Summary for Input Data

elmhurst energy

Property Reference	Annexe	**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	106 A	**DER**	-2.78	**TER**	12.07
Environmental	102 A	**% DER < TER**			123.03
CO_2 Emissions (t/year)	-0.27	**DFEE**	46.73	**TFEE**	51.06
Compliance Check	See BREL	**% DFEE < TFEE**			8.47
% DPER < TPER	118.42	**DPER**	-11.96	**TPER**	64.92

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

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

Orientation	West	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Rural	
1.0 Property Type	House, Detached	
Which Floor	0	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
3.0 Property Age Band	L	
4.0 Sheltered Sides	1	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	N/A	kJ/m²K
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 m²	0.00 m
Ground floor:	36.98 m	75.11 m²	3.06 m
1st Storey:	87.88 m	328.80 m²	3.35 m
2nd Storey:	46.42 m	106.60 m²	3.06 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

8.0 Living Area	40.83	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	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	77.07	70.02	0.00	None	7.05	Enter Gross Area

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall - Timber	Plasterboard on timber frame	9.00	61.38

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
Ceiling	External Plane Roof	Plasterboard, insulated at ceiling level	0.11	9.00	15.48	15.48	None	0.00	Enter Gross Area	0.00
Sloped Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.12	9.00	69.72	68.08	None	0.00	Enter Gross Area	1.64

11.0 Heat Loss Floors

Summary for Input Data

elmhurst energy

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Exposed Floor	Ground Floor - Timber	Lowest occupied	Suspended timber, insulation between joists	0.15	None	0.00	20.00	75.11

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
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 (m²)	Pitch
Windows E	Windows	External Facade	East	1.26	0
Door W	Door	External Facade	West	2.13	0
Windows N	Windows	External Facade	North	3.66	0
Rooflight S	Rooflight	Sloped Roof	South	1.64	30

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	User Input	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E2 Other lintels (including other steel lintels)		4.60	0.00	0.00	No
E3 Sill		3.70	0.00	0.00	No
E4 Jamb		15.80	0.00	0.00	No
E20 Exposed floor (normal)		36.96	0.00	0.00	No
E16 Corner (normal)		8.40	0.00	0.00	No
E11 Eaves (insulation at rafter level)		36.96	0.00	0.00	No

Y-value	0.04	W/m²K
Description	Thermal Bridging	
18.0 Pressure Testing	Yes	
Designed AP_{50}	4.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	No	

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System	No	

22.0 Lighting

No Fixed Lighting	No	

Name	Efficacy	Power	Capacity	Count
Lighting	95.83	12	1152	25

24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%
Database Ref. No.	106393	
Fuel Type	Electricity	
SAP Code	0	
In Winter	350.75	
In Summer	178.42	
Model Name	Ecodan 8.5kW	
Manufacturer	Mitsubishi Electric Europe B.V.	
System Type	Heat Pump	
Controls SAP Code	2207	
Delayed Start Stat	No	
HETAS approved System	No	

Summary for Input Data

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

26.0 Heat Networks — None

	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
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	1
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	210.00	L
Loss	2.09	kWh/day
Pipes insulation	Fully insulated primary pipework	

Summary for Input Data

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
5.00	South	30°	None Or Little	No	No	1.00		

34.0 Small-scale Hydro	None	
Electricity Generated	0.00	
Apportioned	0.00	kWh/Year
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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% DPER < TPER	118.42	**DPER**	-11.96	**TPER**	64.92

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	75.1100 (1b)	x	3.0600 (2b)	=	229.8366	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	75.1100					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	229.8366	(5)

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2. Ventilation rate

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		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	2 * 10 =	20.0000	(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)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.0870	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2870	(18)
Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2655	(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	0.3385	0.3319	0.3252	0.2920	0.2854	0.2522	0.2522	0.2456	0.2655	0.2854	0.2987	0.3120	(22b)
Effective ac	0.5573	0.5551	0.5529	0.5426	0.5407	0.5318	0.5318	0.5302	0.5352	0.5407	0.5446	0.5487	(25)

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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)			4.9200	1.1450	5.6336			(27)
Door			2.1300	1.2000	2.5560			(26a)
Rooflight S			1.6400	1.2357	2.0266			(27a)
Exposed Floor			75.1100	0.1500	11.2665	20.0000	1502.2000	(28a)
External Facade	77.0700	7.0500	70.0200	0.1800	12.6036	60.0000	4201.2000	(29a)
Ceiling	15.4800		15.4800	0.1100	1.7028	9.0000	139.3200	(30)
Sloped Roof	69.7200	1.6400	68.0800	0.1200	8.1696	9.0000	612.7200	(30)
Total net area of external elements Aum(A, m2)			237.3800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		43.9587			(33)
Internal Wall - Timber			61.3800			9.0000	552.4200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7007.8600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		93.3013 (35)
Thermal bridges (User defined value 0.040 * total exposed area)		9.4952 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	53.4539 (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	42.2684	42.0997	41.9343	41.1574	41.0121	40.3355	40.3355	40.2102	40.5961	41.0121	41.3061	41.6135	(38)

Heat transfer coeff

	95.7223	95.5536	95.3882	94.6113	94.4660	93.7894	93.7894	93.6641	94.0500	94.4660	94.7600	95.0674 (39)
Average = Sum(39)m / 12 =												94.6106

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2744	1.2722	1.2700	1.2596	1.2577	1.2487	1.2487	1.2470	1.2522	1.2577	1.2616	1.2657	(40)
HLP (average)												1.2596	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3635 (42)

Hot water usage for mixer showers

	63.8485	62.8890	61.4908	58.8156	56.8413	54.6397	53.3882	54.7759	56.2970	58.6609	61.3936	63.6039 (42a)

Hot water usage for baths

	27.5802	27.1706	26.5938	25.5302	24.7339	23.8508	23.3739	23.9466	24.5703	25.5152	26.6006	27.4869 (42b)

Hot water usage for other uses

	38.8350	37.4228	36.0107	34.5985	33.1863	31.7741	31.7741	33.1863	34.5985	36.0107	37.4228	38.8350 (42c)

Average daily hot water use (litres/day) 119.7419 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	130.2637	127.4824	124.0952	118.9443	114.7615	110.2646	108.5362	111.9088	115.4657	120.1867	125.4170	129.9258	(44)
Energy conte	206.3059	181.5332	190.7297	162.8288	154.4910	135.5832	131.2651	138.5665	142.3808	163.0922	178.6795	203.4325	(45)
Energy content (annual)										Total = Sum(45)m =		1988.8884	
Distribution loss (46)m = 0.15 x (45)m													
	30.9459	27.2300	28.6095	24.4243	23.1737	20.3375	19.6898	20.7850	21.3571	24.4638	26.8019	30.5149	(46)

Water storage loss:

Store volume 210.0000 (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

	264.5549	234.1452	248.9787	219.1988	212.7400	191.9532	189.5141	196.8155	198.7508	221.3412	235.0495	261.6815 (62)
WWHRS	-52.2854	-46.2417	-48.4216	-40.0950	-37.3671	-31.9753	-29.9717	-31.8719	-33.0829	-39.0011	-44.1835	-51.3172 (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

	212.2694	187.9036	200.5571	179.1038	175.3729	159.9779	159.5424	164.9435	165.6679	182.3402	190.8660	210.3643 (64)
										Total per year (kWh/year) = Sum(64)m =		2188.9090 (64)
12Total per year (kWh/year)												2189 (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

	115.1959	102.4494	110.0168	99.2366	97.9675	90.1774	90.2449	92.6725	92.4376	100.8274	104.5069	114.2405 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	118.1771	118.1771	118.1771	118.1771	118.1771	118.1771	118.1771	118.1771	118.1771	118.1771	118.1771	118.1771	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	123.8424	137.1112	123.8424	127.9705	123.8424	127.9705	123.8424	123.8424	127.9705	123.8424	127.9705	123.8424	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	208.9186	211.0865	205.6234	193.9932	179.3120	165.5138	156.2958	154.1279	159.5910	171.2212	185.9024	199.7006	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.8177	34.8177	34.8177	34.8177	34.8177	34.8177	34.8177	34.8177	34.8177	34.8177	34.8177	34.8177	(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)													
	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	(71)
Water heating gains (Table 5)													
	154.8332	152.4545	147.8721	137.8286	131.6767	125.2464	121.2969	124.5599	128.3856	135.5206	145.1485	153.5491	(72)
Total internal gains													
	546.0473	559.1053	535.7910	518.2453	493.2842	477.1838	459.8881	460.9832	474.4001	489.0374	517.4745	535.5451	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.6600	10.6334	0.7600	0.7000	0.7700	14.3482	(74)
East	1.2600	19.6403	0.7600	0.7000	0.7700	9.1235	(76)
South	1.6400	42.0754	0.7600	0.7000	1.0000	33.0389	(82)

Solar gains	56.5107	106.3072	169.8828	247.7432	308.8182	319.6496	302.7921	255.7026	196.8543	124.2973	69.5715	47.1121	(83)
Total gains	602.5580	665.4125	705.6738	765.9885	802.1025	796.8334	762.6802	716.6858	671.2544	613.3346	587.0460	582.6572	(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	20.3362	20.3721	20.4074	20.5750	20.6067	20.7553	20.7553	20.7831	20.6978	20.6067	20.5427	20.4763	
alpha	2.3557	2.3581	2.3605	2.3717	2.3738	2.3837	2.3837	2.3855	2.3799	2.3738	2.3695	2.3651	
util living area													
	0.9350	0.9164	0.8883	0.8280	0.7349	0.5999	0.4754	0.5145	0.6921	0.8457	0.9126	0.9395	(86)
Living	18.7685	18.9834	19.3327	19.8293	20.2810	20.6214	20.7693	20.7446	20.4945	19.9243	19.2774	18.7330	

Non living	17.2672	17.5381	17.9774	18.5959	19.1361	19.5185	19.6587	19.6415	19.3917	18.7249	17.9187	17.2271	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	19.8584	18.9834	19.3327	19.8293	20.2810	20.6214	20.7693	20.7446	20.4945	19.9243	19.2774	19.0501	(87)
Th 2	19.8609	19.8627	19.8644	19.8726	19.8741	19.8812	19.8812	19.8826	19.8785	19.8741	19.8710	19.8678	(88)
util rest of house													
	0.9258	0.9046	0.8719	0.8012	0.6901	0.5269	0.3745	0.4144	0.6269	0.8161	0.8984	0.9309	(89)
MIT 2	18.8269	17.5381	17.9774	18.5959	19.1361	19.5185	19.6587	19.6415	19.3917	18.7249	17.9187	17.7029	(90)
Living area fraction										fLA = Living area / (4) =		0.5436	(91)
MIT	19.3876	18.3238	18.7142	19.2664	19.7585	20.1181	20.2624	20.2411	19.9912	19.3769	18.6573	18.4352	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3876	18.3238	18.7142	19.2664	19.7585	20.1181	20.2624	20.2411	19.9912	19.3769	18.6573	18.4352	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9215	0.8849	0.8518	0.7845	0.6850	0.5435	0.4107	0.4485	0.6341	0.8007	0.8794	0.9176	(94)
Useful gains	555.2507	588.8363	601.0754	600.9105	549.4377	433.0849	313.2650	321.4430	425.6575	491.0764	516.2289	534.6229	(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													
	1444.2232	1282.6907	1165.0874	980.7771	761.2514	517.5367	343.4975	359.7775	554.0670	829.1202	1095.1700	1353.3068	(97)
Space heating kWh													
	661.3955	466.2702	419.6250	273.5039	157.5894	0.0000	0.0000	0.0000	0.0000	251.5046	416.8376	609.1008	(98a)
Space heating requirement - total per year (kWh/year)												3255.8270	
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													
	661.3955	466.2702	419.6250	273.5039	157.5894	0.0000	0.0000	0.0000	0.0000	251.5046	416.8376	609.1008	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3255.8270	
Space heating per m2											(98c) / (4) =	43.3475	(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 %)												350.7483	(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													
	661.3955	466.2702	419.6250	273.5039	157.5894	0.0000	0.0000	0.0000	0.0000	251.5046	416.8376	609.1008	(98)
Space heating efficiency (main heating system 1)													
	350.7483	350.7483	350.7483	350.7483	350.7483	0.0000	0.0000	0.0000	0.0000	350.7483	350.7483	350.7483	(210)
Space heating fuel (main heating system)													
	188.5670	132.9359	119.6371	77.9773	44.9295	0.0000	0.0000	0.0000	0.0000	71.7052	118.8424	173.6576	(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													
	212.2694	187.9036	200.5571	179.1038	175.3729	159.9779	159.5424	164.9435	165.6679	182.3402	190.8660	210.3643	(64)
Efficiency of water heater												178.4193	(216)
(217)m	178.4193	178.4193	178.4193	178.4193	178.4193	178.4193	178.4193	178.4193	178.4193	178.4193	178.4193	178.4193	(217)
Fuel for water heating, kWh/month													
	118.9723	105.3158	112.4078	100.3837	98.2926	89.6640	89.4199	92.4472	92.8532	102.1976	106.9761	117.9045	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	25.4484	20.4156	18.3820	13.4674	10.4026	8.4990	9.4896	12.3350	16.0219	21.0216	23.7439	26.1556	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-112.7773	-170.8657	-256.7990	-287.3440	-294.7907	-247.5650	-244.8814	-238.7768	-219.2948	-197.2448	-127.6236	-95.5505	(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	-12.4390	-38.0842	-99.0666	-189.5861	-294.4163	-331.7193	-326.7474	-260.6582	-171.8629	-69.8699	-20.9009	-9.2341	(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	928.2518	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	178.4193	
Water heating fuel used	1226.8345	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	0.0000	(231)
Electricity for lighting (calculated in Appendix L)	205.3828	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-4318.0985	(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	-1957.6293	(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	928.2518	0.1545	143.3954	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1226.8345	0.1405	172.4090	(264)
Space and water heating			315.8044	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	205.3828	0.1443	29.6431	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-2493.5135	0.1352	-337.0718	
PV Unit electricity exported	-1824.5850	0.1191	-217.3596	
Total			-554.4314	(269)
Total CO2, kg/year			-208.9840	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			-2.7800	(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	928.2518	1.5719	1459.1052	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1226.8345	1.5196	1864.3179	(278)
Space and water heating			3323.4231	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	205.3828	1.5338	315.0230	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-2493.5135	1.4997	-3739.4395	
PV Unit electricity exported	-1824.5850	0.4369	-797.1086	
Total			-4536.5481	(283)
Total Primary energy kWh/year			-898.1020	(286)
Dwelling Primary energy Rate (DPER)			-11.9600	(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	75.1100	(1b)	x 3.0600	(2b) =	229.8366	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	75.1100					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		229.8366	(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	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1305	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3805	(18)
Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3520	(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	0.4488	0.4400	0.4312	0.3872	0.3784	0.3344	0.3344	0.3256	0.3520	0.3784	0.3960	0.4136	(22b)
Effective ac	0.6007	0.5968	0.5930	0.5750	0.5716	0.5559	0.5559	0.5530	0.5619	0.5716	0.5784	0.5855	(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			2.1300	1.0000	2.1300			(26a)
TER Opening Type (Uw = 1.20)			4.9200	1.1450	5.6336			(27)
Rooflight S			1.6400	2.0221	3.3162			(27a)

