compliance Check	See BREL	% DFEE < TFEE			4.73
% DPER < TPER	55.12	DPER	20.27	TPER	45.16
Assessor Details	Mr. Alexander Cotterill			Assessor ID	AV67-0001
Client					

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
 CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	319.9000 (1b)	x 3.3000 (2b)	= 1055.6700 (1b) - (3b)
First floor	328.8000 (1c)	x 3.3500 (2c)	= 1101.4800 (1c) - (3c)
Second floor	106.6000 (1d)	x 3.0600 (2d)	= 326.1960 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	755.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 2483.3460 (5)

2. Ventilation rate

		m ³ per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		4.0000 (17)
Infiltration rate		0.2000 (18)
Number of sides sheltered		0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2000 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 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	0.2550 0.2500 0.2450 0.2200 0.2150 0.1900 0.1900 0.1850 0.2000 0.2150 0.2250 0.2350	(22b)
Balanced mechanical ventilation with heat recovery		
If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		72.8000 (23c)
Effective ac	0.3910 0.3860 0.3810 0.3560 0.3510 0.3260 0.3260 0.3210 0.3360 0.3510 0.3610 0.3710	(25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.20)			176.1100	1.1450	201.6527		(27)
Door			5.3600	1.2000	6.4320		(26a)
Rooflight			1.4500	1.2357	1.7918		(27a)
Rooflight			4.0000	1.2357	4.9430		(27a)
Ground Floor			319.9000	0.1300	41.5870	110.0000	35189.0000 (28a)
Exposed Floor			8.9000	0.1500	1.3350	20.0000	178.0000 (28a)
External Facade	578.5900	168.6300	409.9600	0.1800	73.7928	60.0000	24597.6000 (29a)
Ashlar Wall	45.2800		45.2800	0.1800	8.1504	9.0000	407.5200 (29a)
Dormer Wall	29.1200	12.8400	16.2800	0.1800	2.9304	9.0000	146.5200 (29a)
Ceiling	222.2000		222.2000	0.1100	24.4420	9.0000	1999.8000 (30)
Sloped Roof	77.9600	1.4500	76.5100	0.1200	9.1812	9.0000	688.5900 (30)
Flat Roof	36.4500	4.0000	32.4500	0.1200	3.8940	9.0000	292.0500 (30)
Total net area of external elements Aum(A, m ²)			1318.4000				(31)

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Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	380.1323		(33)
Internal Wall - Solid	540.3400		75.0000	40525.5000 (32c)
Internal Wall - Timber	731.6100		9.0000	6584.4900 (32c)
Internal Floor 1	319.1900		18.0000	5745.4200 (32d)
Internal Floor 2	106.6000		18.0000	1918.8000 (32d)
Internal Ceiling 1	319.9000		9.0000	2879.1000 (32e)
Internal Ceiling 2	106.6000		9.0000	959.4000 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	122111.7900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		161.6732 (35)
Thermal bridges (User defined value 0.040 * total exposed area)		52.7360 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	432.8683 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	320.4261	316.3286	312.2311	291.7435	287.6460	267.1584	267.1584	263.0608	275.3534	287.6460	295.8410	304.0361	(38)
Average = Sum(39)m / 12 =													
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9973	0.9919	0.9865	0.9594	0.9539	0.9268	0.9268	0.9214	0.9377	0.9539	0.9648	0.9756	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.7238 (42)
Hot water usage for mixer showers	86.6563	85.3540	83.4563	79.8255	77.1460	74.1579	72.4594	74.3427	76.4072	79.6155	83.3244	86.3243	(42a)
Hot water usage for baths	37.3883	36.8330	36.0511	34.6093	33.5297	32.3327	31.6861	32.4626	33.3080	34.5889	36.0603	37.2619	(42b)
Hot water usage for other uses	52.7656	50.8469	48.9281	47.0094	45.0906	43.1719	43.1719	45.0906	47.0094	48.9281	50.8469	52.7656	(42c)
Average daily hot water use (litres/day)													162.5278 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	176.8102	173.0339	168.4355	161.4442	155.7664	149.6625	147.3174	151.8959	156.7246	163.1326	170.2316	176.3518	(44)
Energy content (annual)	280.0241	246.3980	258.8791	221.0090	209.6915	184.0275	178.1676	188.0789	193.2571	221.3693	242.5261	276.1243	(45)
Distribution loss (46)m = 0.15 x (45)m													Total = Sum(45)m = 2699.5525
Water storage loss:	42.0036	36.9597	38.8319	33.1514	31.4537	27.6041	26.7251	28.2118	28.9886	33.2054	36.3789	41.4186	(46)
Store volume													500.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													2.0900 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.1286 (55)
Total storage loss	34.9866	31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866	(56)
If cylinder contains dedicated solar storage	34.9866	31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866	(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)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	338.2731	299.0100	317.1281	277.3790	267.9405	240.3975	236.4166	246.3279	249.6271	279.6183	298.8961	334.3733	(62)
WWHRS	-70.9627	-62.7600	-65.7186	-54.4176	-50.7153	-43.3974	-40.6782	-43.2571	-44.9006	-52.9329	-59.9666	-69.6486	(63a)
FV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
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	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	267.3104	236.2500	251.4095	222.9614	217.2252	197.0000	195.7385	203.0707	204.7264	226.6854	238.9295	264.7247	(64)
12Total per year (kWh/year)													Total per year (kWh/year) = Sum(64)m = 2726.0319 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower (s) (kWh/year) = Sum(64a)m =													0.0000 (64a)
Heat gains from water heating, kWh/month	139.7072	124.0169	132.6765	118.5815	116.3216	106.2851	105.8399	109.1354	109.3540	120.2045	125.7359	138.4105	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	186.1910	186.1910	186.1910	186.1910	186.1910	186.1910	186.1910	186.1910	186.1910	186.1910	186.1910	186.1910	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	387.5675	429.0926	387.5675	400.4864	387.5675	400.4864	387.5675	387.5675	400.4864	387.5675	400.4864	387.5675	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	768.3959	776.3695	756.2764	713.5006	659.5039	608.7546	574.8509	566.8773	586.9704	629.7462	683.7429	734.4923	(68)
Pumps, fans	41.6191	41.6191	41.6191	41.6191	41.6191	41.6191	41.6191	41.6191	41.6191	41.6191	41.6191	41.6191	(69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	(71)
Total internal gains	187.7785	184.5490	178.3286	164.6965	156.3463	147.6182	142.2580	146.6874	151.8805	161.5652	174.6332	186.0356	(72)
Total internal gains	1422.5993	1468.8684	1401.0299	1357.5409	1282.2750	1235.7165	1183.5337	1179.9896	1218.1947	1257.7362	1337.7199	1386.9527	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
	m2	Table 6a	Specific data	Specific data	factor	W
		W/m2	or Table 6b	or Table 6c	Table 6d	
North	8.0400	10.6334	0.7600	0.7000	0.7700	31.5190 (74)
East	49.8300	19.6403	0.7600	0.7000	0.7700	360.8137 (76)
South	31.2300	46.7521	0.7600	0.7000	0.7700	538.2917 (78)
West	87.0100	19.6403	0.7600	0.7000	0.7700	630.0302 (80)
North	1.4500	16.7973	0.7600	0.7000	1.0000	11.6617 (82)

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South	4.0000		26.0000		0.7600		0.7000		1.0000		49.7952 (82)	
Solar gains	1622.1115	3005.8830	4642.3712	6451.2800	7727.6803	7856.0464	7500.0764	6543.7583	5280.8578	3476.0798	1989.9341	1356.2509 (83)
Total gains	3044.7108	4474.7514	6043.4010	7808.8209	9009.9552	9091.7629	8683.6101	7723.7479	6499.0525	4733.8160	3327.6541	2743.2036 (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	45.0288	45.2751	45.5241	46.8112	47.0774	48.4552	48.4552	48.7405	47.8945	47.0774	46.5480	46.0303
alpha	4.0019	4.0183	4.0349	4.1207	4.1385	4.2303	4.2303	4.2494	4.1930	4.1385	4.1032	4.0687
util living area	0.9974	0.9882	0.9553	0.8483	0.6721	0.4799	0.3518	0.4087	0.6789	0.9392	0.9930	0.9983 (86)
Living	19.4568	19.7478	20.1485	20.5924	20.8251	20.9087	20.9231	20.9202	20.8522	20.4518	19.8672	19.4344
Non living	18.2407	18.6155	19.1239	19.6785	19.9375	20.0387	20.0492	20.0526	19.9840	19.5280	18.7865	18.2255
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	31	0	0	0	0	0	0	0	0	0	0	14
16 / 9	0	28	31	0	0	0	0	0	0	0	21	17
MIT	21.0000	20.2908	20.5177	20.5924	20.8251	20.9087	20.9231	20.9202	20.8522	20.4518	20.2111	20.5138 (87)
Th 2	20.0855	20.0901	20.0946	20.1173	20.1219	20.1448	20.1448	20.1494	20.1356	20.1219	20.1128	20.1037 (88)
util rest of house	0.9968	0.9856	0.9458	0.8205	0.6242	0.4202	0.2847	0.3356	0.6139	0.9216	0.9911	0.9979 (89)
MIT 2	20.0855	19.4392	19.6661	19.6785	19.9375	20.0387	20.0492	20.0526	19.9840	19.5280	19.3051	19.6491 (90)
Living area fraction										FLA = Living area / (4) =		0.1680 (91)
MIT	20.2392	19.5823	19.8092	19.8320	20.0866	20.1848	20.1960	20.1983	20.1299	19.6832	19.4573	19.7943 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2392	19.5823	19.8092	19.8320	20.0866	20.1848	20.1960	20.1983	20.1299	19.6832	19.4573	19.7943 (93)

8. Space heating requirement

Utilisation	0.9969	0.9838	0.9423	0.8104	0.6222	0.4230	0.2888	0.3399	0.6134	0.9107	0.9893	0.9978 (94)
Useful gains	3035.3286	4402.4563	5694.5912	6328.5405	5605.6349	3846.0413	2507.8223	2625.0499	3986.6644	4310.9812	3292.1298	2737.0533 (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	12006.8908	10999.9322	9916.6788	7921.4561	6042.6980	3909.5401	2517.3288	2643.3725	4270.4715	6544.5828	9004.9077	11491.5375 (97)
Space heating kWh	6674.8422	4433.5038	3141.2332	1146.8993	325.1750	0.0000	0.0000	0.0000	0.0000	1661.7996	4113.2001	6513.3363 (98a)
Space heating requirement - total per year (kWh/year)												28009.9894
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	6674.8422	4433.5038	3141.2332	1146.8993	325.1750	0.0000	0.0000	0.0000	0.0000	1661.7996	4113.2001	6513.3363 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												28009.9894
Space heating per m2										(98c) / (4) =		37.0846 (99)

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 %)												348.7625 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	6674.8422	4433.5038	3141.2332	1146.8993	325.1750	0.0000	0.0000	0.0000	0.0000	1661.7996	4113.2001	6513.3363 (98)
Space heating efficiency (main heating system 1)	348.7625	348.7625	348.7625	348.7625	348.7625	0.0000	0.0000	0.0000	0.0000	348.7625	348.7625	348.7625 (210)
Space heating fuel (main heating system)	1913.8648	1271.2101	900.6798	328.8482	93.2368	0.0000	0.0000	0.0000	0.0000	476.4847	1179.3700	1867.5565 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	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	267.3104	236.2500	251.4095	222.9614	217.2252	197.0000	195.7385	203.0707	204.7264	226.6854	238.9295	264.7247 (64)
Efficiency of water heater (217)m	169.5203	169.5203	169.5203	169.5203	169.5203	169.5203	169.5203	169.5203	169.5203	169.5203	169.5203	169.5203 (216)
Fuel for water heating, kWh/month	157.6863	139.3638	148.3064	131.5249	128.1411	116.2103	115.4661	119.7914	120.7681	133.7217	140.9445	156.1610 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	337.7266	305.0433	337.7266	326.8321	337.7266	326.8321	337.7266	337.7266	326.8321	337.7266	326.8321	337.7266 (231)
Lighting	76.1107	61.0589	54.9767	40.2783	31.1121	25.4189	28.3815	36.8914	47.9183	62.8713	71.0130	78.2261 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-146.7307	-238.6189	-389.8900	-483.9274	-554.1774	-525.7519	-520.3699	-470.3071	-387.3129	-292.6933	-171.7068	-123.1816 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-3.5288	-12.1210	-37.1487	-88.3887	-152.8710	-169.3892	-165.5847	-129.0148	-82.0763	-27.8443	-6.5227	-2.5599 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												8031.2511 (211)
Space heating fuel - main system 2												0.0000 (213)