Exposed Floor			75.1100	0.1300	9.7643	(28a)
External Facade	77.0700	7.0500	70.0200	0.1800	12.6036	(29a)
Ceiling	15.4800		15.4800	0.1100	1.7028	(30)
Sloped Roof	69.7200	1.6400	68.0800	0.1100	7.4888	(30)
Total net area of external elements Aum(A, m2)			237.3800			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		42.6393	(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 93.3013 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	4.6000	0.0500	0.2300
E3 Sill	3.7000	0.0500	0.1850
E4 Jamb	15.8000	0.0500	0.7900
E20 Exposed floor (normal)	36.9600	0.3200	11.8272
E16 Corner (normal)	8.4000	0.0900	0.7560
E11 Eaves (insulation at rafter level)	36.9600	0.0400	1.4784

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.2666 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 57.9059 (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	45.5610	45.2644	44.9737	43.6082	43.3527	42.1634	42.1634	41.9432	42.6215	43.3527	43.8696	44.4099	(38)
Heat transfer coeff	103.4669	103.1703	102.8796	101.5141	101.2586	100.0693	100.0693	99.8491	100.5274	101.2586	101.7754	102.3158	(39)

Average = Sum(39)m / 12 = 101.5129

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3775	1.3736	1.3697	1.3515	1.3481	1.3323	1.3323	1.3294	1.3384	1.3481	1.3550	1.3622	(40)
HLP (average)												1.3515	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3635 (42)

Hot water usage for mixer showers

63.8485	62.8890	61.4908	58.8156	56.8413	54.6397	53.3882	54.7759	56.2970	58.6609	61.3936	63.6039	(42a)

Hot water usage for baths

27.5802	27.1706	26.5938	25.5302	24.7339	23.8508	23.3739	23.9466	24.5703	25.5152	26.6006	27.4869	(42b)

Hot water usage for other uses

38.8350	37.4228	36.0107	34.5985	33.1863	31.7741	31.7741	33.1863	34.5985	36.0107	37.4228	38.8350	(42c)

Average daily hot water use (litres/day) 119.7419 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	130.2637	127.4824	124.0952	118.9443	114.7615	110.2646	108.5362	111.9088	115.4657	120.1867	125.4170	129.9258	(44)
Energy conte	206.3059	181.5332	190.7297	162.8288	154.4910	135.5832	131.2651	138.5665	142.3808	163.0922	178.6795	203.4325	(45)
Energy content (annual)											Total = Sum(45)m =	1988.8884	
Distribution loss (46)m = 0.15 x (45)m	30.9459	27.2300	28.6095	24.4243	23.1737	20.3375	19.6898	20.7850	21.3571	24.4638	26.8019	30.5149	(46)

Water storage loss:

Store volume 210.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.7016 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9188 (55)

Total storage loss

28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)

If cylinder contains dedicated solar storage

28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(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

258.0525	228.2721	242.4763	212.9061	206.2376	185.6605	183.0117	190.3131	192.4581	214.8388	228.7568	255.1791	(62)
WWHRS -29.1889	-25.8149	-27.0319	-22.3834	-20.8606	-17.8505	-16.7320	-17.7928	-18.4688	-21.7727	-24.6659	-28.6483	(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

228.8636	202.4572	215.4444	190.5227	185.3770	167.8100	166.2797	172.5202	173.9893	193.0661	204.0910	226.5307	(64)
										Total per year (kWh/year) = Sum(64)m =	2326.9520	(64)

12Total per year (kWh/year) 2327 (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

109.9940	97.7509	104.8149	94.2024	92.7655	85.1433	85.0429	87.4706	87.4035	95.6254	99.4728	109.0386	(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	118.1771	118.1771	118.1771	118.1771	118.1771	118.1771	118.1771	118.1771	118.1771	118.1771	118.1771	118.1771	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	123.8424	137.1112	123.8424	127.9705	123.8424	127.9705	123.8424	123.8424	127.9705	123.8424	127.9705	123.8424	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	208.9186	211.0865	205.6234	193.9932	179.3120	165.5138	156.2958	154.1279	159.5910	171.2212	185.9024	199.7006	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.8177	34.8177	34.8177	34.8177	34.8177	34.8177	34.8177	34.8177	34.8177	34.8177	34.8177	34.8177	(69)
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	(70)
Losses e.g. evaporation (negative values) (Table 5)	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	(71)
Water heating gains (Table 5)	147.8414	145.4626	140.8802	130.8367	124.6849	118.2546	114.3050	117.5680	121.3937	128.5288	138.1567	146.5572	(72)
Total internal gains	542.0555	555.1135	531.7992	514.2535	489.2924	470.1920	452.8963	453.9914	467.4083	485.0455	513.4826	531.5533	(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			3.6600		10.6334		0.6300		0.7000		0.7700	11.8939	(74)
East			1.2600		19.6403		0.6300		0.7000		0.7700	7.5629	(76)
South			1.6400		42.0754		0.6300		0.7000		1.0000	27.3875	(82)
Solar gains	46.8444	88.1231	140.8239	205.3661	255.9941	264.9727	250.9987	211.9640	163.1818	103.0359	57.6711	39.0534	(83)
Total gains	588.8998	643.2366	672.6231	719.6196	745.2864	735.1646	703.8950	665.9554	630.5901	588.0814	571.1538	570.6067	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	18.8140	18.8681	18.9214	19.1759	19.2243	19.4528	19.4528	19.4957	19.3642	19.2243	19.1267	19.0257	
alpha	2.2543	2.2579	2.2614	2.2784	2.2816	2.2969	2.2969	2.2997	2.2909	2.2816	2.2751	2.2684	
util living area	0.9400	0.9246	0.9021	0.8518	0.7718	0.6474	0.5242	0.5608	0.7286	0.8629	0.9202	0.9437	(86)
MIT	17.9300	18.2088	18.6803	19.3773	20.0323	20.5633	20.8107	20.7719	20.3796	19.5594	18.6581	17.8983	(87)
Th 2	19.7806	19.7836	19.7866	19.8007	19.8033	19.8156	19.8156	19.8179	19.8109	19.8033	19.7980	19.7924	(88)
util rest of house	0.9311	0.9134	0.8866	0.8265	0.7280	0.5714	0.4127	0.4521	0.6629	0.8344	0.9065	0.9354	(89)
MIT 2	16.2490	16.6011	17.1962	18.0692	18.8618	19.4688	19.7090	19.6809	19.2804	18.3089	17.1808	16.2144	(90)
Living area fraction										fLA = Living area / (4) =		0.5436	(91)
MIT	17.1628	17.4751	18.0030	18.7803	19.4981	20.0638	20.3079	20.2740	19.8779	18.9887	17.9838	17.1298	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.1628	17.4751	18.0030	18.7803	19.4981	20.0638	20.3079	20.2740	19.8779	18.9887	17.9838	17.1298	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9046	0.8849	0.8571	0.8001	0.7151	0.5888	0.4620	0.4971	0.6671	0.8103	0.8788	0.9098	(94)
Useful gains	532.6942	569.1748	576.4857	575.7610	532.9559	432.8650	325.1764	331.0454	420.6438	476.5022	501.9479	519.1387	(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	1330.8722	1297.3745	1183.4246	1002.9926	789.6258	546.7581	371.0464	386.8126	580.8408	849.4276	1107.7060	1322.9182	(97)
Space heating kWh	593.8445	489.3501	451.5625	307.6068	190.9623	0.0000	0.0000	0.0000	0.0000	277.4565	436.1458	598.0120	(98a)
Space heating requirement - total per year (kWh/year)												3344.9406	
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	593.8445	489.3501	451.5625	307.6068	190.9623	0.0000	0.0000	0.0000	0.0000	277.4565	436.1458	598.0120	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3344.9406	
Space heating per m2											(98c) / (4) =	44.5339	(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 %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement	593.8445	489.3501	451.5625	307.6068	190.9623	0.0000	0.0000	0.0000	0.0000	277.4565	436.1458	598.0120	(98)
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	(210)
Space heating fuel (main heating system)	643.3851	530.1735	489.2335	333.2685	206.8931	0.0000	0.0000	0.0000	0.0000	300.6030	472.5306	647.9003	(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	228.8636	202.4572	215.4444	190.5227	185.3770	167.8100	166.2797	172.5202	173.9893	193.0661	204.0910	226.5307	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.0987	85.9627	85.6788	85.1279	84.1264	79.8000	79.8000	79.8000	79.8000	84.8724	85.7183	86.1312	(217)
Fuel for water heating, kWh/month	265.8153	235.5174	251.4559	223.8076	220.3553	210.2882	208.3706	216.1908	218.0317	227.4781	238.0951	263.0065	(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	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	25.7320	20.6432	18.5869	13.6175	10.5186	8.5938	9.5954	12.4725	16.2005	21.2559	24.0085	26.4472	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-58.3134	-76.7531	-103.0566	-107.9898	-110.2267	-100.7691	-99.5656	-96.9914	-91.6253	-83.9390	-62.1672	-51.0888	(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	-51.6624	-105.8426	-205.3744	-301.5122	-392.2100	-391.7521	-387.0637	-330.5182	-246.1131	-148.8026	-68.1003	-41.0622	(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												3623.9877	(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	2778.4124	(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)	207.6720	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-3712.4999	(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	2983.5721	(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	3623.9877	0.2100	761.0374	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2778.4124	0.2100	583.4666	(264)
Space and water heating			1344.5040	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	207.6720	0.1443	29.9735	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1042.4861	0.1361	-141.8615	
PV Unit electricity exported	-2670.0139	0.1266	-337.9821	
Total			-479.8436	(269)
Total CO2, kg/year			906.5631	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.0700	(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	3623.9877	1.1300	4095.1061	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2778.4124	1.1300	3139.6061	(278)
Space and water heating			7234.7121	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	207.6720	1.5338	318.5342	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1042.4861	1.5030	-1566.8670	
PV Unit electricity exported	-2670.0139	0.4647	-1240.7086	
Total			-2807.5756	(283)
Total Primary energy kWh/year			4875.7715	(286)
Target Primary Energy Rate (TPER)			64.9200	(287)

Full SAP Calculation Printout

Property Reference	Annexe	**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	106 A	**DER**	-2.78	**TER**	12.07
Environmental	102 A	**% DER < TER**			123.03
CO_2 Emissions (t/year)	-0.27	**DFEE**	46.73	**TFEE**	51.06
Compliance Check	See BREL	**% DFEE < TFEE**			8.47
% DPER < TPER	118.42	**DPER**	-11.96	**TPER**	64.92

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	75.1100	(1b)	x 3.0600	(2b) =	229.8366	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	75.1100					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	229.8366	(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	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1305	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.3305	(18)
Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3057	(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	0.3898	0.3822	0.3745	0.3363	0.3287	0.2905	0.2905	0.2828	0.3057	0.3287	0.3440	0.3592	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

Effective ac	0.5760	0.5730	0.5701	0.5566	0.5540	0.5422	0.5422	0.5400	0.5467	0.5540	0.5592	0.5645	(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)			4.9200	1.1450	5.6336			(27)
Door			2.1300	1.2000	2.5560			(26a)
Rooflight S			1.6400	1.2357	2.0266			(27a)
Exposed Floor			75.1100	0.1500	11.2665	20.0000	1502.2000	(28a)
External Facade	77.0700	7.0500	70.0200	0.1800	12.6036	60.0000	4201.2000	(29a)
Ceiling	15.4800		15.4800	0.1100	1.7028	9.0000	139.3200	(30)
Sloped Roof	69.7200	1.6400	68.0800	0.1200	8.1696	9.0000	612.7200	(30)
Total net area of external elements Aum(A, m2)			237.3800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.9587			(33)
Internal Wall - Timber			61.3800			9.0000	552.4200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7007.8600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		93.3013 (35)
Thermal bridges (User defined value 0.040 * total exposed area)		9.4952 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	53.4539 (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	43.6857	43.4619	43.2426	42.2123	42.0196	41.1223	41.1223	40.9561	41.4679	42.0196	42.4095	42.8172	(38)
Heat transfer coeff													
	97.1396	96.9158	96.6965	95.6663	95.4735	94.5762	94.5762	94.4100	94.9218	95.4735	95.8634	96.2711	(39)
Average = Sum(39)m / 12 =												95.6653	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2933	1.2903	1.2874	1.2737	1.2711	1.2592	1.2592	1.2570	1.2638	1.2711	1.2763	1.2817	(40)
HLP (average)												1.2737	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3635 (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	(42a)

Hot water usage for baths

27.5802	27.1706	26.5938	25.5302	24.7339	23.8508	23.3739	23.9466	24.5703	25.5152	26.6006	27.4869	(42b)

Hot water usage for other uses

38.8350	37.4228	36.0107	34.5985	33.1863	31.7741	31.7741	33.1863	34.5985	36.0107	37.4228	38.8350	(42c)

Average daily hot water use (litres/day) 60.8757 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	66.4152	64.5934	62.6044	60.1287	57.9202	55.6249	55.1480	57.1329	59.1688	61.5258	64.0234	66.3220	(44)
Energy conte	105.1854	91.9802	96.2207	82.3132	77.9717	68.3974	66.6967	70.7425	72.9610	83.4900	91.2131	103.8442	(45)
Energy content (annual)											Total = Sum(45)m =	1011.0160	
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													
	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)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
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													
	89.4076	78.1831	81.7876	69.9662	66.2759	58.1378	56.6922	60.1311	62.0168	70.9665	77.5312	88.2675	(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													
	89.4076	78.1831	81.7876	69.9662	66.2759	58.1378	56.6922	60.1311	62.0168	70.9665	77.5312	88.2675	(64)
											Total per year (kWh/year) = Sum(64)m =	859.3636	(64)
12Total per year (kWh/year)												859	(64)
Electric shower(s)													
	51.1320	45.5590	49.7487	47.4746	48.3654	46.1359	47.6738	48.3654	47.4746	49.7487	48.8133	51.1320	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 581.6236 (64a)													
Heat gains from water heating, kWh/month													
	35.1349	30.9355	32.8841	29.3602	28.6603	26.0684	26.0915	27.1241	27.3729	30.1788	31.5861	34.8499	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	118.1771	118.1771	118.1771	118.1771	118.1771	118.1771	118.1771	118.1771	118.1771	118.1771	118.1771	118.1771	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	123.8424	137.1112	123.8424	127.9705	123.8424	127.9705	123.8424	123.8424	127.9705	123.8424	127.9705	123.8424	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	208.9186	211.0865	205.6234	193.9932	179.3120	165.5138	156.2958	154.1279	159.5910	171.2212	185.9024	199.7006	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.8177	34.8177	34.8177	34.8177	34.8177	34.8177	34.8177	34.8177	34.8177	34.8177	34.8177	34.8177	(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)													
	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	(71)
Water heating gains (Table 5)													
	47.2243	46.0350	44.1990	40.7781	38.5220	36.2061	35.0692	36.4572	38.0179	40.5629	43.8696	46.8412	(72)
Total internal gains													
	438.4385	452.6859	432.1180	421.1948	400.1295	388.1436	373.6605	372.8806	384.0324	394.0796	416.1955	428.8373	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.6600	10.6334	0.7600	0.7000	0.7700	14.3482	(74)
East	1.2600	19.6403	0.7600	0.7000	0.7700	9.1235	(76)
South	1.6400	42.0754	0.7600	0.7000	1.0000	33.0389	(82)

Solar gains	56.5107	106.3072	169.8828	247.7432	308.8182	319.6496	302.7921	255.7026	196.8543	124.2973	69.5715	47.1121	(83)
Total gains	494.9491	558.9931	602.0008	668.9380	708.9477	707.7931	676.4526	628.5831	580.8867	518.3769	485.7671	475.9494	(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	20.0395	20.0858	20.1313	20.3481	20.3892	20.5826	20.5826	20.6189	20.5077	20.3892	20.3063	20.2203	
alpha	2.3360	2.3391	2.3421	2.3565	2.3593	2.3722	2.3722	2.3746	2.3672	2.3593	2.3538	2.3480	
util living area													
	0.9557	0.9399	0.9163	0.8622	0.7766	0.6467	0.5224	0.5664	0.7439	0.8838	0.9388	0.9594	(86)
MIT	17.9089	18.2133	18.7076	19.4272	20.0857	20.5985	20.8291	20.7868	20.3945	19.5505	18.6287	17.8654	(87)
Th 2	19.8461	19.8484	19.8507	19.8615	19.8635	19.8730	19.8730	19.8747	19.8693	19.8635	19.8594	19.8552	(88)
util rest of house													

	0.9491	0.9309	0.9030	0.8388	0.7348	0.5737	0.4157	0.4619	0.6820	0.8593	0.9282	0.9533	(89)
MIT 2	17.0477	17.3488	17.8364	18.5413	19.1630	19.6208	19.7959	19.7721	19.4578	18.6736	17.7699	17.0104	(90)
Living area fraction									fLA = Living area / (4) =			0.5436	(91)
MIT	17.5158	17.8187	18.3100	19.0228	19.6646	20.1523	20.3576	20.3237	19.9670	19.1503	18.2368	17.4752	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.5158	17.8187	18.3100	19.0228	19.6646	20.1523	20.3576	20.3237	19.9670	19.1503	18.2368	17.4752	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9308	0.9100	0.8804	0.8182	0.7265	0.5933	0.4642	0.5065	0.6881	0.8402	0.9080	0.9359	(94)
Useful gains	460.7053	508.6615	529.9831	547.2933	515.0572	419.9195	314.0210	318.3512	399.6843	435.5528	441.0988	445.4566	(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													
	1283.7816	1252.0301	1141.9879	968.4149	760.4061	525.1118	355.3774	370.4365	556.9057	816.3248	1067.6074	1278.0175	(97)
Space heating kWh													
	612.3688	499.5437	455.3315	303.2076	182.5396	0.0000	0.0000	0.0000	0.0000	283.2944	451.0862	619.4252	(98a)
Space heating requirement - total per year (kWh/year)												3406.7970	
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													
	612.3688	499.5437	455.3315	303.2076	182.5396	0.0000	0.0000	0.0000	0.0000	283.2944	451.0862	619.4252	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3406.7970	
Space heating per m2											(98c) / (4) =	45.3574	(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	889.0163	699.8639	717.5162	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6366	0.7072	0.6722	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	565.9413	494.9251	482.2987	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	739.8439	707.3190	657.1582	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	125.2099	158.0211	130.0955	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	31.3025	39.5053	32.5239	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												103.3316	(107)
Energy for space heating												45.3574	(99)
Energy for space cooling												1.3757	(108)
Total												46.7332	(109)
Fabric Energy Efficiency (DFEE)												46.7	(109)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	75.1100	(1b)	x 3.0600	(2b) =	229.8366	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	75.1100					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		229.8366	(5)

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2. Ventilation rate

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	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	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1305	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3805	(18)
Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3520	(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

	0.4488	0.4400	0.4312	0.3872	0.3784	0.3344	0.3344	0.3256	0.3520	0.3784	0.3960	0.4136 (22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.6007	0.5968	0.5930	0.5750	0.5716	0.5559	0.5559	0.5530	0.5619	0.5716	0.5784	0.5855 (25)

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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			2.1300	1.0000	2.1300			(26a)
TER Opening Type (Uw = 1.20)			4.9200	1.1450	5.6336			(27)
Rooflight S			1.6400	2.0221	3.3162			(27a)
Exposed Floor			75.1100	0.1300	9.7643			(28a)
External Facade	77.0700	7.0500	70.0200	0.1800	12.6036			(29a)
Ceiling	15.4800		15.4800	0.1100	1.7028			(30)
Sloped Roof	69.7200	1.6400	68.0800	0.1100	7.4888			(30)
Total net area of external elements Aum(A, m2)			237.3800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.6393			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 93.3013 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	4.6000	0.0500	0.2300
E3 Sill	3.7000	0.0500	0.1850
E4 Jamb	15.8000	0.0500	0.7900
E20 Exposed floor (normal)	36.9600	0.3200	11.8272
E16 Corner (normal)	8.4000	0.0900	0.7560
E11 Eaves (insulation at rafter level)	36.9600	0.0400	1.4784

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.2666 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 57.9059 (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	45.5610	45.2644	44.9737	43.6082	43.3527	42.1634	42.1634	41.9432	42.6215	43.3527	43.8696	44.4099	(38)
Heat transfer coeff	103.4669	103.1703	102.8796	101.5141	101.2586	100.0693	100.0693	99.8491	100.5274	101.2586	101.7754	102.3158	(39)

Average = Sum(39)m / 12 = 101.5129

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3775	1.3736	1.3697	1.3515	1.3481	1.3323	1.3323	1.3294	1.3384	1.3481	1.3550	1.3622	(40)
HLP (average)												1.3515	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3635 (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 (42a)

Hot water usage for baths

	27.5802	27.1706	26.5938	25.5302	24.7339	23.8508	23.3739	23.9466	24.5703	25.5152	26.6006	27.4869 (42b)

Hot water usage for other uses

	38.8350	37.4228	36.0107	34.5985	33.1863	31.7741	31.7741	33.1863	34.5985	36.0107	37.4228	38.8350 (42c)

Average daily hot water use (litres/day) 60.8757 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	66.4152	64.5934	62.6044	60.1287	57.9202	55.6249	55.1480	57.1329	59.1688	61.5258	64.0234	66.3220	(44)
Energy conte	105.1854	91.9802	96.2207	82.3132	77.9717	68.3974	66.6967	70.7425	72.9610	83.4900	91.2131	103.8442	(45)
Energy content (annual)										Total = Sum(45)m =		1011.0160	
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													
	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)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
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													
	89.4076	78.1831	81.7876	69.9662	66.2759	58.1378	56.6922	60.1311	62.0168	70.9665	77.5312	88.2675	(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													
	89.4076	78.1831	81.7876	69.9662	66.2759	58.1378	56.6922	60.1311	62.0168	70.9665	77.5312	88.2675	(64)
										Total per year (kWh/year) = Sum(64)m =		859.3636	(64)
12Total per year (kWh/year)												859	(64)
Electric shower(s)													
	51.1320	45.5590	49.7487	47.4746	48.3654	46.1359	47.6738	48.3654	47.4746	49.7487	48.8133	51.1320	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		581.6236	(64a)
Heat gains from water heating, kWh/month													
	35.1349	30.9355	32.8841	29.3602	28.6603	26.0684	26.0915	27.1241	27.3729	30.1788	31.5861	34.8499	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	118.1771	118.1771	118.1771	118.1771	118.1771	118.1771	118.1771	118.1771	118.1771	118.1771	118.1771	118.1771	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	123.8424	137.1112	123.8424	127.9705	123.8424	127.9705	123.8424	123.8424	127.9705	123.8424	127.9705	123.8424	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	208.9186	211.0865	205.6234	193.9932	179.3120	165.5138	156.2958	154.1279	159.5910	171.2212	185.9024	199.7006	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.8177	34.8177	34.8177	34.8177	34.8177	34.8177	34.8177	34.8177	34.8177	34.8177	34.8177	34.8177	(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)	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	(71)
Water heating gains (Table 5)													

	47.2243	46.0350	44.1990	40.7781	38.5220	36.2061	35.0692	36.4572	38.0179	40.5629	43.8696	46.8412	(72)
Total internal gains	438.4385	452.6859	432.1180	421.1948	400.1295	388.1436	373.6605	372.8806	384.0324	394.0796	416.1955	428.8373	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.6600	10.6334	0.6300	0.7000	0.7700	11.8939	(74)
East	1.2600	19.6403	0.6300	0.7000	0.7700	7.5629	(76)
South	1.6400	42.0754	0.6300	0.7000	1.0000	27.3875	(82)

Solar gains	46.8444	88.1231	140.8239	205.3661	255.9941	264.9727	250.9987	211.9640	163.1818	103.0359	57.6711	39.0534	(83)
Total gains	485.2828	540.8090	572.9419	626.5609	656.1236	653.1162	624.6592	584.8445	547.2142	497.1155	473.8667	467.8907	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	18.8140	18.8681	18.9214	19.1759	19.2243	19.4528	19.4528	19.4957	19.3642	19.2243	19.1267	19.0257	
alpha	2.2543	2.2579	2.2614	2.2784	2.2816	2.2969	2.2969	2.2997	2.2909	2.2816	2.2751	2.2684	
util living area	0.9583	0.9451	0.9260	0.8812	0.8085	0.6898	0.5687	0.6093	0.7737	0.8959	0.9432	0.9614	(86)
MIT	17.6986	17.9898	18.4806	19.2169	19.9144	20.4959	20.7743	20.7265	20.2841	19.3956	18.4510	17.6653	(87)
Th 2	19.7806	19.7836	19.7866	19.8007	19.8033	19.8156	19.8156	19.8179	19.8109	19.8033	19.7980	19.7924	(88)
util rest of house	0.9518	0.9365	0.9136	0.8595	0.7686	0.6156	0.4538	0.4988	0.7127	0.8726	0.9329	0.9555	(89)
MIT 2	16.8008	17.0898	17.5759	18.3027	18.9685	19.4974	19.7140	19.6862	19.3232	18.4881	17.5583	16.7751	(90)
Living area fraction									fLA = Living area / (4) =			0.5436	(91)
MIT	17.2888	17.5791	18.0677	18.7997	19.4827	20.0402	20.2903	20.2517	19.8455	18.9814	18.0436	17.2590	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.2888	17.5791	18.0677	18.7997	19.4827	20.0402	20.2903	20.2517	19.8455	18.9814	18.0436	17.2590	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9333	0.9154	0.8906	0.8371	0.7561	0.6312	0.5034	0.5430	0.7147	0.8522	0.9125	0.9379	(94)
Useful gains	452.9032	495.0580	510.2820	524.4641	496.0930	412.2369	314.4554	317.5570	391.0972	423.6393	432.3849	438.8156	(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	1343.9142	1308.1028	1190.0781	1004.9564	788.0607	544.3991	369.2903	384.5907	577.5812	848.6905	1113.7880	1336.1444	(97)
Space heating kWh	662.9122	546.3661	505.7683	345.9545	217.2240	0.0000	0.0000	0.0000	0.0000	316.2381	490.6102	667.6126	(98a)
Space heating requirement - total per year (kWh/year)												3752.6860	
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	662.9122	546.3661	505.7683	345.9545	217.2240	0.0000	0.0000	0.0000	0.0000	316.2381	490.6102	667.6126	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3752.6860	
Space heating per m2											(98c) / (4) =	49.9625	(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	940.6514	740.5128	758.8528	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.5785	0.6508	0.6179	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	544.1245	481.9092	468.8923	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	680.4971	651.1370	609.8408	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	98.1883	125.9055	104.8657	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	24.5471	31.4764	26.2164	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												82.2399	(107)
Energy for space heating												49.9625	(99)
Energy for space cooling												1.0949	(108)
Total												51.0575	(109)
Fabric Energy Efficiency (TFEE)												51.1	(109)

Full SAP Calculation Printout

Property Reference	Annexe	**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	106 A	**DER**	-2.78	**TER**	12.07
Environmental	102 A	**% DER < TER**			123.03
CO_2 Emissions (t/year)	-0.27	**DFEE**	46.73	**TFEE**	51.06
Compliance Check	See BREL	**% DFEE < TFEE**			8.47
% DPER < TPER	118.42	**DPER**	-11.96	**TPER**	64.92