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Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	169.5203
Water heating fuel used	1608.0854 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.3125)	
mechanical ventilation fans (SFP = 1.3125)	3976.4578 (230a)
Total electricity for the above, kWh/year	3976.4578 (231)
Electricity for lighting (calculated in Appendix L)	614.2573 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-5181.7182 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	9048.3334 (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	8031.2511	0.1569	1259.7887 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1608.0854	0.1407	226.2500 (264)
Space and water heating			1486.0386 (265)
Pumps, fans and electric keep-hot	3976.4578	0.1387	551.5837 (267)
Energy for lighting	614.2573	0.1443	88.6563 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-4304.6679	0.1326	-570.6928
PV Unit electricity exported	-877.0503	0.1168	-102.4045
Total			-673.0973 (269)
Total CO2, kg/year			1453.1814 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.9200 (273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	8031.2511	1.5807	12694.7483 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1608.0854	1.5202	2444.6588 (278)
Space and water heating			15139.4070 (279)
Pumps, fans and electric keep-hot	3976.4578	1.5128	6015.5853 (281)
Energy for lighting	614.2573	1.5338	942.1684 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-4304.6679	1.4899	-6413.4043
PV Unit electricity exported	-877.0503	0.4281	-375.4321
Total			-6788.8365 (283)
Total Primary energy kWh/year			15308.3243 (286)
Dwelling Primary energy Rate (DPER)			20.2700 (287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	319.9000 (1b)	x 3.3000 (2b)	= 1055.6700 (1b) - (3b)
First floor	328.8000 (1c)	x 3.3500 (2c)	= 1101.4800 (1c) - (3c)
Second floor	106.6000 (1d)	x 3.0600 (2d)	= 326.1960 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	755.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	2483.3460 (5)

2. Ventilation rate

Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract 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)+(6c)+(6d)+(6e)+(6f)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0161 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000 (17)	
Infiltration rate		0.2661 (18)

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Number of sides sheltered

0 (19)

Shelter factor

$$(20) = 1 - [0.075 \times (19)] = 1.0000 \quad (20)$$

Infiltration rate adjusted to include shelter factor

$$(21) = (18) \times (20) = 0.2661 \quad (21)$$

	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	0.3393	0.3326	0.3260	0.2927	0.2861	0.2528	0.2528	0.2461	0.2661	0.2861	0.2994	0.3127 (22b)
Effective ac	0.5576	0.5553	0.5531	0.5428	0.5409	0.5320	0.5320	0.5303	0.5354	0.5409	0.5448	0.5489 (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 Semi-glazed door			5.3600	1.0000	5.3600		(26a)
TER Opening Type (Uw = 1.20)			176.1100	1.1450	201.6527		(27)
Rooflight			1.4500	2.0221	2.9320		(27a)
Rooflight			4.0000	2.0221	8.0882		(27a)
Ground Floor			319.9000	0.1300	41.5870		(28a)
Exposed Floor			8.9000	0.1300	1.1570		(28a)
External Facade	578.5900	168.6300	409.9600	0.1800	73.7928		(29a)
Ashlar Wall	45.2800		45.2800	0.1800	8.1504		(29a)
Dormer Wall	29.1200	12.8400	16.2800	0.1800	2.9304		(29a)
Ceiling	222.2000		222.2000	0.1100	24.4420		(30)
Sloped Roof	77.9600	1.4500	76.5100	0.1100	8.4161		(30)
Flat Roof	36.4500	4.0000	32.4500	0.1100	3.5695		(30)
Total net area of external elements Aum (A, m2)			1318.4000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 382.0781		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K

161.6732 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	78.8400	0.0500	3.9420
E3 Sill	42.5900	0.0500	2.1295
E4 Jamb	196.0600	0.0500	9.8030
E5 Ground floor (normal)	86.1700	0.1600	13.7872
E20 Exposed floor (normal)	1.7100	0.3200	0.5472
E6 Intermediate floor within a dwelling	132.5900	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	90.2200	0.0600	5.4132
E14 Flat roof	31.0200	0.0800	2.4816
E16 Corner (normal)	79.0000	0.0900	7.1100
E17 Corner (inverted - internal area greater than external area)	47.3000	-0.0900	-4.2570

Thermal bridges (Sum(L x Psi) calculated using Appendix K)

40.9567 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

$$(33) + (36) + (36a) = 423.0348 \quad (37)$$

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	456.9209	455.0893	453.2939	444.8612	443.2835	435.9389	435.9389	434.5787	438.7679	443.2835	446.4752	449.8120 (38)
Average = Sum(39)m / 12 =	879.9557	878.1241	876.3287	867.8960	866.3183	858.9737	858.9737	857.6135	861.8027	866.3183	869.5100	872.8468 (39)
												867.8885

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1650	1.1626	1.1602	1.1491	1.1470	1.1373	1.1373	1.1355	1.1410	1.1470	1.1512	1.1556 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage for mixer showers	86.6563	85.3540	83.4563	79.8255	77.1460	74.1579	72.4594	74.3427	76.4072	79.6155	83.3244	86.3243 (42a)
Hot water usage for baths	37.3883	36.8330	36.0511	34.6093	33.5297	32.3327	31.6861	32.4626	33.3080	34.5889	36.0603	37.2619 (42b)
Hot water usage for other uses	52.7656	50.8469	48.9281	47.0094	45.0906	43.1719	43.1719	45.0906	47.0094	48.9281	50.8469	52.7656 (42c)
Average daily hot water use (litres/day)												162.5278 (43)
Daily hot water use	176.8102	173.0339	168.4355	161.4442	155.7664	149.6625	147.3174	151.8959	156.7246	163.1326	170.2316	176.3518 (44)
Energy conte	280.0241	246.3980	258.8791	221.0090	209.6915	184.0275	178.1676	188.0789	193.2571	221.3693	242.5261	276.1243 (45)
Energy content (annual)												Total = Sum(45)m = 2699.5525
Distribution loss (46)m = 0.15 x (45)m	42.0036	36.9597	38.8319	33.1514	31.4537	27.6041	26.7251	28.2118	28.9886	33.2054	36.3789	41.4186 (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)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	351.8472	311.2704	330.7023	290.5153	281.5146	253.5337	249.9908	259.9020	262.7633	293.1925	312.0323	347.9474 (62)
WWHRS	-39.6156	-35.0364	-36.6881	-30.3792	-28.3123	-24.2270	-22.7090	-24.1487	-25.0662	-29.5503	-33.4769	-38.8820 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
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 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	312.2316	276.2340	294.0142	260.1361	253.2023	229.3066	227.2818	235.7533	237.6971	263.6421	278.5554	309.0654 (64)
12Total per year (kWh/year)												Total per year (kWh/year) = Sum(64)m = 3177.1198 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												

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150.5665 133.8253 143.5358 129.0905 127.1809 116.7941 116.6992 119.9947 119.8630 131.0638 136.2449 149.2698 (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	186.1910	186.1910	186.1910	186.1910	186.1910	186.1910	186.1910	186.1910	186.1910	186.1910	186.1910	186.1910
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	387.5675	429.0926	387.5675	400.4864	387.5675	400.4864	387.5675	387.5675	400.4864	387.5675	400.4864	387.5675
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	768.3959	776.3695	756.2764	713.5006	659.5039	608.7546	574.8509	566.8773	586.9704	629.7462	683.7429	734.4923
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	41.6191	41.6191	41.6191	41.6191	41.6191	41.6191	41.6191	41.6191	41.6191	41.6191	41.6191	41.6191
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000
Losses e.g. evaporation (negative values) (Table 5)	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528
Water heating gains (Table 5)	202.3743	199.1448	192.9245	179.2923	170.9421	162.2141	156.8538	161.2832	166.4763	176.1610	189.2291	200.6315
Total internal gains	1440.1951	1486.4642	1418.6257	1375.1367	1299.8708	1250.3123	1198.1295	1194.5854	1232.7905	1275.3320	1355.3157	1404.5485

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W				
North	8.0400	10.6334	0.6300	0.7000	0.7700	0.7700	26.1276 (74)					
East	49.8300	19.6403	0.6300	0.7000	0.7700	0.7700	299.0956 (76)					
South	31.2300	46.7521	0.6300	0.7000	0.7700	0.7700	446.2155 (78)					
West	87.0100	19.6403	0.6300	0.7000	0.7700	0.7700	522.2619 (80)					
North	1.4500	16.7973	0.6300	0.7000	1.0000	1.0000	9.6669 (82)					
South	4.0000	26.0000	0.6300	0.7000	1.0000	1.0000	41.2776 (82)					
Solar gains	1344.6450	2491.7188	3848.2814	5347.7716	6405.8402	6512.2490	6217.1686	5424.4312	4377.5532	2881.4872	1649.5507	1124.2606
Total gains	2784.8401	3978.1830	5266.9070	6722.9083	7705.7110	7762.5613	7415.2981	6619.0166	5610.3437	4156.8192	3004.8664	2528.8092

7. Mean internal temperature (heating season)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains for living area, nil,m (see Table 9a)	38.5473	38.6277	38.7069	39.0830	39.1541	39.4889	39.4889	39.5515	39.3593	39.1541	39.0104	38.8613
alpha	3.5698	3.5752	3.5805	3.6055	3.6103	3.6326	3.6326	3.6368	3.6240	3.6103	3.6007	3.5908
util living area	0.9979	0.9923	0.9745	0.9173	0.8002	0.6342	0.4871	0.5557	0.8059	0.9660	0.9950	0.9985
MIT	18.6622	18.9996	19.5123	20.1462	20.6274	20.8866	20.9669	20.9472	20.7188	20.0158	19.2092	18.6129
Th 2	19.9481	19.9500	19.9519	19.9610	19.9626	19.9705	19.9705	19.9720	19.9675	19.9626	19.9592	19.9557
util rest of house	0.9973	0.9904	0.9683	0.8971	0.7534	0.5543	0.3825	0.4473	0.7413	0.9543	0.9935	0.9981
MIT 2	17.1809	17.6135	18.2662	19.0589	19.6205	19.8918	19.9556	19.9459	19.7401	18.9146	17.8888	17.1224
Living area fraction	17.4298	17.8464	18.4755	19.2416	19.7897	20.0589	20.1255	20.1141	19.9045	19.0996	18.1106	17.3728
MIT	17.4298	17.8464	18.4755	19.2416	19.7897	20.0589	20.1255	20.1141	19.9045	19.0996	18.1106	17.3728
Temperature adjustment												0.0000
adjusted MIT	17.4298	17.8464	18.4755	19.2416	19.7897	20.0589	20.1255	20.1141	19.9045	19.0996	18.1106	17.3728

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9953	0.9846	0.9559	0.8797	0.7445	0.5616	0.3989	0.4632	0.7367	0.9405	0.9894	0.9966
Useful gains	2771.6631	3917.1074	5034.7641	5913.9010	5737.0384	4359.7003	2957.9742	3065.6756	4133.2891	3909.3475	2972.9326	2520.2225
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	11553.6053	11368.5191	10494.4922	8975.4391	7008.2117	4689.0708	3028.3373	3185.2930	5002.3738	7363.3476	9573.8605	11497.8118
Space heating kWh	6533.7650	5007.3487	4062.0377	2204.3074	945.7529	0.0000	0.0000	0.0000	0.0000	2569.7761	4752.6681	6679.3264
Space heating requirement - total per year (kWh/year)												32754.9824
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	6533.7650	5007.3487	4062.0377	2204.3074	945.7529	0.0000	0.0000	0.0000	0.0000	2569.7761	4752.6681	6679.3264
Space heating requirement after solar contribution - total per year (kWh/year)												32754.9824
Space heating per m ²												(98c) / (4) = 43.3669 (99)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000
Fraction of space heat from main system(s)												1.0000
Efficiency of main space heating system 1 (in %)												92.3000
Efficiency of main space heating system 2 (in %)												0.0000
Efficiency of secondary/supplementary heating system, %												0.0000
Space heating requirement	6533.7650	5007.3487	4062.0377	2204.3074	945.7529	0.0000	0.0000	0.0000	0.0000	2569.7761	4752.6681	6679.3264
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000
Space heating fuel (main heating system)	7078.8353	5425.0798	4400.9076	2388.1987	1024.6511	0.0000	0.0000	0.0000	0.0000	2784.1561	5149.1529	7236.5400
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Space heating fuel (main heating system 2)												

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Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	312.2316	276.2340	294.0142	260.1361	253.2023	229.3066	227.2818	235.7533	237.6971	263.6421	278.5554	309.0654	(64)
Efficiency of water heater (217)m	88.3456	88.2795	88.1291	87.7553	86.7342	79.8000	79.8000	79.8000	79.8000	87.8778	88.2490	79.8000	(216)
Fuel for water heating, kWh/month	353.4208	312.9086	333.6174	296.4335	291.9291	287.3517	284.8142	295.4302	297.8660	300.0099	315.6473	349.7826	(219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa (235a)m	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.3041	7.0685	7.3041	7.0685	(231)
Lighting (234a)m	80.5289	64.6033	58.1681	42.6164	32.9181	26.8944	30.0290	39.0329	50.6998	66.5209	75.1353	82.7670	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-230.0032	-294.5627	-384.6392	-390.9621	-388.6904	-350.4910	-344.7854	-339.8328	-329.0524	-313.6395	-241.3047	-202.3771	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-238.3933	-483.1286	-928.9951	-1353.1422	-1751.2310	-1747.1995	-1727.8109	-1480.9678	-1109.4050	-677.6271	-313.5159	-190.1018	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1													35487.5216 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													79.8000
Water heating fuel used													3719.2112 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year													86.0000 (231)
Electricity for lighting (calculated in Appendix L)													649.9141 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-15811.8590 (233)
Wind generation													0.0000 (234)
Hydro-electric generation (Appendix N)													0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)													0.0000 (235)
Appendix Q - special features													
Energy saved or generated													-0.0000 (236)
Energy used													0.0000 (237)
Total delivered energy for all uses													24130.7880 (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	35487.5216	0.2100	7452.3795 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3719.2112	0.2100	781.0344 (264)
Space and water heating			8233.4139 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	649.9141	0.1443	93.8027 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-3810.3407	0.1368	-521.3003
PV Unit electricity exported	-12001.5183	0.1268	-1521.9063
Total			-2043.2066 (269)
Total CO2, kg/year			6295.9392 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.3400 (273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	35487.5216	1.1300	40100.8994 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3719.2112	1.1300	4202.7087 (278)
Space and water heating			44303.6081 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	649.9141	1.5338	996.8600 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-3810.3407	1.5058	-5737.4377
PV Unit electricity exported	-12001.5183	0.4655	-5586.9024
Total			-11324.3401 (283)
Total Primary energy kWh/year			34106.2288 (286)
Target Primary Energy Rate (TPER)			45.1600 (287)

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Property Reference	Montrose House		Issued on Date	25/10/2023	
Assessment Reference	New Build	Prop Type Ref	New Build		
Property	Montrose House, Coronation Road, Ascot, SL5 9LP				
SAP Rating	89 B	DER	1.92	TER	8.34
Environmental	98 A	% DER < TER			76.98
CO ₂ Emissions (t/year)	1.15	DFEE	45.53	TFEE	47.79
Compliance Check	See BREL	% DFEE < TFEE			4.73
% DPER < TPER	55.12	DPER	20.27	TPER	45.16
Assessor Details	Mr. Alexander Cotterill			Assessor ID	AV67-0001
Client					

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	319.9000 (1b)	x 3.3000 (2b)	= 1055.6700 (1b) - (3b)
First floor	328.8000 (1c)	x 3.3500 (2c)	= 1101.4800 (1c) - (3c)
Second floor	106.6000 (1d)	x 3.0600 (2d)	= 326.1960 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)...(1n)	755.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 2483.3460 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

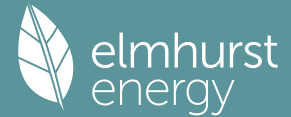
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50		4.0000 (17)
Infiltration rate		0.2000 (18)
Number of sides sheltered		0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2000 (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	0.2550	0.2500	0.2450	0.2200	0.2150	0.1900	0.1900	0.1850	0.2000	0.2150	0.2250	0.2350 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.8000 (23c)
Effective ac	0.3910	0.3860	0.3810	0.3560	0.3510	0.3260	0.3260	0.3210	0.3360	0.3510	0.3610	0.3710 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.20)			176.1100	1.1450	201.6527		(27)
Door			5.3600	1.2000	6.4320		(26a)
Rooflight			1.4500	1.2357	1.7918		(27a)
Rooflight			4.0000	1.2357	4.9430		(27a)
Ground Floor			319.9000	0.1300	41.5870	110.0000	35189.0000 (28a)
Exposed Floor			8.9000	0.1500	1.3350	20.0000	178.0000 (28a)
External Facade	578.5900	168.6300	409.9600	0.1800	73.7928	60.0000	24597.6000 (29a)
Ashlar Wall	45.2800		45.2800	0.1800	8.1504	9.0000	407.5200 (29a)
Dormer Wall	29.1200	12.8400	16.2800	0.1800	2.9304	9.0000	146.5200 (29a)
Ceiling	222.2000		222.2000	0.1100	24.4420	9.0000	1999.8000 (30)
Sloped Roof	77.9600	1.4500	76.5100	0.1200	9.1812	9.0000	688.5900 (30)
Flat Roof	36.4500	4.0000	32.4500	0.1200	3.8940	9.0000	292.0500 (30)
Total net area of external elements Aum(A, m ²)			1318.4000				(31)

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Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	380.1323			(33)
Internal Wall - Solid	540.3400		75.0000	40525.5000	(32c)
Internal Wall - Timber	731.6100		9.0000	6584.4900	(32c)
Internal Floor 1	319.1900		18.0000	5745.4200	(32d)
Internal Floor 2	106.6000		18.0000	1918.8000	(32d)
Internal Ceiling 1	319.9000		9.0000	2879.1000	(32e)
Internal Ceiling 2	106.6000		9.0000	959.4000	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	122111.7900			(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K				161.6732	(35)
Thermal bridges (User defined value 0.040 * total exposed area)				52.7360	(36)
Point Thermal bridges				0.0000	(36a)
Total fabric heat loss	(33) + (36) + (36a) =	432.8683			(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)														
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat transfer coeff	320.4261	316.3286	312.2311	291.7435	287.6460	267.1584	267.1584	263.0608	275.3534	287.6460	295.8410	304.0361	(38)	
Average = Sum(39)m / 12 =														
	753.2944	749.1969	745.0994	724.6118	720.5142	700.0266	700.0266	695.9291	708.2217	720.5142	728.7093	736.9043	(39)	
														723.5874

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9973	0.9919	0.9865	0.9594	0.9539	0.9268	0.9268	0.9214	0.9377	0.9539	0.9648	0.9756	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	
													0.9580

4. Water heating energy requirements (kWh/year)

Assumed occupancy														3.7238	(42)
Hot water usage for mixer showers	86.6563	85.3540	83.4563	79.8255	77.1460	74.1579	72.4594	74.3427	76.4072	79.6155	83.3244	86.3243	(42a)		
Hot water usage for baths	37.3883	36.8330	36.0511	34.6093	33.5297	32.3327	31.6861	32.4626	33.3080	34.5889	36.0603	37.2619	(42b)		
Hot water usage for other uses	52.7656	50.8469	48.9281	47.0094	45.0906	43.1719	43.1719	45.0906	47.0094	48.9281	50.8469	52.7656	(42c)		
Average daily hot water use (litres/day)														162.5278	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Energy cont	176.8102	173.0339	168.4355	161.4442	155.7664	149.6625	147.3174	151.8959	156.7246	163.1326	170.2316	176.3518	(44)		
Energy content (annual)	280.0241	246.3980	258.8791	221.0090	209.6915	184.0275	178.1676	188.0789	193.2571	221.3693	242.5261	276.1243	(45)		
Distribution loss (46)m = 0.15 x (45)m														2699.5525	
Water storage loss:	42.0036	36.9597	38.8319	33.1514	31.4537	27.6041	26.7251	28.2118	28.9886	33.2054	36.3789	41.4186	(46)		
Store volume														500.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):														2.0900	(48)
Temperature factor from Table 2b														0.5400	(49)
Enter (49) or (54) in (55)														1.1286	(55)
Total storage loss	34.9866	31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866	(56)		
If cylinder contains dedicated solar storage	34.9866	31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866	(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)		
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)		
Total heat required for water heating calculated for each month															
WWHRs	338.2731	299.0100	317.1281	277.3790	267.9405	240.3975	236.4166	246.3279	249.6271	279.6183	298.8961	334.3733	(62)		
FV diverter	-70.9627	-62.7600	-65.7186	-54.4176	-50.7153	-43.3974	-40.6782	-43.2571	-44.9006	-52.9329	-59.9666	-69.6486	(63a)		
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	(63b)		
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)		
Output from w/h	267.3104	236.2500	251.4095	222.9614	217.2252	197.0000	195.7385	203.0707	204.7264	226.6854	238.9295	264.7247	(64)		
														2726.0319	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)		
														0.0000	(64a)
Heat gains from water heating, kWh/month	139.7072	124.0169	132.6765	118.5815	116.3216	106.2851	105.8399	109.1354	109.3540	120.2045	125.7359	138.4105	(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	223.4292	223.4292	223.4292	223.4292	223.4292	223.4292	223.4292	223.4292	223.4292	223.4292	223.4292	223.4292	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	86.9545	77.2322	62.8094	47.5508	35.5448	30.0084	32.4251	42.1474	56.5702	71.8288	83.8348	89.3712	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	1146.8596	1158.7604	1128.7708	1064.9263	984.3342	908.5889	857.9864	846.0856	876.0753	939.9197	1020.5119	1096.2571	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	61.0667	61.0667	61.0667	61.0667	61.0667	61.0667	61.0667	61.0667	61.0667	61.0667	61.0667	61.0667	(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)	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	(71)
Water heating gains (Table 5)	187.7785	184.5490	178.3286	164.6965	156.3463	147.6182	142.2580	146.6874	151.8805	161.5652	174.6332	186.0356	(72)
Total internal gains	1557.1357	1556.0847	1505.4520	1412.7168	1311.7683	1221.7587	1168.2127	1170.4636	1220.0691	1308.8569	1414.5231	1507.2071	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	8.0400	10.6334	0.7600	0.7000	0.7700	31.5190 (74)
East	49.8300	19.6403	0.7600	0.7000	0.7700	360.8137 (76)
South	31.2300	46.7521	0.7600	0.7000	0.7700	538.2917 (78)
West	87.0100	19.6403	0.7600	0.7000	0.7700	630.0302 (80)
North	1.4500	16.7973	0.7600	0.7000	1.0000	11.6617 (82)
South	4.0000	26.0000	0.7600	0.7000	1.0000	49.7952 (82)