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	75.1100 (1b)	x	3.0600 (2b)	=	229.8366	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	75.1100					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	229.8366	(5)

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2. Ventilation rate

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		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	2 * 10 =	20.0000	(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)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.0870	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2870	(18)
Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2655	(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	0.3385	0.3319	0.3252	0.2920	0.2854	0.2522	0.2522	0.2456	0.2655	0.2854	0.2987	0.3120	(22b)
Effective ac	0.5573	0.5551	0.5529	0.5426	0.5407	0.5318	0.5318	0.5302	0.5352	0.5407	0.5446	0.5487	(25)

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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)			4.9200	1.1450	5.6336			(27)
Door			2.1300	1.2000	2.5560			(26a)
Rooflight S			1.6400	1.2357	2.0266			(27a)
Exposed Floor			75.1100	0.1500	11.2665	20.0000	1502.2000	(28a)
External Facade	77.0700	7.0500	70.0200	0.1800	12.6036	60.0000	4201.2000	(29a)
Ceiling	15.4800		15.4800	0.1100	1.7028	9.0000	139.3200	(30)
Sloped Roof	69.7200	1.6400	68.0800	0.1200	8.1696	9.0000	612.7200	(30)
Total net area of external elements Aum(A, m2)			237.3800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		43.9587			(33)
Internal Wall - Timber			61.3800			9.0000	552.4200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7007.8600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		93.3013 (35)
Thermal bridges (User defined value 0.040 * total exposed area)		9.4952 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	53.4539 (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	42.2684	42.0997	41.9343	41.1574	41.0121	40.3355	40.3355	40.2102	40.5961	41.0121	41.3061	41.6135	(38)

Heat transfer coeff

	95.7223	95.5536	95.3882	94.6113	94.4660	93.7894	93.7894	93.6641	94.0500	94.4660	94.7600	95.0674 (39)
Average = Sum(39)m / 12 =												94.6106

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2744	1.2722	1.2700	1.2596	1.2577	1.2487	1.2487	1.2470	1.2522	1.2577	1.2616	1.2657	(40)
HLP (average)												1.2596	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3635 (42)

Hot water usage for mixer showers

	63.8485	62.8890	61.4908	58.8156	56.8413	54.6397	53.3882	54.7759	56.2970	58.6609	61.3936	63.6039 (42a)

Hot water usage for baths

	27.5802	27.1706	26.5938	25.5302	24.7339	23.8508	23.3739	23.9466	24.5703	25.5152	26.6006	27.4869 (42b)

Hot water usage for other uses

	38.8350	37.4228	36.0107	34.5985	33.1863	31.7741	31.7741	33.1863	34.5985	36.0107	37.4228	38.8350 (42c)

Average daily hot water use (litres/day) 119.7419 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	130.2637	127.4824	124.0952	118.9443	114.7615	110.2646	108.5362	111.9088	115.4657	120.1867	125.4170	129.9258	(44)
Energy conte	206.3059	181.5332	190.7297	162.8288	154.4910	135.5832	131.2651	138.5665	142.3808	163.0922	178.6795	203.4325	(45)
Energy content (annual)										Total = Sum(45)m =		1988.8884	
Distribution loss (46)m = 0.15 x (45)m													
	30.9459	27.2300	28.6095	24.4243	23.1737	20.3375	19.6898	20.7850	21.3571	24.4638	26.8019	30.5149	(46)

Water storage loss:

Store volume 210.0000 (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

	264.5549	234.1452	248.9787	219.1988	212.7400	191.9532	189.5141	196.8155	198.7508	221.3412	235.0495	261.6815 (62)
WWHRS	-52.2854	-46.2417	-48.4216	-40.0950	-37.3671	-31.9753	-29.9717	-31.8719	-33.0829	-39.0011	-44.1835	-51.3172 (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

	212.2694	187.9036	200.5571	179.1038	175.3729	159.9779	159.5424	164.9435	165.6679	182.3402	190.8660	210.3643 (64)
										Total per year (kWh/year) = Sum(64)m =		2188.9090 (64)
12Total per year (kWh/year)												2189 (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

	115.1959	102.4494	110.0168	99.2366	97.9675	90.1774	90.2449	92.6725	92.4376	100.8274	104.5069	114.2405 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	118.1771	118.1771	118.1771	118.1771	118.1771	118.1771	118.1771	118.1771	118.1771	118.1771	118.1771	118.1771	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	123.8424	137.1112	123.8424	127.9705	123.8424	127.9705	123.8424	123.8424	127.9705	123.8424	127.9705	123.8424	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	208.9186	211.0865	205.6234	193.9932	179.3120	165.5138	156.2958	154.1279	159.5910	171.2212	185.9024	199.7006	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.8177	34.8177	34.8177	34.8177	34.8177	34.8177	34.8177	34.8177	34.8177	34.8177	34.8177	34.8177	(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)													
	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	(71)
Water heating gains (Table 5)													
	154.8332	152.4545	147.8721	137.8286	131.6767	125.2464	121.2969	124.5599	128.3856	135.5206	145.1485	153.5491	(72)
Total internal gains													
	546.0473	559.1053	535.7910	518.2453	493.2842	477.1838	459.8881	460.9832	474.4001	489.0374	517.4745	535.5451	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.6600	10.6334	0.7600	0.7000	0.7700	14.3482	(74)
East	1.2600	19.6403	0.7600	0.7000	0.7700	9.1235	(76)
South	1.6400	42.0754	0.7600	0.7000	1.0000	33.0389	(82)

Solar gains	56.5107	106.3072	169.8828	247.7432	308.8182	319.6496	302.7921	255.7026	196.8543	124.2973	69.5715	47.1121	(83)
Total gains	602.5580	665.4125	705.6738	765.9885	802.1025	796.8334	762.6802	716.6858	671.2544	613.3346	587.0460	582.6572	(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	20.3362	20.3721	20.4074	20.5750	20.6067	20.7553	20.7553	20.7831	20.6978	20.6067	20.5427	20.4763	
alpha	2.3557	2.3581	2.3605	2.3717	2.3738	2.3837	2.3837	2.3855	2.3799	2.3738	2.3695	2.3651	
util living area													
	0.9350	0.9164	0.8883	0.8280	0.7349	0.5999	0.4754	0.5145	0.6921	0.8457	0.9126	0.9395	(86)
Living	18.7685	18.9834	19.3327	19.8293	20.2810	20.6214	20.7693	20.7446	20.4945	19.9243	19.2774	18.7330	

Non living	17.2672	17.5381	17.9774	18.5959	19.1361	19.5185	19.6587	19.6415	19.3917	18.7249	17.9187	17.2271	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	19.8584	18.9834	19.3327	19.8293	20.2810	20.6214	20.7693	20.7446	20.4945	19.9243	19.2774	19.0501	(87)
Th 2	19.8609	19.8627	19.8644	19.8726	19.8741	19.8812	19.8812	19.8826	19.8785	19.8741	19.8710	19.8678	(88)
util rest of house													
	0.9258	0.9046	0.8719	0.8012	0.6901	0.5269	0.3745	0.4144	0.6269	0.8161	0.8984	0.9309	(89)
MIT 2	18.8269	17.5381	17.9774	18.5959	19.1361	19.5185	19.6587	19.6415	19.3917	18.7249	17.9187	17.7029	(90)
Living area fraction										fLA = Living area / (4) =		0.5436	(91)
MIT	19.3876	18.3238	18.7142	19.2664	19.7585	20.1181	20.2624	20.2411	19.9912	19.3769	18.6573	18.4352	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3876	18.3238	18.7142	19.2664	19.7585	20.1181	20.2624	20.2411	19.9912	19.3769	18.6573	18.4352	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9215	0.8849	0.8518	0.7845	0.6850	0.5435	0.4107	0.4485	0.6341	0.8007	0.8794	0.9176	(94)
Useful gains	555.2507	588.8363	601.0754	600.9105	549.4377	433.0849	313.2650	321.4430	425.6575	491.0764	516.2289	534.6229	(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													
	1444.2232	1282.6907	1165.0874	980.7771	761.2514	517.5367	343.4975	359.7775	554.0670	829.1202	1095.1700	1353.3068	(97)
Space heating kWh													
	661.3955	466.2702	419.6250	273.5039	157.5894	0.0000	0.0000	0.0000	0.0000	251.5046	416.8376	609.1008	(98a)
Space heating requirement - total per year (kWh/year)												3255.8270	
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													
	661.3955	466.2702	419.6250	273.5039	157.5894	0.0000	0.0000	0.0000	0.0000	251.5046	416.8376	609.1008	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3255.8270	
Space heating per m2											(98c) / (4) =	43.3475	(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 %)												350.7483	(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													
	661.3955	466.2702	419.6250	273.5039	157.5894	0.0000	0.0000	0.0000	0.0000	251.5046	416.8376	609.1008	(98)
Space heating efficiency (main heating system 1)													
	350.7483	350.7483	350.7483	350.7483	350.7483	0.0000	0.0000	0.0000	0.0000	350.7483	350.7483	350.7483	(210)
Space heating fuel (main heating system)													
	188.5670	132.9359	119.6371	77.9773	44.9295	0.0000	0.0000	0.0000	0.0000	71.7052	118.8424	173.6576	(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													
	212.2694	187.9036	200.5571	179.1038	175.3729	159.9779	159.5424	164.9435	165.6679	182.3402	190.8660	210.3643	(64)
Efficiency of water heater												178.4193	(216)
(217)m	178.4193	178.4193	178.4193	178.4193	178.4193	178.4193	178.4193	178.4193	178.4193	178.4193	178.4193	178.4193	(217)
Fuel for water heating, kWh/month													
	118.9723	105.3158	112.4078	100.3837	98.2926	89.6640	89.4199	92.4472	92.8532	102.1976	106.9761	117.9045	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	25.4484	20.4156	18.3820	13.4674	10.4026	8.4990	9.4896	12.3350	16.0219	21.0216	23.7439	26.1556	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-112.7773	-170.8657	-256.7990	-287.3440	-294.7907	-247.5650	-244.8814	-238.7768	-219.2948	-197.2448	-127.6236	-95.5505	(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	-12.4390	-38.0842	-99.0666	-189.5861	-294.4163	-331.7193	-326.7474	-260.6582	-171.8629	-69.8699	-20.9009	-9.2341	(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	928.2518	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	178.4193	
Water heating fuel used	1226.8345	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	0.0000	(231)
Electricity for lighting (calculated in Appendix L)	205.3828	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-4318.0985	(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	-1957.6293	(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	928.2518	0.1545	143.3954	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1226.8345	0.1405	172.4090	(264)
Space and water heating			315.8044	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	205.3828	0.1443	29.6431	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-2493.5135	0.1352	-337.0718	
PV Unit electricity exported	-1824.5850	0.1191	-217.3596	
Total			-554.4314	(269)
Total CO2, kg/year			-208.9840	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			-2.7800	(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	928.2518	1.5719	1459.1052	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1226.8345	1.5196	1864.3179	(278)
Space and water heating			3323.4231	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	205.3828	1.5338	315.0230	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-2493.5135	1.4997	-3739.4395	
PV Unit electricity exported	-1824.5850	0.4369	-797.1086	
Total			-4536.5481	(283)
Total Primary energy kWh/year			-898.1020	(286)
Dwelling Primary energy Rate (DPER)			-11.9600	(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	75.1100	(1b)	x 3.0600	(2b) =	229.8366	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	75.1100					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		229.8366	(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	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1305	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3805	(18)
Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3520	(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	0.4488	0.4400	0.4312	0.3872	0.3784	0.3344	0.3344	0.3256	0.3520	0.3784	0.3960	0.4136	(22b)
Effective ac	0.6007	0.5968	0.5930	0.5750	0.5716	0.5559	0.5559	0.5530	0.5619	0.5716	0.5784	0.5855	(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			2.1300	1.0000	2.1300			(26a)
TER Opening Type (Uw = 1.20)			4.9200	1.1450	5.6336			(27)
Rooflight S			1.6400	2.0221	3.3162			(27a)

Exposed Floor			75.1100	0.1300	9.7643	(28a)
External Facade	77.0700	7.0500	70.0200	0.1800	12.6036	(29a)
Ceiling	15.4800		15.4800	0.1100	1.7028	(30)
Sloped Roof	69.7200	1.6400	68.0800	0.1100	7.4888	(30)
Total net area of external elements Aum(A, m2)			237.3800			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		42.6393	(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 93.3013 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	4.6000	0.0500	0.2300
E3 Sill	3.7000	0.0500	0.1850
E4 Jamb	15.8000	0.0500	0.7900
E20 Exposed floor (normal)	36.9600	0.3200	11.8272
E16 Corner (normal)	8.4000	0.0900	0.7560
E11 Eaves (insulation at rafter level)	36.9600	0.0400	1.4784

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.2666 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 57.9059 (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	45.5610	45.2644	44.9737	43.6082	43.3527	42.1634	42.1634	41.9432	42.6215	43.3527	43.8696	44.4099	(38)
Heat transfer coeff	103.4669	103.1703	102.8796	101.5141	101.2586	100.0693	100.0693	99.8491	100.5274	101.2586	101.7754	102.3158	(39)

Average = Sum(39)m / 12 = 101.5129

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3775	1.3736	1.3697	1.3515	1.3481	1.3323	1.3323	1.3294	1.3384	1.3481	1.3550	1.3622	(40)
HLP (average)												1.3515	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3635 (42)

Hot water usage for mixer showers

63.8485	62.8890	61.4908	58.8156	56.8413	54.6397	53.3882	54.7759	56.2970	58.6609	61.3936	63.6039	(42a)

Hot water usage for baths

27.5802	27.1706	26.5938	25.5302	24.7339	23.8508	23.3739	23.9466	24.5703	25.5152	26.6006	27.4869	(42b)

Hot water usage for other uses

38.8350	37.4228	36.0107	34.5985	33.1863	31.7741	31.7741	33.1863	34.5985	36.0107	37.4228	38.8350	(42c)