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Solar gains	1622.1115	3005.8830	4642.3712	6451.2800	7727.6803	7856.0464	7500.0764	6543.7583	5280.8578	3476.0798	1989.9341	1356.2509 (83)
Total gains	3179.2472	4561.9678	6147.8231	7863.9967	9039.4486	9077.8051	8668.2891	7714.2219	6500.9269	4784.9366	3404.4572	2863.4580 (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	45.0288	45.2751	45.5241	46.8112	47.0774	48.4552	48.4552	48.7405	47.8945	47.0774	46.5480	46.0303	
alpha	4.0019	4.0183	4.0349	4.1207	4.1385	4.2303	4.2303	4.2494	4.1930	4.1385	4.1032	4.0687	
util living area	0.9970	0.9874	0.9529	0.8459	0.6705	0.4806	0.3524	0.4091	0.6787	0.9373	0.9924	0.9980 (86)	
Living	19.4772	19.7605	20.1616	20.5967	20.8260	20.9086	20.9230	20.9202	20.8523	20.4578	19.8787	19.4529	
Non living	18.2668	18.6316	19.1400	19.6832	19.9384	20.0386	20.0492	20.0526	19.9840	19.5351	18.8012	18.2491	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	31	0	0	0	0	0	0	0	0	0	0	14	
16 / 9	0	28	31	0	0	0	0	0	0	0	21	17	
MIT	21.0000	20.2980	20.5251	20.5967	20.8260	20.9086	20.9230	20.9202	20.8523	20.4578	20.2191	20.5195 (87)	
Th 2	20.0855	20.0901	20.0946	20.1173	20.1219	20.1448	20.1448	20.1494	20.1356	20.1219	20.1128	20.1037 (88)	
util rest of house	0.9963	0.9846	0.9430	0.8178	0.6226	0.4208	0.2852	0.3360	0.6137	0.9192	0.9904	0.9976 (89)	
MIT 2	20.0855	19.4463	19.6733	19.6832	19.9384	20.0386	20.0492	20.0526	19.9840	19.5351	19.3140	19.6548 (90)	
Living area fraction	20.2392	19.5894	19.8164	19.8367	20.0875	20.1848	20.1960	20.1983	20.1299	19.6901	19.4661	19.8001 (91)	
Temperature adjustment												0.0000	
adjusted MIT	20.2392	19.5894	19.8164	19.8367	20.0875	20.1848	20.1960	20.1983	20.1299	19.6901	19.4661	19.8001 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9964	0.9828	0.9394	0.8078	0.6206	0.4236	0.2893	0.3403	0.6133	0.9082	0.9885	0.9974 (94)
Useful gains	3167.7718	4483.4233	5775.3984	6352.5715	5610.1363	3845.6484	2507.7479	2624.9524	3986.9309	4345.7982	3365.1538	2855.9278 (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	12006.8908	11005.2630	9922.0166	7924.8386	6043.2967	3909.4896	2517.3187	2643.3596	4270.5068	6549.5726	9011.2874	11495.7457 (97)
Space heating kWh	6576.3045	4382.6763	3085.0839	1132.0323	322.2714	0.0000	0.0000	0.0000	0.0000	1639.6082	4065.2162	6428.0245 (98a)
Space heating requirement - total per year (kWh/year)												27631.2173
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	6576.3045	4382.6763	3085.0839	1132.0323	322.2714	0.0000	0.0000	0.0000	0.0000	1639.6082	4065.2162	6428.0245 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												27631.2173
Space heating per m2												(98c) / (4) = 36.5831 (99)

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 %)													348.7625 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	6576.3045	4382.6763	3085.0839	1132.0323	322.2714	0.0000	0.0000	0.0000	0.0000	1639.6082	4065.2162	6428.0245 (98)	
Space heating efficiency (main heating system 1)	348.7625	348.7625	348.7625	348.7625	348.7625	0.0000	0.0000	0.0000	0.0000	348.7625	348.7625	348.7625 (210)	
Space heating fuel (main heating system)	1885.6113	1256.6364	884.5803	324.5855	92.4043	0.0000	0.0000	0.0000	0.0000	470.1217	1165.6117	1843.0953 (211)	
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)	
Space heating fuel (secondary)	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	267.3104	236.2500	251.4095	222.9614	217.2252	197.0000	195.7385	203.0707	204.7264	226.6854	238.9295	264.7247 (64)	
Efficiency of water heater (217)m	169.5203	169.5203	169.5203	169.5203	169.5203	169.5203	169.5203	169.5203	169.5203	169.5203	169.5203	169.5203 (216)	
Fuel for water heating, kWh/month	157.6863	139.3638	148.3064	131.5249	128.1411	116.2103	115.4661	119.7914	120.7681	133.7217	140.9445	156.1610 (219)	
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa	337.7266	305.0433	337.7266	326.8321	337.7266	326.8321	337.7266	337.7266	326.8321	337.7266	326.8321	337.7266 (231)	
Lighting	76.1107	61.0589	54.9767	40.2783	31.1121	25.4189	28.3815	36.8914	47.9183	62.8713	71.0130	78.2261 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-146.7028	-238.5554	-389.6542	-483.7245	-554.0983	-525.7519	-520.3699	-470.3071	-387.3129	-292.6007	-171.6729	-123.1636 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-3.5567	-12.1845	-37.3845	-88.5916	-152.9500	-169.3892	-165.5847	-129.0148	-82.0763	-27.9370	-6.5565	-2.5779 (233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)	
Annual totals kWh/year													
Space heating fuel - main system 1												7922.6465 (211)	
Space heating fuel - main system 2												0.0000 (213)	
Space heating fuel - secondary												0.0000 (215)	

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Efficiency of water heater	169.5203	
Water heating fuel used	1608.0854 (219)	
Space cooling fuel	0.0000 (221)	
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.3125)		
mechanical ventilation fans (SFP = 1.3125)	3976.4578 (230a)	
Total electricity for the above, kWh/year	3976.4578 (231)	
Electricity for lighting (calculated in Appendix L)	614.2573 (232)	
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-5181.7182 (233)	
Wind generation	0.0000 (234)	
Hydro-electric generation (Appendix N)	0.0000 (235a)	
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)	
Appendix Q - special features		
Energy saved or generated	-0.0000 (236)	
Energy used	0.0000 (237)	
Total delivered energy for all uses	8939.7288 (238)	

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	7922.6465	16.4900	1306.4444 (240)	
Total CO2 associated with community systems			0.0000 (473)	
Water heating (other fuel)	1608.0854	16.4900	265.1733 (247)	
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)	
Pumps, fans and electric keep-hot	3976.4578	16.4900	655.7179 (249)	
Energy for lighting	614.2573	16.4900	101.2910 (250)	
Additional standing charges			0.0000 (251)	
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-4303.9144	16.4900	-709.7155	
PV Unit electricity exported	-877.8038	5.5900	-49.0692	
Total			-758.7847 (252)	
Total energy cost			1569.8419 (255)	

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.7062 (257)
SAP value		88.5531
SAP rating (Section 12)		89 (258)
SAP band		B

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	7922.6465	0.1569	1242.7388 (261)	
Total CO2 associated with community systems			0.0000 (373)	
Water heating (other fuel)	1608.0854	0.1407	226.2500 (264)	
Space and water heating			1468.9887 (265)	
Pumps, fans and electric keep-hot	3976.4578	0.1387	551.5837 (267)	
Energy for lighting	614.2573	0.1443	88.6563 (268)	
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-4303.9144	0.1326	-570.5819	
PV Unit electricity exported	-877.8038	0.1168	-102.5266	
Total			-673.1085 (269)	
Total CO2, kg/year			1436.1203 (272)	
CO2 emissions per m2			1.9000 (273)	
EI value			97.5954	
EI rating			98 (274)	
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	319.9000 (1b)	x 3.3000 (2b)	= 1055.6700 (1b)	- (3b)
First floor	328.8000 (1c)	x 3.3500 (2c)	= 1101.4800 (1c)	- (3c)
Second floor	106.6000 (1d)	x 3.0600 (2d)	= 326.1960 (1d)	- (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	755.3000		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	2483.3460 (5)	

2. Ventilation rate

		m3 per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)

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Number of chimneys / flues attached to closed fire 0 * 10 = 0.0000 (6c)
 Number of flues attached to solid fuel boiler 0 * 20 = 0.0000 (6d)
 Number of flues attached to other heater 0 * 35 = 0.0000 (6e)
 Number of blocked chimneys 0 * 20 = 0.0000 (6f)
 Number of intermittent extract fans 0 * 10 = 0.0000 (7a)
 Number of passive vents 0 * 10 = 0.0000 (7b)
 Number of flueless gas fires 0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 0.0000 / (5) = 0.0000 (8)
 Pressure test Yes
 Pressure Test Method Blower Door
 Measured/design AP50 4.0000 (17)
 Infiltration rate 0.2000 (18)
 Number of sides sheltered 0 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 1.0000 (20)
 Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.2000 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.0000	4.0000	3.7000	3.7000	3.4000	3.5000	3.3000	3.3000	3.5000	3.5000	3.9000	(22)
Wind factor	1.0750	1.0000	1.0000	0.9250	0.9250	0.8500	0.8750	0.8250	0.8250	0.8750	0.8750	0.9750	(22a)
Adj infilt rate	0.2150	0.2000	0.2000	0.1850	0.1850	0.1700	0.1750	0.1650	0.1650	0.1750	0.1750	0.1950	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation													0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													72.8000 (23c)
Effective ac	0.3510	0.3360	0.3360	0.3210	0.3210	0.3060	0.3110	0.3010	0.3010	0.3110	0.3110	0.3310	(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	
Windows (Uw = 1.20)			176.1100	1.1450	201.6527			(27)
Door			5.3600	1.2000	6.4320			(26a)
Rooflight			1.4500	1.2357	1.7918			(27a)
Rooflight			4.0000	1.2357	4.9430			(27a)
Ground Floor			319.9000	0.1300	41.5870	110.0000	35189.0000	(28a)
Exposed Floor			8.9000	0.1500	1.3350	20.0000	178.0000	(28a)
External Facade	578.5900	168.6300	409.9600	0.1800	73.7928	60.0000	24597.6000	(29a)
Ashlar Wall	45.2800		45.2800	0.1800	8.1504	9.0000	407.5200	(29a)
Dormer Wall	29.1200	12.8400	16.2800	0.1800	2.9304	9.0000	146.5200	(29a)
Ceiling	222.2000		222.2000	0.1100	24.4420	9.0000	1999.8000	(30)
Sloped Roof	77.9600	1.4500	76.5100	0.1200	9.1812	9.0000	688.5900	(30)
Flat Roof	36.4500	4.0000	32.4500	0.1200	3.8940	9.0000	292.0500	(30)
Total net area of external elements Aum (A, m2)			1318.4000					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 380.1323			(33)
Internal Wall - Solid			540.3400			75.0000	40525.5000	(32c)
Internal Wall - Timber			731.6100			9.0000	6584.4900	(32c)
Internal Floor 1			319.1900			18.0000	5745.4200	(32d)
Internal Floor 2			106.6000			18.0000	1918.8000	(32d)
Internal Ceiling 1			319.9000			9.0000	2879.1000	(32e)
Internal Ceiling 2			106.6000			9.0000	959.4000	(32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 122111.7900	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							161.6732	(35)
Thermal bridges (User defined value 0.040 * total exposed area)							52.7360	(36)
Point Thermal bridges							0.0000	(36a)
Total fabric heat loss							(33) + (36) + (36a) = 432.8683	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
 (38)m Jan 287.6460 Feb 275.3534 Mar 275.3534 Apr 263.0608 May 263.0608 Jun 250.7683 Jul 254.8658 Aug 246.6708 Sep 246.6708 Oct 254.8658 Nov 254.8658 Dec 271.2559 (38)
 Heat transfer coeff 720.5142 708.2217 708.2217 695.9291 695.9291 683.6365 687.7341 679.5390 679.5390 687.7341 687.7341 704.1241 (39)
 Average = Sum(39)m / 12 = 694.9047