Average daily hot water use (litres/day) 119.7419 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	130.2637	127.4824	124.0952	118.9443	114.7615	110.2646	108.5362	111.9088	115.4657	120.1867	125.4170	129.9258	(44)
Energy conte	206.3059	181.5332	190.7297	162.8288	154.4910	135.5832	131.2651	138.5665	142.3808	163.0922	178.6795	203.4325	(45)
Energy content (annual)											Total = Sum(45)m =	1988.8884	
Distribution loss (46)m = 0.15 x (45)m	30.9459	27.2300	28.6095	24.4243	23.1737	20.3375	19.6898	20.7850	21.3571	24.4638	26.8019	30.5149	(46)

Water storage loss:

Store volume 210.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.7016 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9188 (55)

Total storage loss

28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)

If cylinder contains dedicated solar storage

28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(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

258.0525	228.2721	242.4763	212.9061	206.2376	185.6605	183.0117	190.3131	192.4581	214.8388	228.7568	255.1791	(62)
WWHRS -29.1889	-25.8149	-27.0319	-22.3834	-20.8606	-17.8505	-16.7320	-17.7928	-18.4688	-21.7727	-24.6659	-28.6483	(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

228.8636	202.4572	215.4444	190.5227	185.3770	167.8100	166.2797	172.5202	173.9893	193.0661	204.0910	226.5307	(64)
										Total per year (kWh/year) = Sum(64)m =	2326.9520	(64)

12Total per year (kWh/year) 2327 (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

109.9940	97.7509	104.8149	94.2024	92.7655	85.1433	85.0429	87.4706	87.4035	95.6254	99.4728	109.0386	(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	118.1771	118.1771	118.1771	118.1771	118.1771	118.1771	118.1771	118.1771	118.1771	118.1771	118.1771	118.1771	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	123.8424	137.1112	123.8424	127.9705	123.8424	127.9705	123.8424	123.8424	127.9705	123.8424	127.9705	123.8424	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	208.9186	211.0865	205.6234	193.9932	179.3120	165.5138	156.2958	154.1279	159.5910	171.2212	185.9024	199.7006	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.8177	34.8177	34.8177	34.8177	34.8177	34.8177	34.8177	34.8177	34.8177	34.8177	34.8177	34.8177	(69)
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	(70)
Losses e.g. evaporation (negative values) (Table 5)	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	(71)
Water heating gains (Table 5)	147.8414	145.4626	140.8802	130.8367	124.6849	118.2546	114.3050	117.5680	121.3937	128.5288	138.1567	146.5572	(72)
Total internal gains	542.0555	555.1135	531.7992	514.2535	489.2924	470.1920	452.8963	453.9914	467.4083	485.0455	513.4826	531.5533	(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			3.6600		10.6334		0.6300		0.7000		0.7700	11.8939	(74)
East			1.2600		19.6403		0.6300		0.7000		0.7700	7.5629	(76)
South			1.6400		42.0754		0.6300		0.7000		1.0000	27.3875	(82)
Solar gains	46.8444	88.1231	140.8239	205.3661	255.9941	264.9727	250.9987	211.9640	163.1818	103.0359	57.6711	39.0534	(83)
Total gains	588.8998	643.2366	672.6231	719.6196	745.2864	735.1646	703.8950	665.9554	630.5901	588.0814	571.1538	570.6067	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	18.8140	18.8681	18.9214	19.1759	19.2243	19.4528	19.4528	19.4957	19.3642	19.2243	19.1267	19.0257	
alpha	2.2543	2.2579	2.2614	2.2784	2.2816	2.2969	2.2969	2.2997	2.2909	2.2816	2.2751	2.2684	
util living area	0.9400	0.9246	0.9021	0.8518	0.7718	0.6474	0.5242	0.5608	0.7286	0.8629	0.9202	0.9437	(86)
MIT	17.9300	18.2088	18.6803	19.3773	20.0323	20.5633	20.8107	20.7719	20.3796	19.5594	18.6581	17.8983	(87)
Th 2	19.7806	19.7836	19.7866	19.8007	19.8033	19.8156	19.8156	19.8179	19.8109	19.8033	19.7980	19.7924	(88)
util rest of house	0.9311	0.9134	0.8866	0.8265	0.7280	0.5714	0.4127	0.4521	0.6629	0.8344	0.9065	0.9354	(89)
MIT 2	16.2490	16.6011	17.1962	18.0692	18.8618	19.4688	19.7090	19.6809	19.2804	18.3089	17.1808	16.2144	(90)
Living area fraction										fLA = Living area / (4) =		0.5436	(91)
MIT	17.1628	17.4751	18.0030	18.7803	19.4981	20.0638	20.3079	20.2740	19.8779	18.9887	17.9838	17.1298	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.1628	17.4751	18.0030	18.7803	19.4981	20.0638	20.3079	20.2740	19.8779	18.9887	17.9838	17.1298	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9046	0.8849	0.8571	0.8001	0.7151	0.5888	0.4620	0.4971	0.6671	0.8103	0.8788	0.9098	(94)
Useful gains	532.6942	569.1748	576.4857	575.7610	532.9559	432.8650	325.1764	331.0454	420.6438	476.5022	501.9479	519.1387	(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	1330.8722	1297.3745	1183.4246	1002.9926	789.6258	546.7581	371.0464	386.8126	580.8408	849.4276	1107.7060	1322.9182	(97)
Space heating kWh	593.8445	489.3501	451.5625	307.6068	190.9623	0.0000	0.0000	0.0000	0.0000	277.4565	436.1458	598.0120	(98a)
Space heating requirement - total per year (kWh/year)												3344.9406	
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	593.8445	489.3501	451.5625	307.6068	190.9623	0.0000	0.0000	0.0000	0.0000	277.4565	436.1458	598.0120	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3344.9406	
Space heating per m2											(98c) / (4) =	44.5339	(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 %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement	593.8445	489.3501	451.5625	307.6068	190.9623	0.0000	0.0000	0.0000	0.0000	277.4565	436.1458	598.0120	(98)
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	(210)
Space heating fuel (main heating system)	643.3851	530.1735	489.2335	333.2685	206.8931	0.0000	0.0000	0.0000	0.0000	300.6030	472.5306	647.9003	(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	228.8636	202.4572	215.4444	190.5227	185.3770	167.8100	166.2797	172.5202	173.9893	193.0661	204.0910	226.5307	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.0987	85.9627	85.6788	85.1279	84.1264	79.8000	79.8000	79.8000	79.8000	84.8724	85.7183	86.1312	(217)
Fuel for water heating, kWh/month	265.8153	235.5174	251.4559	223.8076	220.3553	210.2882	208.3706	216.1908	218.0317	227.4781	238.0951	263.0065	(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	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	25.7320	20.6432	18.5869	13.6175	10.5186	8.5938	9.5954	12.4725	16.2005	21.2559	24.0085	26.4472	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-58.3134	-76.7531	-103.0566	-107.9898	-110.2267	-100.7691	-99.5656	-96.9914	-91.6253	-83.9390	-62.1672	-51.0888	(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	-51.6624	-105.8426	-205.3744	-301.5122	-392.2100	-391.7521	-387.0637	-330.5182	-246.1131	-148.8026	-68.1003	-41.0622	(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												3623.9877	(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	2778.4124	(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)	207.6720	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-3712.4999	(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	2983.5721	(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	3623.9877	0.2100	761.0374	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2778.4124	0.2100	583.4666	(264)
Space and water heating			1344.5040	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	207.6720	0.1443	29.9735	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1042.4861	0.1361	-141.8615	
PV Unit electricity exported	-2670.0139	0.1266	-337.9821	
Total			-479.8436	(269)
Total CO2, kg/year			906.5631	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.0700	(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	3623.9877	1.1300	4095.1061	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2778.4124	1.1300	3139.6061	(278)
Space and water heating			7234.7121	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	207.6720	1.5338	318.5342	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1042.4861	1.5030	-1566.8670	
PV Unit electricity exported	-2670.0139	0.4647	-1240.7086	
Total			-2807.5756	(283)
Total Primary energy kWh/year			4875.7715	(286)
Target Primary Energy Rate (TPER)			64.9200	(287)

Full SAP Calculation Printout

Property Reference	Annexe	**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	106 A	**DER**	-2.78	**TER**	12.07
Environmental	102 A	**% DER < TER**			123.03
CO_2 Emissions (t/year)	-0.27	**DFEE**	46.73	**TFEE**	51.06
Compliance Check	See BREL	**% DFEE < TFEE**			8.47
% DPER < TPER	118.42	**DPER**	-11.96	**TPER**	64.92

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	75.1100	(1b)	x 3.0600	(2b) =	229.8366	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	75.1100					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		229.8366	(5)

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2. Ventilation rate

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	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	2 * 10 =	20.0000 (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)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.0870 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		4.0000 (17)
Infiltration rate		0.2870 (18)
Number of sides sheltered		1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2655 (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	0.3385	0.3319	0.3252	0.2920	0.2854	0.2522	0.2522	0.2456	0.2655	0.2854	0.2987	0.3120	(22b)
Effective ac	0.5573	0.5551	0.5529	0.5426	0.5407	0.5318	0.5318	0.5302	0.5352	0.5407	0.5446	0.5487	(25)

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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)			4.9200	1.1450	5.6336			(27)
Door			2.1300	1.2000	2.5560			(26a)
Rooflight S			1.6400	1.2357	2.0266			(27a)
Exposed Floor			75.1100	0.1500	11.2665	20.0000	1502.2000	(28a)
External Facade	77.0700	7.0500	70.0200	0.1800	12.6036	60.0000	4201.2000	(29a)
Ceiling	15.4800		15.4800	0.1100	1.7028	9.0000	139.3200	(30)
Sloped Roof	69.7200	1.6400	68.0800	0.1200	8.1696	9.0000	612.7200	(30)
Total net area of external elements Aum(A, m2)			237.3800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		43.9587			(33)
Internal Wall - Timber			61.3800			9.0000	552.4200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7007.8600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		93.3013 (35)
Thermal bridges (User defined value 0.040 * total exposed area)		9.4952 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	53.4539 (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	42.2684	42.0997	41.9343	41.1574	41.0121	40.3355	40.3355	40.2102	40.5961	41.0121	41.3061	41.6135	(38)

Heat transfer coeff

	95.7223	95.5536	95.3882	94.6113	94.4660	93.7894	93.7894	93.6641	94.0500	94.4660	94.7600	95.0674 (39)
Average = Sum(39)m / 12 =												94.6106

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2744	1.2722	1.2700	1.2596	1.2577	1.2487	1.2487	1.2470	1.2522	1.2577	1.2616	1.2657	(40)
HLP (average)												1.2596	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3635 (42)
Hot water usage for mixer showers												
	63.8485	62.8890	61.4908	58.8156	56.8413	54.6397	53.3882	54.7759	56.2970	58.6609	61.3936	63.6039 (42a)
Hot water usage for baths												
	27.5802	27.1706	26.5938	25.5302	24.7339	23.8508	23.3739	23.9466	24.5703	25.5152	26.6006	27.4869 (42b)
Hot water usage for other uses												
	38.8350	37.4228	36.0107	34.5985	33.1863	31.7741	31.7741	33.1863	34.5985	36.0107	37.4228	38.8350 (42c)
Average daily hot water use (litres/day)												119.7419 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	130.2637	127.4824	124.0952	118.9443	114.7615	110.2646	108.5362	111.9088	115.4657	120.1867	125.4170	129.9258	(44)
Energy conte	206.3059	181.5332	190.7297	162.8288	154.4910	135.5832	131.2651	138.5665	142.3808	163.0922	178.6795	203.4325	(45)
Energy content (annual)										Total = Sum(45)m =		1988.8884	
Distribution loss (46)m = 0.15 x (45)m													
	30.9459	27.2300	28.6095	24.4243	23.1737	20.3375	19.6898	20.7850	21.3571	24.4638	26.8019	30.5149	(46)
Water storage loss:													
Store volume												210.0000	(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													
	264.5549	234.1452	248.9787	219.1988	212.7400	191.9532	189.5141	196.8155	198.7508	221.3412	235.0495	261.6815	(62)
WWHRS	-52.2854	-46.2417	-48.4216	-40.0950	-37.3671	-31.9753	-29.9717	-31.8719	-33.0829	-39.0011	-44.1835	-51.3172	(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													
	212.2694	187.9036	200.5571	179.1038	175.3729	159.9779	159.5424	164.9435	165.6679	182.3402	190.8660	210.3643	(64)
										Total per year (kWh/year) = Sum(64)m =		2188.9090	(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													
	115.1959	102.4494	110.0168	99.2366	97.9675	90.1774	90.2449	92.6725	92.4376	100.8274	104.5069	114.2405	(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	141.8125	141.8125	141.8125	141.8125	141.8125	141.8125	141.8125	141.8125	141.8125	141.8125	141.8125	141.8125	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	29.0741	25.8233	21.0009	15.8991	11.8847	10.0336	10.8417	14.0924	18.9148	24.0167	28.0310	29.8821	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	311.8188	315.0545	306.9007	289.5420	267.6299	247.0356	233.2773	230.0416	238.1955	255.5541	277.4662	298.0606	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	51.5448	51.5448	51.5448	51.5448	51.5448	51.5448	51.5448	51.5448	51.5448	51.5448	51.5448	51.5448	(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)													
	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	(71)
Water heating gains (Table 5)													
	154.8332	152.4545	147.8721	137.8286	131.6767	125.2464	121.2969	124.5599	128.3856	135.5206	145.1485	153.5491	(72)
Total internal gains													
	594.5417	592.1480	574.5893	542.0853	510.0070	481.1312	464.2314	467.5095	484.3114	513.9070	549.4614	580.3074	(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	3.6600	10.6334	0.7600	0.7000	0.7700	14.3482	(74)
East	1.2600	19.6403	0.7600	0.7000	0.7700	9.1235	(76)
South	1.6400	42.0754	0.7600	0.7000	1.0000	33.0389	(82)

Solar gains	56.5107	106.3072	169.8828	247.7432	308.8182	319.6496	302.7921	255.7026	196.8543	124.2973	69.5715	47.1121	(83)
Total gains	651.0524	698.4552	744.4721	789.8285	818.8252	800.7808	767.0235	723.2121	681.1657	638.2043	619.0329	627.4194	(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, ni1,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	20.3362	20.3721	20.4074	20.5750	20.6067	20.7553	20.7553	20.7831	20.6978	20.6067	20.5427	20.4763
alpha	2.3557	2.3581	2.3605	2.3717	2.3738	2.3837	2.3837	2.3855	2.3799	2.3738	2.3695	2.3651
util living area												
	0.9249	0.9087	0.8777	0.8199	0.7279	0.5980	0.4734	0.5111	0.6869	0.8359	0.9039	0.9304 (86)
Living	18.8472	19.0342	19.3868	19.8565	20.2945	20.6232	20.7703	20.7465	20.5012	19.9544	19.3259	18.8070
Non living	17.3651	17.6007	18.0429	18.6275	19.1504	19.5201	19.6593	19.6427	19.3982	18.7596	17.9781	17.3193

24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	19.8987	19.0342	19.3868	19.8565	20.2945	20.6232	20.7703	20.7465	20.5012	19.9544	19.3259	19.1138	(87)
Th 2	19.8609	19.8627	19.8644	19.8726	19.8741	19.8812	19.8812	19.8826	19.8785	19.8741	19.8710	19.8678	(88)
util rest of house													
	0.9146	0.8962	0.8602	0.7923	0.6827	0.5251	0.3727	0.4113	0.6213	0.8051	0.8886	0.9208	(89)
MIT 2	18.8659	17.6007	18.0429	18.6275	19.1504	19.5201	19.6593	19.6427	19.3982	18.7596	17.9781	17.7786	(90)
Living area fraction										fLA = Living area / (4) =		0.5436	(91)
MIT	19.4273	18.3799	18.7735	19.2956	19.7723	20.1197	20.2632	20.2427	19.9978	19.4091	18.7108	18.5044	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4273	18.3799	18.7735	19.2956	19.7723	20.1197	20.2632	20.2427	19.9978	19.4091	18.7108	18.5044	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9101	0.8760	0.8400	0.7760	0.6782	0.5418	0.4089	0.4454	0.6290	0.7901	0.8692	0.9066	(94)
Useful gains	592.5424	611.8603	625.3502	612.9212	555.3025	433.8235	313.6317	322.1495	428.4810	504.2603	538.0773	568.8432	(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													
	1448.0241	1288.0542	1170.7432	983.5379	762.5607	517.6934	343.5738	359.9252	554.6868	832.1596	1100.2384	1359.8797	(97)
Space heating kWh													
	636.4784	454.4023	405.7724	266.8440	154.2001	0.0000	0.0000	0.0000	0.0000	243.9570	404.7560	588.5311	(98a)
Space heating requirement - total per year (kWh/year)												3154.9413	
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													
	636.4784	454.4023	405.7724	266.8440	154.2001	0.0000	0.0000	0.0000	0.0000	243.9570	404.7560	588.5311	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3154.9413	
Space heating per m2											(98c) / (4) =	42.0043	(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 %)	350.7483	(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													
	636.4784	454.4023	405.7724	266.8440	154.2001	0.0000	0.0000	0.0000	0.0000	243.9570	404.7560	588.5311	(98)
Space heating efficiency (main heating system 1)													
	350.7483	350.7483	350.7483	350.7483	350.7483	0.0000	0.0000	0.0000	0.0000	350.7483	350.7483	350.7483	(210)
Space heating fuel (main heating system)													
	181.4630	129.5523	115.6876	76.0785	43.9632	0.0000	0.0000	0.0000	0.0000	69.5533	115.3979	167.7930	(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													
	212.2694	187.9036	200.5571	179.1038	175.3729	159.9779	159.5424	164.9435	165.6679	182.3402	190.8660	210.3643	(64)
Efficiency of water heater												178.4193	(216)
(217)m	178.4193	178.4193	178.4193	178.4193	178.4193	178.4193	178.4193	178.4193	178.4193	178.4193	178.4193	178.4193	(217)
Fuel for water heating, kWh/month													
	118.9723	105.3158	112.4078	100.3837	98.2926	89.6640	89.4199	92.4472	92.8532	102.1976	106.9761	117.9045	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	25.4484	20.4156	18.3820	13.4674	10.4026	8.4990	9.4896	12.3350	16.0219	21.0216	23.7439	26.1556	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-112.6398	-170.6384	-256.1652	-286.7162	-294.2866	-247.5650	-244.8814	-238.7768	-219.2948	-196.9415	-127.4877	-95.4620	(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	-12.5764	-38.3115	-99.7004	-190.2139	-294.9203	-331.7193	-326.7474	-260.6582	-171.8629	-70.1732	-21.0368	-9.3227	(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	899.4888	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	178.4193	
Water heating fuel used	1226.8345	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	0.0000	(231)
Electricity for lighting (calculated in Appendix L)	205.3828	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-4318.0985	(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	-1986.3923	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	899.4888	16.4900	148.3257	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1226.8345	16.4900	202.3050	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	205.3828	16.4900	33.8676	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-2490.8554	16.4900	-410.7421	
PV Unit electricity exported	-1827.2431	5.5900	-102.1429	
Total			-512.8849	(252)
Total energy cost			-128.3866	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	-0.3848 (257)
SAP value		106.2377
SAP rating (Section 12)		106 (258)
SAP band		A

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	899.4888	0.1544	138.9240	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1226.8345	0.1405	172.4090	(264)
Space and water heating			311.3330	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	205.3828	0.1443	29.6431	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-2490.8554	0.1352	-336.6835	
PV Unit electricity exported	-1827.2431	0.1192	-217.7840	
Total			-554.4676	(269)
Total CO2, kg/year			-213.4914	(272)
CO2 emissions per m2			-2.8400	(273)
EI value			102.3818	
EI rating			102	(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	75.1100	(1b) x	3.0600	(2b) =	229.8366	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	75.1100					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		229.8366	(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	2 * 10 =	20.0000 (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)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.0870 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		4.0000 (17)
Infiltration rate		0.2870 (18)
Number of sides sheltered		1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2655 (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													

	0.2854	0.2655	0.2655	0.2456	0.2456	0.2257	0.2323	0.2190	0.2190	0.2323	0.2323	0.2589	(22b)
Effective ac	0.5407	0.5352	0.5352	0.5302	0.5302	0.5255	0.5270	0.5240	0.5240	0.5270	0.5270	0.5335	(25)

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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)			4.9200	1.1450	5.6336			(27)
Door			2.1300	1.2000	2.5560			(26a)
Rooflight S			1.6400	1.2357	2.0266			(27a)
Exposed Floor			75.1100	0.1500	11.2665	20.0000	1502.2000	(28a)
External Facade	77.0700	7.0500	70.0200	0.1800	12.6036	60.0000	4201.2000	(29a)
Ceiling	15.4800		15.4800	0.1100	1.7028	9.0000	139.3200	(30)
Sloped Roof	69.7200	1.6400	68.0800	0.1200	8.1696	9.0000	612.7200	(30)
Total net area of external elements Aum(A, m2)			237.3800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.9587			(33)
Internal Wall - Timber			61.3800			9.0000	552.4200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7007.8600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		93.3013 (35)
Thermal bridges (User defined value 0.040 * total exposed area)		9.4952 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	53.4539 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	41.0121	40.5961	40.5961	40.2102	40.2102	39.8543	39.9696	39.7424	39.7424	39.9696	39.9696	40.4641	(38)
Heat transfer coeff	94.4660	94.0500	94.0500	93.6641	93.6641	93.3082	93.4235	93.1963	93.1963	93.4235	93.4235	93.9180	(39)
Average = Sum(39)m / 12 =												93.6486	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2577	1.2522	1.2522	1.2470	1.2470	1.2423	1.2438	1.2408	1.2408	1.2438	1.2438	1.2504	(40)
HLP (average)												1.2468	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.3635 (42)
Hot water usage for mixer showers	63.8485 62.8890 61.4908 58.8156 56.8413 54.6397 53.3882 54.7759 56.2970 58.6609 61.3936	63.6039 (42a)
Hot water usage for baths	27.5802 27.1706 26.5938 25.5302 24.7339 23.8508 23.3739 23.9466 24.5703 25.5152 26.6006	27.4869 (42b)
Hot water usage for other uses	38.8350 37.4228 36.0107 34.5985 33.1863 31.7741 31.7741 33.1863 34.5985 36.0107 37.4228	38.8350 (42c)
Average daily hot water use (litres/day)		119.7419 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	130.2637	127.4824	124.0952	118.9443	114.7615	110.2646	108.5362	111.9088	115.4657	120.1867	125.4170	129.9258	(44)
Energy conte	206.3059	181.5332	190.7297	162.8288	154.4910	135.5832	131.2651	138.5665	142.3808	163.0922	178.6795	203.4325	(45)
Energy content (annual)										Total = Sum(45)m =		1988.8884	
Distribution loss (46)m = 0.15 x (45)m	30.9459	27.2300	28.6095	24.4243	23.1737	20.3375	19.6898	20.7850	21.3571	24.4638	26.8019	30.5149	(46)
Water storage loss:													
Store volume												210.0000	(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	264.5549	234.1452	248.9787	219.1988	212.7400	191.9532	189.5141	196.8155	198.7508	221.3412	235.0495	261.6815	(62)
WWHRS	-52.2854	-46.2417	-48.4216	-40.0950	-37.3671	-31.9753	-29.9717	-31.8719	-33.0829	-39.0011	-44.1835	-51.3172	(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	212.2694	187.9036	200.5571	179.1038	175.3729	159.9779	159.5424	164.9435	165.6679	182.3402	190.8660	210.3643	(64)
									Total per year (kWh/year) = Sum(64)m =			2188.9090	(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	115.1959	102.4494	110.0168	99.2366	97.9675	90.1774	90.2449	92.6725	92.4376	100.8274	104.5069	114.2405	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	141.8125	141.8125	141.8125	141.8125	141.8125	141.8125	141.8125	141.8125	141.8125	141.8125	141.8125	141.8125	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.0741	25.8233	21.0009	15.8991	11.8847	10.0336	10.8417	14.0924	18.9148	24.0167	28.0310	29.8821	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	311.8188	315.0545	306.9007	289.5420	267.6299	247.0356	233.2773	230.0416	238.1955	255.5541	277.4662	298.0606	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.5448	51.5448	51.5448	51.5448	51.5448	51.5448	51.5448	51.5448	51.5448	51.5448	51.5448	51.5448	(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)	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	(71)
Water heating gains (Table 5)	154.8332	152.4545	147.8721	137.8286	131.6767	125.2464	121.2969	124.5599	128.3856	135.5206	145.1485	153.5491	(72)
Total internal gains	594.5417	592.1480	574.5893	542.0853	510.0070	481.1312	464.2314	467.5095	484.3114	513.9070	549.4614	580.3074	(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	3.6600	12.7500	0.7600	0.7000	0.7700	17.2042	(74)
East	1.2600	23.7835	0.7600	0.7000	0.7700	11.0482	(76)
South	1.6400	50.1591	0.7600	0.7000	1.0000	39.3865	(82)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	67.6390	111.5456	175.9353	263.7795	317.3488	349.3257	329.1676	284.9654	218.0812	140.2078	82.1083	56.6639	(83)
Total gains	662.1807	703.6936	750.5246	805.8648	827.3557	830.4569	793.3991	752.4749	702.3926	654.1149	631.5696	636.9713	(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	20.6067	20.6978	20.6978	20.7831	20.7831	20.8623	20.8366	20.8874	20.8874	20.8366	20.8366	20.7269	
alpha	2.3738	2.3799	2.3799	2.3855	2.3855	2.3908	2.3891	2.3925	2.3925	2.3891	2.3891	2.3818	
util living area	0.9174	0.9012	0.8641	0.7985	0.6910	0.5319	0.3815	0.4169	0.6398	0.8120	0.8914	0.9229	(86)
Living	18.9867	19.1671	19.5430	19.9830	20.4118	20.7064	20.8223	20.8085	20.5894	20.0832	19.4776	18.9602	
Non living	17.5495	17.7782	18.2468	18.7873	19.2906	19.6045	19.7005	19.6947	19.4975	18.9219	18.1768	17.5207	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	19.9701	19.1671	19.5430	19.9830	20.4118	20.7064	20.8223	20.8085	20.5894	20.0832	19.4776	19.2455	(87)
Th 2	19.8741	19.8785	19.8785	19.8826	19.8826	19.8863	19.8851	19.8875	19.8875	19.8851	19.8851	19.8799	(88)
util rest of house	0.9060	0.8875	0.8443	0.7675	0.6392	0.4502	0.2710	0.3059	0.5661	0.7765	0.8739	0.9121	(89)
MIT 2	18.9474	17.7782	18.2468	18.7873	19.2906	19.6045	19.7005	19.6947	19.4975	18.9219	18.1768	17.9459	(90)
Living area fraction										fLA = Living area / (4) =		0.5436	(91)
MIT	19.5033	18.5332	18.9514	19.4373	19.9001	20.2035	20.3103	20.3002	20.0911	19.5532	18.8839	18.6524	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5033	18.5332	18.9514	19.4373	19.9001	20.2035	20.3103	20.3002	20.0911	19.5532	18.8839	18.6524	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9018	0.8674	0.8249	0.7535	0.6401	0.4748	0.3148	0.3489	0.5808	0.7642	0.8548	0.8977	(94)
Useful gains	597.1316	610.3953	619.1128	607.2235	529.6049	394.3268	249.7357	262.5631	407.9356	499.9060	539.8850	571.8148	(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	1388.9623	1235.1818	1105.2178	930.7680	693.1236	448.2058	262.5470	279.6053	502.4260	780.3833	1044.8410	1300.9853	(97)
Space heating kWh	589.1221	419.8565	361.6621	232.9520	121.6579	0.0000	0.0000	0.0000	0.0000	208.6751	363.5683	542.5029	(98a)
Space heating requirement - total per year (kWh/year)												2839.9969	
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	589.1221	419.8565	361.6621	232.9520	121.6579	0.0000	0.0000	0.0000	0.0000	208.6751	363.5683	542.5029	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2839.9969	
Space heating per m2											(98c) / (4) =	37.8112	(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 %) 350.0041 (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	589.1221	419.8565	361.6621	232.9520	121.6579	0.0000	0.0000	0.0000	0.0000	208.6751	363.5683	542.5029	(98)
Space heating efficiency (main heating system 1)	350.0041	350.0041	350.0041	350.0041	350.0041	0.0000	0.0000	0.0000	0.0000	350.0041	350.0041	350.0041	(210)
Space heating fuel (main heating system)	168.3186	119.9576	103.3308	66.5570	34.7590	0.0000	0.0000	0.0000	0.0000	59.6208	103.8755	154.9990	(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	212.2694	187.9036	200.5571	179.1038	175.3729	159.9779	159.5424	164.9435	165.6679	182.3402	190.8660	210.3643	(64)
Efficiency of water heater												178.5557	(216)
(217)m	178.5557	178.5557	178.5557	178.5557	178.5557	178.5557	178.5557	178.5557	178.5557	178.5557	178.5557	178.5557	(217)
Fuel for water heating, kWh/month	118.8813	105.2353	112.3219	100.3069	98.2175	89.5955	89.3516	92.3765	92.7822	102.1195	106.8944	117.8144	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	25.4484	20.4156	18.3820	13.4674	10.4026	8.4990	9.4896	12.3350	16.0219	21.0216	23.7439	26.1556	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-131.3752	-175.7812	-258.6828	-291.0142	-291.0428	-250.8385	-247.9733	-245.1711	-228.1862	-211.3566	-145.4269	-112.1734	(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	-17.8983	-42.1185	-106.6603	-211.8029	-308.8474	-376.8166	-367.9306	-306.0099	-201.0829	-87.7819	-29.0506	-13.4269	(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	811.4183	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	178.5557	
Water heating fuel used	1225.8969	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	0.0000	(231)
Electricity for lighting (calculated in Appendix L)	205.3828	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-4658.4492	(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	-2415.7512	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	811.4183	21.5100	174.5361	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1225.8969	21.5100	263.6904	(247)
Energy for instantaneous electric shower(s)	0.0000	21.5100	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	205.3828	21.5100	44.1778	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-2589.0222	21.5100	-556.8987	
PV Unit electricity exported	-2069.4270	5.5900	-115.6810	
Total			-672.5796	(252)
Total energy cost			-190.1753	(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	811.4183	0.1548	125.6031	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1225.8969	0.1405	172.2773	(264)
Space and water heating			297.8803	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	205.3828	0.1443	29.6431	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-2589.0222	0.1356	-351.0621	
PV Unit electricity exported	-2069.4270	0.1191	-246.4621	
Total			-597.5241	(269)
Total CO2, kg/year			-270.0007	(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	811.4183	1.5731	1276.4065	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1225.8969	1.5196	1862.8929	(278)
Space and water heating			3139.2994	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	205.3828	1.5338	315.0230	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-2589.0222	1.5012	-3886.6803	
PV Unit electricity exported	-2069.4270	0.4367	-903.6990	
Total			-4790.3793	(283)
Total Primary energy kWh/year			-1336.0568	(286)