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9539	0.9377	0.9377	0.9214	0.9214	0.9051	0.9105	0.8997	0.8997	0.9105	0.9105	0.9322	(40)
HLP (average)													0.9200
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Assumed occupancy													3.7238 (42)
Hot water usage for mixer showers													
86.6563 85.3540	86.6563	85.3540	83.4563	79.8255	77.1460	74.1579	72.4594	74.3427	76.4072	79.6155	83.3244	86.3243	(42a)
Hot water usage for baths													
37.3883 36.8330	37.3883	36.8330	36.0511	34.6093	33.5297	32.3327	31.6861	32.4626	33.3080	34.5889	36.0603	37.2619	(42b)
Hot water usage for other uses													
52.7656 50.8469	52.7656	50.8469	48.9281	47.0094	45.0906	43.1719	43.1719	45.0906	47.0094	48.9281	50.8469	52.7656	(42c)
Average daily hot water use (litres/day)													162.5278 (43)
Daily hot water use	176.8102	173.0339	168.4355	161.4442	155.7664	149.6625	147.3174	151.8959	156.7246	163.1326	170.2316	176.3518	(44)
Energy conte 280.0241 246.3980 258.8791 221.0090 209.6915 184.0275 178.1676 188.0789 193.2571 221.3693 242.5261 276.1243 (45)	280.0241	246.3980	258.8791	221.0090	209.6915	184.0275	178.1676	188.0789	193.2571	221.3693	242.5261	276.1243	(45)
Energy content (annual)													Total = Sum(45)m = 2699.5525
Distribution loss (46)m = 0.15 x (45)m	42.0036	36.9597	38.8319	33.1514	31.4537	27.6041	26.7251	28.2118	28.9886	33.2054	36.3789	41.4186	(46)
Water storage loss:													
Store volume													500.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													2.0900 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.1286 (55)
Total storage loss	34.9866	31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866	(56)
If cylinder contains dedicated solar storage	34.9866	31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866	(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)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

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Total heat required for water heating calculated for each month													
WWHRS	338.2731	299.0100	317.1281	277.3790	267.9405	240.3975	236.4166	246.3279	249.6271	279.6183	298.8961	334.3733 (62)	
PV diverter	-70.9627	-62.7600	-65.7186	-54.4176	-50.7153	-43.3974	-40.6782	-43.2571	-44.9006	-52.9329	-59.9666	-69.6486 (63a)	
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 (63b)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)	
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)	
Electric shower(s)	267.3104	236.2500	251.4095	222.9614	217.2252	197.0000	195.7385	203.0707	204.7264	226.6854	238.9295	264.7247 (64)	
Total per year (kWh/year) = Sum(64)m =												2726.0319 (64)	
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)
Heat gains from water heating, kWh/month													
	139.7072	124.0169	132.6765	118.5815	116.3216	106.2851	105.8399	109.1354	109.3540	120.2045	125.7359	138.4105 (65)	

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

Metabolic gains (Table 5), Watts												
(66)m	223.4292	223.4292	223.4292	223.4292	223.4292	223.4292	223.4292	223.4292	223.4292	223.4292	223.4292	223.4292 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	86.9545	77.2322	62.8094	47.5508	35.5448	30.0084	32.4251	42.1474	56.5702	71.8288	83.8348	89.3712 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	1146.8596	1158.7604	1128.7708	1064.9263	984.3342	908.5889	857.9864	846.0856	876.0753	939.9197	1020.5119	1096.2571 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	61.0667	61.0667	61.0667	61.0667	61.0667	61.0667	61.0667	61.0667	61.0667	61.0667	61.0667	61.0667 (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)												
	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528 (71)
Water heating gains (Table 5)												
	187.7785	184.5490	178.3286	164.6965	156.3463	147.6182	142.2580	146.6874	151.8805	161.5652	174.6332	186.0356 (72)
Total internal gains												
	1557.1357	1556.0847	1505.4520	1412.7168	1311.7683	1221.7587	1168.2127	1170.4636	1220.0691	1308.8569	1414.5231	1507.2071 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
North	8.0400	12.7500	0.7600	0.7000	0.7700	37.7929 (74)						
East	49.8300	23.7835	0.7600	0.7000	0.7700	436.9294 (76)						
South	31.2300	54.0600	0.7600	0.7000	0.7700	622.4335 (78)						
West	87.0100	23.7835	0.7600	0.7000	0.7700	762.9386 (80)						
North	1.4500	20.0590	0.7600	0.7000	1.0000	13.9262 (82)						
South	4.0000	32.0000	0.7600	0.7000	1.0000	61.2864 (82)						

Solar gains	1935.3070	3137.1100	4769.3209	6804.9110	7870.5159	8514.3601	8083.4494	7224.9154	5799.0223	3895.8032	2339.5262	1626.9631 (83)
Total gains	3492.4427	4693.1948	6274.7729	8217.6278	9182.2842	9736.1188	9251.6620	8395.3790	7019.0914	5204.6601	3754.0493	3134.1702 (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	47.0774	47.8945	47.8945	48.7405	48.7405	49.6169	49.3213	49.9161	49.9161	49.3213	49.3213	48.1732
alpha	4.1385	4.1930	4.1930	4.2494	4.2494	4.3078	4.2881	4.3277	4.3277	4.2881	4.2881	4.2115
util living area	0.9952	0.9839	0.9379	0.7986	0.6049	0.3889	0.2596	0.2983	0.5798	0.8991	0.9869	0.9969 (86)
Living	19.6516	19.9227	20.3195	20.7015	20.8707	20.9216	20.9270	20.9271	20.8952	20.6040	20.0724	19.6321
Non living	18.5171	18.8725	19.3688	19.8307	20.0090	20.0672	20.0658	20.0756	20.0528	19.7391	19.0824	18.5059
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	31	0	0	0	0	0	0	0	0	0	0	7
16 / 9	0	28	31	0	0	0	0	0	0	0	16	24
MIT	21.0000	20.3898	20.6146	20.7015	20.8707	20.9216	20.9270	20.9271	20.8952	20.6040	20.2869	20.4002 (87)
Th 2	20.1219	20.1356	20.1356	20.1494	20.1494	20.1632	20.1585	20.1678	20.1678	20.1585	20.1585	20.1402 (88)
util rest of house	0.9941	0.9804	0.9250	0.7655	0.5543	0.3325	0.1975	0.2318	0.5129	0.8724	0.9835	0.9961 (89)
MIT 2	20.1219	19.5781	19.7971	19.8307	20.0090	20.0672	20.0658	20.0756	20.0528	19.7391	19.4030	19.5817 (90)
Living area fraction	FLA = Living area / (4) =											
MIT	20.2694	19.7145	19.9345	19.9770	20.1537	20.2107	20.2105	20.2186	20.1943	19.8844	19.5515	19.7192 (91)
Temperature adjustment	0.0000											
adjusted MIT	20.2694	19.7145	19.9345	19.9770	20.1537	20.2107	20.2105	20.2186	20.1943	19.8844	19.5515	19.7192 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9943	0.9783	0.9216	0.7582	0.5545	0.3357	0.2013	0.2359	0.5151	0.8622	0.9803	0.9957 (94)	
Useful gains	3472.7074	4591.5516	5782.9223	6230.8215	5091.9187	3268.4086	1862.5333	1980.3683	3615.7479	4487.2888	3679.9330	3120.6549 (95)	
Ext temp.	4.8000	5.4000	7.2000	9.5000	12.5000	15.4000	17.5000	17.3000	14.7000	11.2000	7.7000	4.8000 (96)	
Heat loss rate W	11145.9313	10137.8150	9018.8244	7291.2344	5326.4628	3288.7749	1864.0800	1983.3098	3733.5843	5972.5883	8150.6803	10504.9791 (97)	
Space heating kWh	5708.8786	3727.0890	2407.5112	763.4973	174.5009	0.0000	0.0000	0.0000	0.0000	1105.0628	3218.9380	5493.9372 (98a)	
Space heating requirement - total per year (kWh/year)	22599.4150												
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)	
Solar heating contribution - total per year (kWh/year)	0.0000												
Space heating kWh	5708.8786	3727.0890	2407.5112	763.4973	174.5009	0.0000	0.0000	0.0000	0.0000	1105.0628	3218.9380	5493.9372 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)	22599.4150												
Space heating per m ²												(98c) / (4) =	29.9211 (99)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 1)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													354.1183 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	5708.8786	3727.0890	2407.5112	763.4973	174.5009	0.0000	0.0000	0.0000	0.0000	1105.0628	3218.9380	5493.9372	(98)
Space heating efficiency (main heating system 1)	354.1183	354.1183	354.1183	354.1183	354.1183	0.0000	0.0000	0.0000	0.0000	354.1183	354.1183	354.1183	(210)
Space heating fuel (main heating system)	1612.1388	1052.4982	679.8607	215.6051	49.2776	0.0000	0.0000	0.0000	0.0000	312.0603	909.0007	1551.4411	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	267.3104	236.2500	251.4095	222.9614	217.2252	197.0000	195.7385	203.0707	204.7264	226.6854	238.9295	264.7247	(64)
Efficiency of water heater (217)m	169.4907	169.4907	169.4907	169.4907	169.4907	169.4907	169.4907	169.4907	169.4907	169.4907	169.4907	169.4907	(216)
Fuel for water heating, kWh/month	157.7139	139.3882	148.3324	131.5479	128.1635	116.2306	115.4863	119.8123	120.7892	133.7451	140.9691	156.1884	(219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	337.7266	305.0433	337.7266	326.8321	337.7266	326.8321	337.7266	337.7266	326.8321	337.7266	326.8321	337.7266	(231)
Lighting	76.1107	61.0589	54.9767	40.2783	31.1121	25.4189	28.3815	36.8914	47.9183	62.8713	71.0130	78.2261	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-173.7196	-247.2253	-395.6562	-499.5349	-557.4559	-557.2797	-549.4888	-506.9098	-417.6229	-321.2151	-199.4771	-146.7260	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-5.4086	-14.2543	-42.7555	-103.8456	-162.4124	-195.9064	-189.5958	-154.5074	-97.5001	-37.7512	-9.8959	-3.9944	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1													6381.8826 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													169.4907
Water heating fuel used													1608.3669 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.3125) mechanical ventilation fans (SFP = 1.3125)													3976.4578 (230a)
Total electricity for the above, kWh/year													3976.4578 (231)
Electricity for lighting (calculated in Appendix L)													614.2573 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-5590.1390 (233)
Wind generation													0.0000 (234)
Hydro-electric generation (Appendix N)													0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)													0.0000 (235)
Appendix Q - special features													
Energy saved or generated													-0.0000 (236)
Energy used													0.0000 (237)
Total delivered energy for all uses													6990.8256 (238)

10a. Fuel costs - using BEDF prices (528)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	6381.8826	21.5100	1372.7429	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1608.3669	21.5100	345.9597	(247)
Energy for instantaneous electric shower(s)	0.0000	21.5100	0.0000	(247a)
Pumps, fans and electric keep-hot	3976.4578	21.5100	855.3361	(249)
Energy for lighting	614.2573	21.5100	132.1267	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-4572.3113	21.5100	-983.5042	
PV Unit electricity exported	-1017.8277	5.5900	-56.8966	
Total			-1040.4007	(252)
Total energy cost			1665.7647	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	6381.8826	0.1575	1005.1174	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1608.3669	0.1407	226.2896	(264)
Space and water heating			1231.4070	(265)
Pumps, fans and electric keep-hot	3976.4578	0.1387	551.5837	(267)
Energy for lighting	614.2573	0.1443	88.6563	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-4572.3113	0.1327	-606.7388	
PV Unit electricity exported	-1017.8277	0.1170	-119.0623	