SAP 10 EPC IMPROVEMENTS

New Build

Current energy efficiency rating:	A 106
Current environmental impact rating:	A 102

N	Solar water heating	Recommended
U	Solar photovoltaic panels	Already installed
V2	Wind turbine	Recommended

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.4	-£ 37	-38 kg (14.1%)
V2 Wind turbine	+ 23.0	-£ 598	-496 kg (161.1%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£37	0.51 kg/m²	A 108	A 103
Wind turbine	£598	6.60 kg/m²	A 131	A 108
Total Savings	£636	7.11 kg/m²		

Potential energy efficiency rating: A 131
Potential environmental impact rating: A 108

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	£482	£413	£69
Space heating	£175	£192	-£18
Water heating	£264	£177	£87
Lighting	£44	£44	£0
Generated (PV)	-£673	-£641	-£32
Generated (wind)	-£0	-£598	£598
Total cost of fuels	-£191	-£826	£635
Total cost of uses	-£190	-£826	£635
Delivered energy	-32 kWh/m²	-84 kWh/m²	52 kWh/m²
Carbon dioxide emissions	-0.3 tonnes	-0.8 tonnes	0.5 tonnes
CO2 emissions per m²	-4 kg/m²	-11 kg/m²	7 kg/m²
Primary energy	-18 kWh/m²	-79 kWh/m²	61 kWh/m²

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	75.1100	(1b)	x 3.0600	(2b) =	229.8366	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	75.1100					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		229.8366	(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	2 * 10 =	20.0000 (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)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.0870 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		4.0000 (17)
Infiltration rate		0.2870 (18)
Number of sides sheltered		1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2655 (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	0.3385	0.3319	0.3252	0.2920	0.2854	0.2522	0.2522	0.2456	0.2655	0.2854	0.2987	0.3120	(22b)
Effective ac	0.5573	0.5551	0.5529	0.5426	0.5407	0.5318	0.5318	0.5302	0.5352	0.5407	0.5446	0.5487	(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)			4.9200	1.1450	5.6336			(27)
Door			2.1300	1.2000	2.5560			(26a)
Rooflight S			1.6400	1.2357	2.0266			(27a)
Exposed Floor			75.1100	0.1500	11.2665	20.0000	1502.2000	(28a)
External Facade	77.0700	7.0500	70.0200	0.1800	12.6036	60.0000	4201.2000	(29a)
Ceiling	15.4800		15.4800	0.1100	1.7028	9.0000	139.3200	(30)
Sloped Roof	69.7200	1.6400	68.0800	0.1200	8.1696	9.0000	612.7200	(30)
Total net area of external elements Aum(A, m2)			237.3800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.9587			(33)
Internal Wall - Timber			61.3800			9.0000	552.4200	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 7007.8600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 93.3013 (35)
Thermal bridges (User defined value 0.040 * total exposed area) 9.4952 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 53.4539 (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	42.2684	42.0997	41.9343	41.1574	41.0121	40.3355	40.3355	40.2102	40.5961	41.0121	41.3061	41.6135	(38)
Heat transfer coeff	95.7223	95.5536	95.3882	94.6113	94.4660	93.7894	93.7894	93.6641	94.0500	94.4660	94.7600	95.0674	(39)
Average = Sum(39)m / 12 =												94.6106	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2744	1.2722	1.2700	1.2596	1.2577	1.2487	1.2487	1.2470	1.2522	1.2577	1.2616	1.2657	(40)
HLP (average)												1.2596	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3635 (42)

Hot water usage for mixer showers	63.8485	62.8890	61.4908	58.8156	56.8413	54.6397	53.3882	54.7759	56.2970	58.6609	61.3936	63.6039	(42a)
Hot water usage for baths	27.5802	27.1706	26.5938	25.5302	24.7339	23.8508	23.3739	23.9466	24.5703	25.5152	26.6006	27.4869	(42b)
Hot water usage for other uses	38.8350	37.4228	36.0107	34.5985	33.1863	31.7741	31.7741	33.1863	34.5985	36.0107	37.4228	38.8350	(42c)
Average daily hot water use (litres/day)												119.7419	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	130.2637	127.4824	124.0952	118.9443	114.7615	110.2646	108.5362	111.9088	115.4657	120.1867	125.4170	129.9258	(44)
Energy conte	206.3059	181.5332	190.7297	162.8288	154.4910	135.5832	131.2651	138.5665	142.3808	163.0922	178.6795	203.4325	(45)
Energy content (annual)										Total = Sum(45)m =		1988.8884	
Distribution loss (46)m = 0.15 x (45)m	30.9459	27.2300	28.6095	24.4243	23.1737	20.3375	19.6898	20.7850	21.3571	24.4638	26.8019	30.5149	(46)
Water storage loss:													
Store volume												210.0000	(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	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	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	264.5549	234.1452	247.5830	212.4452	199.9457	179.3465	176.4872	184.7190	193.3479	219.9455	235.0495	261.6815	(62)
WWHRS	-52.2854	-46.2417	-48.4216	-40.0950	-37.3671	-31.9753	-29.9717	-31.8719	-33.0829	-39.0011	-44.1835	-51.3172	(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)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												589.3273	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												589.3273	

Solar input	-0.0000	-16.2769	-56.4455	-76.2061	-97.5798	-89.9801	-89.5157	-79.1504	-55.7302	-28.4426	-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	212.2694	171.6267	142.7159	96.1441	64.9988	57.3911	56.9998	73.6966	104.5348	152.5018	190.8660	210.3643	(64)
									Total per year (kWh/year) = Sum(64)m =			1534.1093	(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	115.1959	102.4494	108.9002	93.8337	87.7320	80.0920	79.8233	82.9954	88.1153	99.7108	104.5069	114.2405	(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	141.8125	141.8125	141.8125	141.8125	141.8125	141.8125	141.8125	141.8125	141.8125	141.8125	141.8125	141.8125	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.0741	25.8233	21.0009	15.8991	11.8847	10.0336	10.8417	14.0924	18.9148	24.0167	28.0310	29.8821	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	311.8188	315.0545	306.9007	289.5420	267.6299	247.0356	233.2773	230.0416	238.1955	255.5541	277.4662	298.0606	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.5448	51.5448	51.5448	51.5448	51.5448	51.5448	51.5448	51.5448	51.5448	51.5448	51.5448	51.5448	(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)	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	(71)
Water heating gains (Table 5)	154.8332	152.4545	146.3713	130.3246	117.9194	111.2389	107.2894	111.5529	122.3824	134.0198	145.1485	153.5491	(72)
Total internal gains	594.5417	592.1480	573.0885	534.5813	496.2496	467.1237	450.2240	454.5026	478.3082	512.4062	549.4614	580.3074	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

		W/m2	or Table 6b	or Table 6c	Table 6d		
North		3.6600	10.6334	0.7600	0.7000	0.7700	14.3482 (74)
East		1.2600	19.6403	0.7600	0.7000	0.7700	9.1235 (76)
South		1.6400	42.0754	0.7600	0.7000	1.0000	33.0389 (82)

Solar gains	56.5107	106.3072	169.8828	247.7432	308.8182	319.6496	302.7921	255.7026	196.8543	124.2973	69.5715	47.1121	(83)
Total gains	651.0524	698.4552	742.9713	782.3245	805.0679	786.7733	753.0160	710.2051	675.1625	636.7035	619.0329	627.4194	(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	20.3362	20.3721	20.4074	20.5750	20.6067	20.7553	20.7553	20.7831	20.6978	20.6067	20.5427	20.4763	
alpha	2.3557	2.3581	2.3605	2.3717	2.3738	2.3837	2.3837	2.3855	2.3799	2.3738	2.3695	2.3651	
util living area	0.9249	0.9087	0.8782	0.8225	0.7337	0.6047	0.4801	0.5179	0.6901	0.8365	0.9039	0.9304	(86)
Living	18.8472	19.0342	19.3847	19.8480	20.2834	20.6169	20.7671	20.7427	20.4972	19.9526	19.3259	18.8070	
Non living	17.3651	17.6007	18.0405	18.6176	19.1387	19.5145	19.6573	19.6402	19.3943	18.7576	17.9781	17.3193	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	19.8987	19.0342	19.3847	19.8480	20.2834	20.6169	20.7671	20.7427	20.4972	19.9526	19.3259	19.1138	(87)
Th 2	19.8609	19.8627	19.8644	19.8726	19.8741	19.8812	19.8812	19.8826	19.8785	19.8741	19.8710	19.8678	(88)
util rest of house	0.9146	0.8962	0.8606	0.7951	0.6888	0.5317	0.3786	0.4175	0.6247	0.8057	0.8886	0.9208	(89)
MIT 2	18.8659	17.6007	18.0405	18.6176	19.1387	19.5145	19.6573	19.6402	19.3943	18.7576	17.9781	17.7786	(90)
Living area fraction										fLA = Living area / (4) =		0.5436	(91)
MIT	19.4273	18.3799	18.7712	19.2865	19.7610	20.1137	20.2606	20.2395	19.9938	19.4072	18.7108	18.5044	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4273	18.3799	18.7712	19.2865	19.7610	20.1137	20.2606	20.2395	19.9938	19.4072	18.7108	18.5044	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9101	0.8760	0.8404	0.7787	0.6838	0.5480	0.4149	0.4516	0.6321	0.7908	0.8692	0.9066	(94)
Useful gains	592.5424	611.8603	624.4279	609.1780	550.4893	431.1720	312.4314	320.7275	426.7783	503.4779	538.0773	568.8432	(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	1448.0241	1288.0542	1170.5283	982.6780	761.4864	517.1302	343.3239	359.6277	554.3132	831.9793	1100.2384	1359.8797	(97)
Space heating kWh	636.4784	454.4023	406.2987	268.9200	156.9819	0.0000	0.0000	0.0000	0.0000	244.4051	404.7560	588.5311	(98a)
Space heating requirement - total per year (kWh/year)												3160.7735	
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	636.4784	454.4023	406.2987	268.9200	156.9819	0.0000	0.0000	0.0000	0.0000	244.4051	404.7560	588.5311	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3160.7735	
Space heating per m2										(98c) / (4) =		42.0819	(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 %)	350.7483 (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	636.4784	454.4023	406.2987	268.9200	156.9819	0.0000	0.0000	0.0000	0.0000	244.4051	404.7560	588.5311	(98)
Space heating efficiency (main heating system 1)	350.7483	350.7483	350.7483	350.7483	350.7483	0.0000	0.0000	0.0000	0.0000	350.7483	350.7483	350.7483	(210)
Space heating fuel (main heating system)	181.4630	129.5523	115.8377	76.6704	44.7563	0.0000	0.0000	0.0000	0.0000	69.6811	115.3979	167.7930	(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	212.2694	171.6267	142.7159	96.1441	64.9988	57.3911	56.9998	73.6966	104.5348	152.5018	190.8660	210.3643	(64)
Efficiency of water heater												178.4193	(216)
(217)m	178.4193	178.4193	178.4193	178.4193	178.4193	178.4193	178.4193	178.4193	178.4193	178.4193	178.4193	178.4193	(217)
Fuel for water heating, kWh/month	118.9723	96.1929	79.9891	53.8866	36.4304	32.1664	31.9471	41.3053	58.5894	85.4738	106.9761	117.9045	(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	6.7945	6.1370	6.7945	6.5753	6.7945	6.5753	6.7945	6.7945	6.5753	6.7945	6.5753	6.7945	(231)
Lighting	25.4484	20.4156	18.3820	13.4674	10.4026	8.4990	9.4896	12.3350	16.0219	21.0216	23.7439	26.1556	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-112.7713	-170.4354	-251.8689	-272.6986	-262.9847	-209.2767	-206.8759	-211.0313	-207.3568	-195.5252	-127.7456	-95.5644	(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	-12.4449	-38.5145	-103.9967	-204.2315	-326.2223	-370.0076	-364.7529	-288.4036	-183.8009	-71.5895	-20.7789	-9.2203	(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	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	901.1516	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	178.4193	
Water heating fuel used	859.8339	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
pump for solar water heating	80.0000	(230g)
Total electricity for the above, kWh/year	80.0000	(231)
Electricity for lighting (calculated in Appendix L)	205.3828	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-4318.0985	(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	-5847.2709	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	901.1516	16.4900	148.5999	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	859.8339	16.4900	141.7866	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Pump for solar water heating	80.0000	16.4900	13.1920	(249)
Energy for lighting	205.3828	16.4900	33.8676	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-2324.1349	16.4900	-383.2498	
PV Unit electricity exported	-1993.9636	5.5900	-111.4626	
Total			-494.7124	(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			-629.9528	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600	(256)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	-1.8881	(257)
SAP value	130.6065	
SAP rating (Section 12)	131	(258)
SAP band	A	

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	901.1516	0.1544	139.1537	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	859.8339	0.1462	125.7127	(264)
Space and water heating			264.8664	(265)
Pumps, fans and electric keep-hot	80.0000	0.1387	11.0970	(267)
Energy for lighting	205.3828	0.1443	29.6431	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-2324.1349	0.1361	-316.3647	
PV Unit electricity exported	-1993.9636	0.1185	-236.3116	
Total			-552.6763	(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			-743.0414	(272)
CO2 emissions per m2			-9.8900	(273)
EI value			108.2897	
EI rating			108	(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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		75.1100 (1b)	x	3.0600 (2b)	=	229.8366	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	75.1100						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	229.8366	(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	2 * 10 =	20.0000	(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)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.0870	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2870	(18)
Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2655	(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	0.2854	0.2655	0.2655	0.2456	0.2456	0.2257	0.2323	0.2190	0.2190	0.2323	0.2323	0.2589	(22b)
Effective ac	0.5407	0.5352	0.5352	0.5302	0.5302	0.5255	0.5270	0.5240	0.5240	0.5270	0.5270	0.5335	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Windows (Uw = 1.20)			4.9200	1.1450	5.6336			(27)
Door			2.1300	1.2000	2.5560			(26a)
Rooflight S			1.6400	1.2357	2.0266			(27a)
Exposed Floor			75.1100	0.1500	11.2665	20.0000	1502.2000	(28a)
External Facade	77.0700	7.0500	70.0200	0.1800	12.6036	60.0000	4201.2000	(29a)
Ceiling	15.4800		15.4800	0.1100	1.7028	9.0000	139.3200	(30)
Sloped Roof	69.7200	1.6400	68.0800	0.1200	8.1696	9.0000	612.7200	(30)
Total net area of external elements Aum(A, m2)			237.3800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		43.9587			(33)
Internal Wall - Timber			61.3800			9.0000	552.4200	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		7007.8600	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							93.3013	(35)
Thermal bridges (User defined value 0.040 * total exposed area)							9.4952	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		53.4539	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	41.0121	40.5961	40.5961	40.2102	40.2102	39.8543	39.9696	39.7424	39.7424	39.9696	39.9696	40.4641	(38)
Heat transfer coeff	94.4660	94.0500	94.0500	93.6641	93.6641	93.3082	93.4235	93.1963	93.1963	93.4235	93.4235	93.9180	(39)
Average = Sum(39)m / 12 =												93.6486	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2577	1.2522	1.2522	1.2470	1.2470	1.2423	1.2438	1.2408	1.2408	1.2438	1.2438	1.2504	(40)
HLP (average)												1.2468	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3635	(42)
Hot water usage for mixer showers	63.8485	62.8890	61.4908	58.8156	56.8413	54.6397	53.3882	54.7759	56.2970	58.6609	61.3936	63.6039	(42a)
Hot water usage for baths	27.5802	27.1706	26.5938	25.5302	24.7339	23.8508	23.3739	23.9466	24.5703	25.5152	26.6006	27.4869	(42b)
Hot water usage for other uses	38.8350	37.4228	36.0107	34.5985	33.1863	31.7741	31.7741	33.1863	34.5985	36.0107	37.4228	38.8350	(42c)
Average daily hot water use (litres/day)												119.7419	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	130.2637	127.4824	124.0952	118.9443	114.7615	110.2646	108.5362	111.9088	115.4657	120.1867	125.4170	129.9258	(44)
Energy conte	206.3059	181.5332	190.7297	162.8288	154.4910	135.5832	131.2651	138.5665	142.3808	163.0922	178.6795	203.4325	(45)
Energy content (annual)										Total = Sum(45)m =		1988.8884	
Distribution loss (46)m = 0.15 x (45)m	30.9459	27.2300	28.6095	24.4243	23.1737	20.3375	19.6898	20.7850	21.3571	24.4638	26.8019	30.5149	(46)
Water storage loss:													
Store volume												210.0000	(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	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	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	264.5549	234.1452	247.5830	212.4452	199.9457	179.3465	176.4872	184.7190	193.3479	219.9455	235.0495	261.6815	(62)
WWHRS	-52.2854	-46.2417	-48.4216	-40.0950	-37.3671	-31.9753	-29.9717	-31.8719	-33.0829	-39.0011	-44.1835	-51.3172	(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)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)

Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												655.1780	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												655.1780	
Solar input	-1.0262	-19.1141	-59.6427	-82.0801	-100.3302	-98.4760	-97.5697	-89.5421	-64.4311	-37.3558	-5.6102	-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													
	211.2433	168.7895	139.5186	90.2701	62.2484	48.8952	48.9458	63.3050	95.8339	143.5886	185.2558	210.3643	(64)
									Total per year (kWh/year) = Sum(64)m =			1468.2586	(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													
	115.1959	102.4494	108.9002	93.8337	87.7320	80.0920	79.8233	82.9954	88.1153	99.7108	104.5069	114.2405	(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	141.8125	141.8125	141.8125	141.8125	141.8125	141.8125	141.8125	141.8125	141.8125	141.8125	141.8125	141.8125	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	29.0741	25.8233	21.0009	15.8991	11.8847	10.0336	10.8417	14.0924	18.9148	24.0167	28.0310	29.8821	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	311.8188	315.0545	306.9007	289.5420	267.6299	247.0356	233.2773	230.0416	238.1955	255.5541	277.4662	298.0606	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	51.5448	51.5448	51.5448	51.5448	51.5448	51.5448	51.5448	51.5448	51.5448	51.5448	51.5448	51.5448	(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)													
	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	-94.5417	(71)
Water heating gains (Table 5)													
	154.8332	152.4545	146.3713	130.3246	117.9194	111.2389	107.2894	111.5529	122.3824	134.0198	145.1485	153.5491	(72)
Total internal gains													
	594.5417	592.1480	573.0885	534.5813	496.2496	467.1237	450.2240	454.5026	478.3082	512.4062	549.4614	580.3074	(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	3.6600	12.7500	0.7600	0.7000	0.7700	17.2042	(74)
East	1.2600	23.7835	0.7600	0.7000	0.7700	11.0482	(76)
South	1.6400	50.1591	0.7600	0.7000	1.0000	39.3865	(82)

Solar gains	67.6390	111.5456	175.9353	263.7795	317.3488	349.3257	329.1676	284.9654	218.0812	140.2078	82.1083	56.6639	(83)
Total gains	662.1807	703.6936	749.0238	798.3608	813.5984	816.4494	779.3916	739.4680	696.3894	652.6141	631.5696	636.9713	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	20.6067	20.6978	20.6978	20.7831	20.7831	20.8623	20.8366	20.8874	20.8874	20.8366	20.8366	20.7269	
alpha	2.3738	2.3799	2.3799	2.3855	2.3855	2.3908	2.3891	2.3925	2.3925	2.3891	2.3891	2.3818	
util living area													
	0.9174	0.9012	0.8646	0.8012	0.6969	0.5383	0.3873	0.4229	0.6430	0.8126	0.8914	0.9229	(86)
Living	18.9867	19.1671	19.5410	19.9752	20.4023	20.7019	20.8206	20.8065	20.5861	20.0816	19.4776	18.9602	
Non living	17.5495	17.7782	18.2444	18.7783	19.2809	19.6010	19.6997	19.6937	19.4945	18.9200	18.1768	17.5207	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	19.9701	19.1671	19.5410	19.9752	20.4023	20.7019	20.8206	20.8065	20.5861	20.0816	19.4776	19.2455	(87)
Th 2	19.8741	19.8785	19.8785	19.8826	19.8826	19.8863	19.8851	19.8875	19.8875	19.8851	19.8851	19.8799	(88)
util rest of house													
	0.9060	0.8875	0.8448	0.7705	0.6455	0.4563	0.2755	0.3107	0.5694	0.7772	0.8739	0.9121	(89)
MIT 2	18.9474	17.7782	18.2444	18.7783	19.2809	19.6010	19.6997	19.6937	19.4945	18.9200	18.1768	17.9459	(90)
Living area fraction									fLA = Living area / (4) =			0.5436	(91)
MIT	19.5033	18.5332	18.9492	19.4289	19.8905	20.1994	20.3090	20.2986	20.0879	19.5514	18.8839	18.6524	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5033	18.5332	18.9492	19.4289	19.8905	20.1994	20.3090	20.2986	20.0879	19.5514	18.8839	18.6524	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9018	0.8674	0.8254	0.7563	0.6459	0.4807	0.3197	0.3541	0.5838	0.7649	0.8548	0.8977	(94)
Useful gains	597.1316	610.3953	618.2361	603.7707	525.4984	392.5017	249.1774	261.8634	406.5734	499.1919	539.8850	571.8148	(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													
	1388.9623	1235.1818	1105.0155	929.9842	692.2239	447.8264	262.4291	279.4586	502.1335	780.2209	1044.8410	1300.9853	(97)
Space heating kWh													
	589.1221	419.8565	362.1639	234.8737	124.0438	0.0000	0.0000	0.0000	0.0000	209.0856	363.5683	542.5029	(98a)
Space heating requirement - total per year (kWh/year)												2845.2168	
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													

	589.1221	419.8565	362.1639	234.8737	124.0438	0.0000	0.0000	0.0000	209.0856	363.5683	542.5029	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)											2845.2168	
Space heating per m2										(98c) / (4) =	37.8807	(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 %)											350.0041	(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													
	589.1221	419.8565	362.1639	234.8737	124.0438	0.0000	0.0000	0.0000	0.0000	209.0856	363.5683	542.5029	(98)
Space heating efficiency (main heating system 1)													
	350.0041	350.0041	350.0041	350.0041	350.0041	0.0000	0.0000	0.0000	0.0000	350.0041	350.0041	350.0041	(210)
Space heating fuel (main heating system)													
	168.3186	119.9576	103.4742	67.1060	35.4407	0.0000	0.0000	0.0000	0.0000	59.7380	103.8755	154.9990	(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													
	211.2433	168.7895	139.5186	90.2701	62.2484	48.8952	48.9458	63.3050	95.8339	143.5886	185.2558	210.3643	(64)
Efficiency of water heater												178.5557	(216)
(217)m	178.5557	178.5557	178.5557	178.5557	178.5557	178.5557	178.5557	178.5557	178.5557	178.5557	178.5557	178.5557	(217)
Fuel for water heating, kWh/month													
	118.3066	94.5304	78.1373	50.5557	34.8622	27.3837	27.4120	35.4539	53.6717	80.4167	103.7524	117.8144	(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	6.7945	6.1370	6.7945	6.5753	6.7945	6.5753	6.7945	6.7945	6.5753	6.7945	6.5753	6.7945	(231)
Lighting	25.4484	20.4156	18.3820	13.4674	10.4026	8.4990	9.4896	12.3350	16.0219	21.0216	23.7439	26.1556	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-131.5488	-175.4341	-253.6638	-273.9473	-256.8670	-204.9739	-202.8919	-209.5787	-212.0965	-208.6468	-145.6159	-112.3228	(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	-17.7248	-42.4657	-111.6793	-228.8698	-343.0232	-422.6812	-413.0120	-341.6024	-217.1727	-90.4918	-28.8616	-13.2775	(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	812.9097	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	178.5557	
Water heating fuel used	822.2971	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
pump for solar water heating	80.0000	(230g)
Total electricity for the above, kWh/year	80.0000	(231)
Electricity for lighting (calculated in Appendix L)	205.3828	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-4658.4492	(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	-6313.4003	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	812.9097	21.5100	174.8569	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	822.2971	21.5100	176.8761	(247)
Energy for instantaneous electric shower(s)	0.0000	21.5100	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Pump for solar water heating	80.0000	21.5100	17.2080	(249)
Energy for lighting	205.3828	21.5100	44.1778	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-2387.5873	21.5100	-513.5700	
PV Unit electricity exported	-2270.8619	5.5900	-126.9412	
Total			-640.5112	(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			-825.7234	(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	812.9097	0.1548	125.8094	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	822.2971	0.1470	120.8497	(264)
Space and water heating			246.6592	(265)
Pumps, fans and electric keep-hot	80.0000	0.1387	11.0970	(267)
Energy for lighting	205.3828	0.1443	29.6431	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-2387.5873	0.1368	-326.5424	
PV Unit electricity exported	-2270.8619	0.1184	-268.7940	
Total			-595.3363	(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			-803.9087	(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	812.9097	1.5729	1278.6614	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	822.2971	1.5437	1269.3686	(278)
Space and water heating			2548.0300	(279)
Pumps, fans and electric keep-hot	80.0000	1.5128	121.0240	(281)
Energy for lighting	205.3828	1.5338	315.0230	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-2387.5873	1.5056	-3594.8005	
PV Unit electricity exported	-2270.8619	0.4339	-985.4258	
Total			-4580.2262	(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			-5932.5650	(286)