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Total
Total CO2, kg/year -725.8010 (269)
1145.8460 (272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	6381.8826	1.5830	10102.5226 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1608.3669	1.5202	2445.0867 (278)
Space and water heating			12547.6093 (279)
Pumps, fans and electric keep-hot	3976.4578	1.5128	6015.5853 (281)
Energy for lighting	614.2573	1.5338	942.1684 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-4572.3113	1.4903	-6814.2027
PV Unit electricity exported	-1017.8277	0.4288	-436.4691
Total			-7250.6718 (283)
Total Primary energy kWh/year			12254.6912 (286)

SAP 10 EPC IMPROVEMENTS

New Build

Current energy efficiency rating: B 89
Current environmental impact rating: A 98

Recommended measures:	SAP change	Cost change	CO2 change
V2 Wind turbine	+ 3.4	-£ 598	-496 kg (43.3%)
Measures omitted - SAP change or cost saving too small:			
N Solar water heating	+ 0.4	-£ 73	-45 kg (4.0%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Wind turbine	£598	0.66 kg/m ²	A 92 A 98
Total Savings	£598	0.66 kg/m ²	
Potential energy efficiency rating:			A 92
Potential environmental impact rating:			A 98

Fuel prices for cost data on this page from database revision number 528 TEST (04 Oct 2023)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):	Current	Potential	Saving
Electricity	£2706	£2706	£0
Space heating	£2228	£2228	£0
Water heating	£346	£346	£0
Lighting	£132	£132	£0
Generated (PV)	-£1040	-£1040	£0
Generated (wind)	-£0	-£598	£598
Total cost of fuels	£1666	£1068	£598
Total cost of uses	£1666	£1068	£598
Delivered energy	9 kWh/m ²	5 kWh/m ²	5 kWh/m ²
Carbon dioxide emissions	1.1 tonnes	0.6 tonnes	0.5 tonnes
CO2 emissions per m ²	2 kg/m ²	1 kg/m ²	1 kg/m ²
Primary energy	16 kWh/m ²	10 kWh/m ²	6 kWh/m ²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	319.9000 (1b)	x	3.3000 (2b) = 1055.6700 (1b) - (3b)
First floor	328.8000 (1c)	x	3.3500 (2c) = 1101.4800 (1c) - (3c)
Second floor	106.6000 (1d)	x	3.0600 (2d) = 326.1960 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	755.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 2483.3460 (5)

2. Ventilation rate

Number of open chimneys
m3 per hour
0 * 80 = 0.0000 (6a)

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Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000	Air changes per hour	0.0000 (8)
Pressure test			Blower Door	Yes
Pressure Test Method				4.0000 (17)
Measured/design AP50				0.2000 (18)
Infiltration rate				0 (19)
Number of sides sheltered				
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000		(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2000		(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	0.2550	0.2500	0.2450	0.2200	0.2150	0.1900	0.1900	0.1850	0.2000	0.2150	0.2250	0.2350 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												72.8000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.3910	0.3860	0.3810	0.3560	0.3510	0.3260	0.3260	0.3210	0.3360	0.3510	0.3610	0.3710 (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
Windows (Uw = 1.20)			176.1100	1.1450	201.6527		(27)
Door			5.3600	1.2000	6.4320		(26a)
Rooflight			1.4500	1.2357	1.7918		(27a)
Rooflight			4.0000	1.2357	4.9430		(27a)
Ground Floor			319.9000	0.1300	41.5870	110.0000	35189.0000 (28a)
Exposed Floor			8.9000	0.1500	1.3350	20.0000	178.0000 (28a)
External Facade	578.5900	168.6300	409.9600	0.1800	73.7928	60.0000	24597.6000 (29a)
Ashlar Wall	45.2800		45.2800	0.1800	8.1504	9.0000	407.5200 (29a)
Dormer Wall	29.1200	12.8400	16.2800	0.1800	2.9304	9.0000	146.5200 (29a)
Ceiling	222.2000		222.2000	0.1100	24.4420	9.0000	1999.8000 (30)
Sloped Roof	77.9600	1.4500	76.5100	0.1200	9.1812	9.0000	688.5900 (30)
Flat Roof	36.4500	4.0000	32.4500	0.1200	3.8940	9.0000	292.0500 (30)
Total net area of external elements Aum(A, m2)			1318.4000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	380.1323	(33)
Internal Wall - Solid			540.3400			75.0000	40525.5000 (32c)
Internal Wall - Timber			731.6100			9.0000	6584.4900 (32c)
Internal Floor 1			319.1900			18.0000	5745.4200 (32d)
Internal Floor 2			106.6000			18.0000	1918.8000 (32d)
Internal Ceiling 1			319.9000			9.0000	2879.1000 (32e)
Internal Ceiling 2			106.6000			9.0000	959.4000 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 122111.7900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							161.6732 (35)
Thermal bridges (User defined value 0.040 * total exposed area)							52.7360 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	432.8683 (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	320.4261	316.3286	312.2311	291.7435	287.6460	267.1584	267.1584	263.0608	275.3534	287.6460	295.8410	304.0361 (38)
Heat transfer coeff	753.2944	749.1969	745.0994	724.6118	720.5142	700.0266	700.0266	695.9291	708.2217	720.5142	728.7093	736.9043 (39)
Average = Sum(39)m / 12 =												723.5874
HLP	0.9973	0.9919	0.9865	0.9594	0.9539	0.9268	0.9268	0.9214	0.9377	0.9539	0.9648	0.9756 (40)
HLP (average)												0.9580
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage for mixer showers	86.6563	85.3540	83.4563	79.8255	77.1460	74.1579	72.4594	74.3427	76.4072	79.6155	83.3244	86.3243 (42a)
Hot water usage for baths	37.3883	36.8330	36.0511	34.6093	33.5297	32.3327	31.6861	32.4626	33.3080	34.5889	36.0603	37.2619 (42b)
Hot water usage for other uses	52.7656	50.8469	48.9281	47.0094	45.0906	43.1719	43.1719	45.0906	47.0094	48.9281	50.8469	52.7656 (42c)
Average daily hot water use (litres/day)												162.5278 (43)
Daily hot water use	176.8102	173.0339	169.4355	161.4442	155.7664	149.6625	147.3174	151.8959	156.7246	163.1326	170.2316	176.3518 (44)
Energy conte	280.0241	246.3980	258.8791	221.0090	209.6915	184.0275	178.1676	188.0789	193.2571	221.3693	242.5261	276.1243 (45)
Energy content (annual)												Total = Sum(45)m = 2699.5525
Distribution loss (46)m = 0.15 x (45)m	42.0036	36.9597	38.8319	33.1514	31.4537	27.6041	26.7251	28.2118	28.9886	33.2054	36.3789	41.4186 (46)
Water storage loss:												500.0000 (47)
Store volume												2.0900 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												1.1286 (55)
Enter (49) or (54) in (55)												
Total storage loss	34.9866	31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866 (56)
If cylinder contains dedicated solar storage	34.9866	31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866 (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)

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Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	338.2731	299.0100	317.1281	277.3790	267.9405	240.3975	236.4166	246.3279	249.6271	279.6183	298.8961	334.3733	(62)	
WWHRS	-70.9627	-62.7600	-65.7186	-54.4176	-50.7153	-43.3974	-40.6782	-43.2571	-44.9006	-52.9329	-59.9666	-69.6486	(63a)	
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)	
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	(63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)	
Output from w/h	267.3104	236.2500	251.4095	222.9614	217.2252	197.0000	195.7385	203.0707	204.7264	226.6854	238.9295	264.7247	(64)	
	Total per year (kWh/year) = Sum(64)m =												2726.0319	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	139.7072	124.0169	132.6765	118.5815	116.3216	106.2851	105.8399	109.1354	109.3540	120.2045	125.7359	138.4105	(65)	

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

Metabolic gains (Table 5), Watts													
(66)m	223.4292	223.4292	223.4292	223.4292	223.4292	223.4292	223.4292	223.4292	223.4292	223.4292	223.4292	223.4292	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	86.9545	77.2322	62.8094	47.5508	35.5448	30.0084	32.4251	42.1474	56.5702	71.8288	83.8348	89.3712	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	1146.8596	1158.7604	1128.7708	1064.9263	984.3342	908.5889	857.9864	846.0856	876.0753	939.9197	1020.5119	1096.2571	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	61.0667	61.0667	61.0667	61.0667	61.0667	61.0667	61.0667	61.0667	61.0667	61.0667	61.0667	61.0667	(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)	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	(71)
Water heating gains (Table 5)	187.7785	184.5490	178.3286	164.6965	156.3463	147.6182	142.2580	146.6874	151.8805	161.5652	174.6332	186.0356	(72)
Total internal gains	1557.1357	1556.0847	1505.4520	1412.7168	1311.7683	1221.7587	1168.2127	1170.4636	1220.0691	1308.8569	1414.5231	1507.2071	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W							
North	8.0400	10.6334	0.7600	0.7000	0.7700	31.5190 (74)							
East	49.8300	19.6403	0.7600	0.7000	0.7700	360.8137 (76)							
South	31.2300	46.7521	0.7600	0.7000	0.7700	538.2917 (78)							
West	87.0100	19.6403	0.7600	0.7000	0.7700	630.0302 (80)							
North	1.4500	16.7973	0.7600	0.7000	1.0000	11.6617 (82)							
South	4.0000	26.0000	0.7600	0.7000	1.0000	49.7952 (82)							
Solar gains	1622.1115	3005.8830	4642.3712	6451.2800	7727.6803	7856.0464	7500.0764	6543.7583	5280.8578	3476.0798	1989.9341	1356.2509	(83)
Total gains	3179.2472	4561.9678	6147.8231	7863.9967	9039.4486	9077.8051	8668.2891	7714.2219	6500.9269	4784.9366	3404.4572	2863.4580	(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)														
tau	45.0288	45.2751	45.5241	46.8112	47.0774	48.4552	48.4552	48.7405	47.8945	47.0774	46.5480	46.0303		
alpha	4.0019	4.0183	4.0349	4.1207	4.1385	4.2303	4.2303	4.2494	4.1930	4.1385	4.1032	4.0687		
util living area	0.9970	0.9874	0.9529	0.8459	0.6705	0.4806	0.3524	0.4091	0.6787	0.9373	0.9924	0.9980	(86)	
Living	19.4772	19.7605	20.1616	20.5967	20.8260	20.9086	20.9230	20.9202	20.8523	20.4578	19.8787	19.4529		
Non living	18.2668	18.6316	19.1400	19.6832	19.9384	20.0386	20.0492	20.0526	19.9840	19.5351	18.8012	18.2491		
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0		
24 / 9	31	0	0	0	0	0	0	0	0	0	0	14		
16 / 9	0	28	31	0	0	0	0	0	0	0	21	17		
MIT	21.0000	20.2980	20.5251	20.5967	20.8260	20.9086	20.9230	20.9202	20.8523	20.4578	20.2191	20.5195	(87)	
Th 2	20.0855	20.0901	20.0946	20.1173	20.1219	20.1448	20.1448	20.1494	20.1356	20.1219	20.1128	20.1037	(88)	
util rest of house	0.9963	0.9846	0.9430	0.8178	0.6226	0.4208	0.2852	0.3360	0.6137	0.9192	0.9904	0.9976	(89)	
MIT 2	20.0855	19.4463	19.6733	19.6832	19.9384	20.0386	20.0492	20.0526	19.9840	19.5351	19.3140	19.6548	(90)	
Living area fraction	FLA = Living area / (4) =												0.1680	(91)
MIT	20.2392	19.5894	19.8164	19.8367	20.0875	20.1848	20.1960	20.1983	20.1299	19.6901	19.4661	19.8001	(92)	
Temperature adjustment													0.0000	(92)
adjusted MIT	20.2392	19.5894	19.8164	19.8367	20.0875	20.1848	20.1960	20.1983	20.1299	19.6901	19.4661	19.8001	(93)	

8. Space heating requirement

Utilisation	0.9964	0.9828	0.9394	0.8078	0.6206	0.4236	0.2893	0.3403	0.6133	0.9082	0.9885	0.9974	(94)		
Useful gains	3167.7718	4483.4233	5775.3984	6352.5715	5610.1363	3845.6484	2507.7479	2624.9524	3986.9309	4345.7982	3365.1538	2855.9278	(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	12006.8908	11005.2630	9922.0166	7924.8386	6043.2967	3909.4896	2517.3187	2643.3596	4270.5068	6549.5726	9011.2874	11495.7457	(97)		
Space heating kWh	6576.3045	4382.6763	3085.0839	1132.0323	322.2714	0.0000	0.0000	0.0000	0.0000	1639.6082	4065.2162	6428.0245	(98a)		
Space heating requirement - total per year (kWh/year)													27631.2173	(98a)	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)		
Solar heating contribution - total per year (kWh/year)													0.0000	(98b)	
Space heating kWh	6576.3045	4382.6763	3085.0839	1132.0323	322.2714	0.0000	0.0000	0.0000	0.0000	1639.6082	4065.2162	6428.0245	(98c)		
Space heating requirement after solar contribution - total per year (kWh/year)													27631.2173	(98c)	
Space heating per m2													(98c) / (4) =	36.5831	(99)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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 %)													348.7625 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	6576.3045	4382.6763	3085.0839	1132.0323	322.2714	0.0000	0.0000	0.0000	0.0000	1639.6082	4065.2162	6428.0245	(98)
Space heating efficiency (main heating system 1)	348.7625	348.7625	348.7625	348.7625	348.7625	0.0000	0.0000	0.0000	0.0000	348.7625	348.7625	348.7625	(210)
Space heating fuel (main heating system)	1885.6113	1256.6364	884.5803	324.5855	92.4043	0.0000	0.0000	0.0000	0.0000	470.1217	1165.6117	1843.0953	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	267.3104	236.2500	251.4095	222.9614	217.2252	197.0000	195.7385	203.0707	204.7264	226.6854	238.9295	264.7247	(64)
Efficiency of water heater (217)m	169.5203	169.5203	169.5203	169.5203	169.5203	169.5203	169.5203	169.5203	169.5203	169.5203	169.5203	169.5203	(216)
Fuel for water heating, kWh/month	157.6863	139.3638	148.3064	131.5249	128.1411	116.2103	115.4661	119.7914	120.7681	133.7217	140.9445	156.1610	(219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	337.7266	305.0433	337.7266	326.8321	337.7266	326.8321	337.7266	337.7266	326.8321	337.7266	326.8321	337.7266	(231)
Lighting	76.1107	61.0589	54.9767	40.2783	31.1121	25.4189	28.3815	36.8914	47.9183	62.8713	71.0130	78.2261	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-146.7028	-238.5554	-389.6542	-483.7245	-554.0983	-525.7519	-520.3699	-470.3071	-387.3129	-292.6007	-171.6729	-123.1636	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	-212.5732	-192.0016	-212.5732	-205.7160	-212.5732	-205.7160	-212.5732	-212.5732	-205.7160	-212.5732	-205.7160	-212.5732	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-3.5567	-12.1845	-37.3845	-88.5916	-152.9500	-169.3892	-165.5847	-129.0148	-82.0763	-27.9370	-6.5565	-2.5779	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	-91.1028	-82.2864	-91.1028	-88.1640	-91.1028	-88.1640	-91.1028	-91.1028	-88.1640	-91.1028	-88.1640	-91.1028	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1													7922.6465 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													169.5203
Water heating fuel used													1608.0854 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.3125) mechanical ventilation fans (SFP = 1.3125)													3976.4578 (230a)
Total electricity for the above, kWh/year													3976.4578 (231)
Electricity for lighting (calculated in Appendix L)													614.2573 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-5181.7182 (233)
Wind generation													-3575.5408 (234)
Hydro-electric generation (Appendix N)													0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)													0.0000 (235)
Appendix Q - special features													
Energy saved or generated													-0.0000 (236)
Energy used													0.0000 (237)
Total delivered energy for all uses													5364.1881 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	7922.6465	16.4900	1306.4444 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1608.0854	16.4900	265.1733 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	3976.4578	16.4900	655.7179 (249)
Energy for lighting	614.2573	16.4900	101.2910 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-4303.9144	16.4900	-709.7155
PV Unit electricity exported	-877.8038	5.5900	-49.0692
Total			-758.7847 (252)
Wind Turbine electricity used in dwelling	-2502.8785	16.4900	-412.7247
Wind Turbine electricity exported	-1072.6622	5.5900	-59.9618
Total			-472.6865 (252)
Total energy cost			1097.1554 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)		0.4935 (257)
SAP value		91.9998
SAP rating (Section 12)		92 (258)
SAP band		A

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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	7922.6465	0.1569	1242.7388 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1608.0854	0.1407	226.2500 (264)
Space and water heating			1468.9887 (265)
Pumps, fans and electric keep-hot	3976.4578	0.1387	551.5837 (267)
Energy for lighting	614.2573	0.1443	88.6563 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-4303.9144	0.1326	-570.5819
PV Unit electricity exported	-877.8038	0.1168	-102.5266
Total			-673.1085 (269)
Wind Turbine electricity used in dwelling	-2502.8785	0.1387	-347.1801
Wind Turbine electricity exported	-1072.6622	0.1387	-148.7915
Total			-495.9716 (269)
Total CO2, kg/year			940.1487 (272)
CO2 emissions per m2			1.2400 (273)
EI value			98.4258
EI rating			98 (274)
EI band			A

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	319.9000 (1b)	x 3.3000 (2b)	= 1055.6700 (1b) - (3b)
First floor	328.8000 (1c)	x 3.3500 (2c)	= 1101.4800 (1c) - (3c)
Second floor	106.6000 (1d)	x 3.0600 (2d)	= 326.1960 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	755.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 2483.3460 (5)

2. Ventilation rate

	m3 per hour												
Number of open chimneys	0 * 80 =											0.0000 (6a)	
Number of open flues	0 * 20 =											0.0000 (6b)	
Number of chimneys / flues attached to closed fire	0 * 10 =											0.0000 (6c)	
Number of flues attached to solid fuel boiler	0 * 20 =											0.0000 (6d)	
Number of flues attached to other heater	0 * 35 =											0.0000 (6e)	
Number of blocked chimneys	0 * 20 =											0.0000 (6f)	
Number of intermittent extract fans	0 * 10 =											0.0000 (7a)	
Number of passive vents	0 * 10 =											0.0000 (7b)	
Number of flueless gas fires	0 * 40 =											0.0000 (7c)	
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000 (8)
Pressure test												Yes	
Pressure Test Method												Blower Door	
Measured/design AP50												4.0000 (17)	
Infiltration rate												0.2000 (18)	
Number of sides sheltered												0 (19)	
Shelter factor	(20) = 1 - [0.075 x (19)] =											1.0000 (20)	
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =											0.2000 (21)	
Wind speed	Jan 4.3000	Feb 4.0000	Mar 4.0000	Apr 3.7000	May 3.7000	Jun 3.4000	Jul 3.5000	Aug 3.3000	Sep 3.3000	Oct 3.5000	Nov 3.5000	Dec 3.9000 (22)	
Wind factor	1.0750	1.0000	1.0000	0.9250	0.9250	0.8500	0.8750	0.8250	0.8250	0.8750	0.8750	0.9750 (22a)	
Adj infilt rate	0.2150	0.2000	0.2000	0.1850	0.1850	0.1700	0.1750	0.1650	0.1650	0.1750	0.1750	0.1950 (22b)	
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation												0.5000 (23a)	
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)	
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.8000 (23c)	
Effective ac	0.3510	0.3360	0.3360	0.3210	0.3210	0.3060	0.3110	0.3010	0.3010	0.3110	0.3110	0.3310 (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
Windows (Uw = 1.20)			176.1100	1.1450	201.6527		(27)
Door			5.3600	1.2000	6.4320		(26a)
Rooflight			1.4500	1.2357	1.7918		(27a)
Rooflight			4.0000	1.2357	4.9430		(27a)
Ground Floor			319.9000	0.1300	41.5870	110.0000	35189.0000 (28a)
Exposed Floor			8.9000	0.1500	1.3350	20.0000	178.0000 (28a)
External Facade			409.9600	0.1800	73.7928	60.0000	24597.6000 (29a)
Ashlar Wall	578.5900	168.6300	45.2800	0.1800	8.1504	9.0000	407.5200 (29a)
Dormer Wall	45.2800		16.2800	0.1800	2.9304	9.0000	146.5200 (29a)
Ceiling	29.1200	12.8400	222.2000	0.1100	24.4420	9.0000	1999.8000 (30)
Sloped Roof	222.2000		77.9600	0.1200	9.1812	9.0000	688.5900 (30)
Flat Roof	77.9600	1.4500	36.4500	0.1200	3.8940	9.0000	292.0500 (30)

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Total net area of external elements Aum(A, m2)	1318.4000												(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...	(30) + (32) =	380.1323									(33)
Internal Wall - Solid	540.3400							75.0000				40525.5000	(32c)
Internal Wall - Timber	731.6100							9.0000				6584.4900	(32c)
Internal Floor 1	319.1900							18.0000				5745.4200	(32d)
Internal Floor 2	106.6000							18.0000				1918.8000	(32d)
Internal Ceiling 1	319.9000							9.0000				2879.1000	(32e)
Internal Ceiling 2	106.6000							9.0000				959.4000	(32e)

Heat capacity Cm = Sum(A x k)		(28)...	(30) + (32) + (32a)...	(32e) =	122111.7900								(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K					161.6732								(35)
Thermal bridges (User defined value 0.040 * total exposed area)					52.7360								(36)
Point Thermal bridges					0.0000								(36a) =
Total fabric heat loss		(33) + (36) + (36a) =			432.8683								(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	287.6460	275.3534	275.3534	263.0608	263.0608	250.7683	254.8658	246.6708	246.6708	254.8658	254.8658	271.2559	(38)
Average = Sum(39)m / 12 =	720.5142	708.2217	708.2217	695.9291	695.9291	683.6365	687.7341	679.5390	679.5390	687.7341	687.7341	704.1241	(39)
	694.9047											694.9047	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9539	0.9377	0.9377	0.9214	0.9214	0.9051	0.9105	0.8997	0.8997	0.9105	0.9105	0.9322	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.7238	(42)
Hot water usage for mixer showers	86.6563	85.3540	83.4563	79.8255	77.1460	74.1579	72.4594	74.3427	76.4072	79.6155	83.3244	86.3243	86.3243	(42a)
Hot water usage for baths	37.3883	36.8330	36.0511	34.6093	33.5297	32.3327	31.6861	32.4626	33.3080	34.5889	36.0603	37.2619	37.2619	(42b)
Hot water usage for other uses	52.7656	50.8469	48.9281	47.0094	45.0906	43.1719	43.1719	45.0906	47.0094	48.9281	50.8469	52.7656	52.7656	(42c)
Average daily hot water use (litres/day)													162.5278	(43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	176.8102	173.0339	168.4355	161.4442	155.7664	149.6625	147.3174	151.8959	156.7246	163.1326	170.2316	176.3518	(44)
Energy content (annual)	280.0241	246.3980	258.8791	221.0090	209.6915	184.0275	178.1676	188.0789	193.2571	221.3693	242.5261	276.1243	(45)
Distribution loss (46)m = 0.15 x (45)m													
Total = Sum(45)m =	42.0036	36.9597	38.8319	33.1514	31.4537	27.6041	26.7251	28.2118	28.9886	33.2054	36.3789	41.4186	(46)

Water storage loss:														
Store volume													500.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):													2.0900	(48)
Temperature factor from Table 2b													0.5400	(49)
Enter (49) or (54) in (55)													1.1286	(55)
Total storage loss	34.9866	31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	(56)
If cylinder contains dedicated solar storage	34.9866	31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	(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	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	338.2731	299.0100	317.1281	277.3790	267.9405	240.3975	236.4166	246.3279	249.6271	279.6183	298.8961	334.3733	(62)	
WWHRS	-70.9627	-62.7600	-65.7186	-54.4176	-50.7153	-43.3974	-40.6782	-43.2571	-44.9006	-52.9329	-59.9666	-69.6486	(63a)	
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)	
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	(63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)	
Output from w/h	267.3104	236.2500	251.4095	222.9614	217.2252	197.0000	195.7385	203.0707	204.7264	226.6854	238.9295	264.7247	(64)	
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)	
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)	
Heat gains from water heating, kWh/month	139.7072	124.0169	132.6765	118.5815	116.3216	106.2851	105.8399	109.1354	109.3540	120.2045	125.7359	138.4105	(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	223.4292	223.4292	223.4292	223.4292	223.4292	223.4292	223.4292	223.4292	223.4292	223.4292	223.4292	223.4292	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	86.9545	77.2322	62.8094	47.5508	35.5448	30.0084	32.4251	42.1474	56.5702	71.8288	83.8348	89.3712	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	1146.8596	1158.7604	1128.7708	1064.9263	984.3342	908.5889	857.9864	846.0856	876.0753	939.9197	1020.5119	1096.2571	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	61.0667	61.0667	61.0667	61.0667	61.0667	61.0667	61.0667	61.0667	61.0667	61.0667	61.0667	61.0667	(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)	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	-148.9528	(71)
Water heating gains (Table 5)	187.7785	184.5490	178.3286	164.6965	156.3463	147.6182	142.2580	146.6874	151.8805	161.5652	174.6332	186.0356	(72)
Total internal gains	1557.1357	1556.0847	1505.4520	1412.7168	1311.7683	1221.7587	1168.2127	1170.4636	1220.0691	1308.8569	1414.5231	1507.2071	(73)

6. Solar gains

[Jan]		Area	Solar flux	g	FF	Access	Gains	
		m2	Table 6a	Specific data	Specific data	factor	W	
			W/m2	or Table 6b	or Table 6c	Table 6d		
North		8.0400	12.7500	0.7600	0.7000	0.7700	37.7929	(74)
East		49.8300	23.7835	0.7600	0.7000	0.7700	436.9294	(76)
South		31.2300	54.0600	0.7600	0.7000	0.7700	622.4335	(78)
West		87.0100	23.7835	0.7600	0.7000	0.7700	762.9386	(80)
North		1.4500	20.0590	0.7600	0.7000	1.0000	13.9262	(82)

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South	4.0000	32.0000	0.7600	0.7000	1.0000	61.2864 (82)						
Solar gains	1935.3070	3137.1100	4769.3209	6804.9110	7870.5159	8514.3601	8083.4494	7224.9154	5799.0223	3895.8032	2339.5262	1626.9631 (83)
Total gains	3492.4427	4693.1948	6274.7729	8217.6278	9182.2842	9736.1188	9251.6620	8395.3790	7019.0914	5204.6601	3754.0493	3134.1702 (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	47.0774	47.8945	47.8945	48.7405	48.7405	49.6169	49.3213	49.9161	49.9161	49.3213	49.3213	48.1732	
alpha	4.1385	4.1930	4.1930	4.2494	4.2494	4.3078	4.2881	4.3277	4.3277	4.2881	4.2881	4.2115	
util living area	0.9952	0.9839	0.9379	0.7986	0.6049	0.3889	0.2596	0.2983	0.5798	0.8991	0.9869	0.9969 (86)	
Living	19.6516	19.9227	20.3195	20.7015	20.8707	20.9216	20.9270	20.9271	20.8952	20.6040	20.0724	19.6321	
Non living	18.5171	18.8725	19.3688	19.8307	20.0090	20.0672	20.0658	20.0756	20.0528	19.7391	19.0824	18.5059	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	31	0	0	0	0	0	0	0	0	0	0	7	
16 / 9	0	28	31	0	0	0	0	0	0	0	16	24	
MIT	21.0000	20.3898	20.6146	20.7015	20.8707	20.9216	20.9270	20.9271	20.8952	20.6040	20.2869	20.4002 (87)	
Th 2	20.1219	20.1356	20.1356	20.1494	20.1494	20.1632	20.1585	20.1678	20.1678	20.1585	20.1585	20.1402 (88)	
util rest of house	0.9941	0.9804	0.9250	0.7655	0.5543	0.3325	0.1975	0.2318	0.5129	0.8724	0.9835	0.9961 (89)	
MIT 2	20.1219	19.5781	19.7971	19.8307	20.0090	20.0672	20.0658	20.0756	20.0528	19.7391	19.4030	19.5817 (90)	
Living area fraction										FLA = Living area / (4) =			
MIT	20.2694	19.7145	19.9345	19.9770	20.1537	20.2107	20.2105	20.2186	20.1943	19.8844	19.5515	19.7192 (92)	
Temperature adjustment												0.0000	
adjusted MIT	20.2694	19.7145	19.9345	19.9770	20.1537	20.2107	20.2105	20.2186	20.1943	19.8844	19.5515	19.7192 (93)	

8. Space heating requirement

Utilisation	0.9943	0.9783	0.9216	0.7582	0.5545	0.3357	0.2013	0.2359	0.5151	0.8622	0.9803	0.9957 (94)
Useful gains	3472.7074	4591.5516	5782.9223	6230.8215	5091.9187	3268.4086	1862.5333	1980.3683	3615.7479	4487.2888	3679.9330	3120.6549 (95)
Ext temp.	4.8000	5.4000	7.2000	9.5000	12.5000	15.4000	17.5000	17.3000	14.7000	11.2000	7.7000	4.8000 (96)
Heat loss rate W	11145.9313	10137.8150	9018.8244	7291.2344	5326.4628	3288.7749	1864.0800	1983.3098	3733.5843	5972.5883	8150.6803	10504.9791 (97)
Space heating kWh	5708.8786	3727.0890	2407.5112	763.4973	174.5009	0.0000	0.0000	0.0000	0.0000	1105.0628	3218.9380	5493.9372 (98a)
Space heating requirement - total per year (kWh/year)												22599.4150
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	5708.8786	3727.0890	2407.5112	763.4973	174.5009	0.0000	0.0000	0.0000	0.0000	1105.0628	3218.9380	5493.9372 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												22599.4150
Space heating per m2												(98c) / (4) = 29.9211 (99)

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 %)												354.1183 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	5708.8786	3727.0890	2407.5112	763.4973	174.5009	0.0000	0.0000	0.0000	0.0000	1105.0628	3218.9380	5493.9372 (98)
Space heating efficiency (main heating system 1)	354.1183	354.1183	354.1183	354.1183	354.1183	0.0000	0.0000	0.0000	0.0000	354.1183	354.1183	354.1183 (210)
Space heating fuel (main heating system)	1612.1388	1052.4982	679.8607	215.6051	49.2776	0.0000	0.0000	0.0000	0.0000	312.0603	909.0007	1551.4411 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	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	267.3104	236.2500	251.4095	222.9614	217.2252	197.0000	195.7385	203.0707	204.7264	226.6854	238.9295	264.7247 (64)
Efficiency of water heater (217)m	169.4907	169.4907	169.4907	169.4907	169.4907	169.4907	169.4907	169.4907	169.4907	169.4907	169.4907	169.4907 (216)
Fuel for water heating, kWh/month	157.7139	139.3882	148.3324	131.5479	128.1635	116.2306	115.4863	119.8123	120.7892	133.7451	140.9691	156.1884 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	337.7266	305.0433	337.7266	326.8321	337.7266	326.8321	337.7266	337.7266	326.8321	337.7266	326.8321	337.7266 (231)
Lighting	76.1107	61.0589	54.9767	40.2783	31.1121	25.4189	28.3815	36.8914	47.9183	62.8713	71.0130	78.2261 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-173.7196	-247.2253	-395.6562	-499.5349	-557.4559	-557.2797	-549.4888	-506.9098	-417.6229	-321.2151	-199.4771	-146.7260 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	-212.5732	-192.0016	-212.5732	-205.7160	-212.5732	-205.7160	-212.5732	-212.5732	-205.7160	-212.5732	-205.7160	-212.5732 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-5.4086	-14.2543	-42.7555	-103.8456	-162.4124	-195.9064	-189.5958	-154.5074	-97.5001	-37.7512	-9.8959	-3.9944 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	-91.1028	-82.2864	-91.1028	-88.1640	-91.1028	-88.1640	-91.1028	-88.1640	-91.1028	-88.1640	-91.1028	-91.1028 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												6381.8826 (211)
Space heating fuel - main system 2												0.0000 (213)

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Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	169.4907
Water heating fuel used	1608.3669 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.3125)	
mechanical ventilation fans (SFP = 1.3125)	3976.4578 (230a)
Total electricity for the above, kWh/year	3976.4578 (231)
Electricity for lighting (calculated in Appendix L)	614.2573 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-5590.1390 (233)
Wind generation	-3575.5408 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	3415.2848 (238)

 10a. Fuel costs - using BEDF prices (528)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	6381.8826	21.5100	1372.7429 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1608.3669	21.5100	345.9597 (247)
Energy for instantaneous electric shower(s)	0.0000	21.5100	0.0000 (247a)
Pumps, fans and electric keep-hot	3976.4578	21.5100	855.3361 (249)
Energy for lighting	614.2573	21.5100	132.1267 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-4572.3113	21.5100	-983.5042
PV Unit electricity exported	-1017.8277	5.5900	-56.8966
Total			-1040.4007 (252)
Wind Turbine electricity used in dwelling	-2502.8785	21.5100	-538.3692
Wind Turbine electricity exported	-1072.6622	5.5900	-59.9618
Total			-598.3310 (252)
Total energy cost			1067.4338 (255)

 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	6381.8826	0.1575	1005.1174 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1608.3669	0.1407	226.2896 (264)
Space and water heating			1231.4070 (265)
Pumps, fans and electric keep-hot	3976.4578	0.1387	551.5837 (267)
Energy for lighting	614.2573	0.1443	88.6563 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-4572.3113	0.1327	-606.7388
PV Unit electricity exported	-1017.8277	0.1170	-119.0623
Total			-725.8010 (269)
Wind Turbine electricity used in dwelling	-2502.8785	0.1387	-347.1801
Wind Turbine electricity exported	-1072.6622	0.1387	-148.7915
Total			-495.9716 (269)
Total CO2, kg/year			649.8744 (272)

 13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	6381.8826	1.5830	10102.5226 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1608.3669	1.5202	2445.0867 (278)
Space and water heating			12547.6093 (279)
Pumps, fans and electric keep-hot	3976.4578	1.5128	6015.5853 (281)
Energy for lighting	614.2573	1.5338	942.1684 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-4572.3113	1.4903	-6814.2027
PV Unit electricity exported	-1017.8277	0.4288	-436.4691
Total			-7250.6718 (283)
Wind Turbine electricity used in dwelling	-2502.8785	1.5128	-3786.3546
Wind Turbine electricity exported	-1072.6622	0.5128	-550.0612
Total			-4336.4158 (283)
Total Primary energy kWh/year			7918.2754 (286)