

Summary for Input Data



Property Reference	Flat E - 3 New Close			Issued on Date	30/05/2024
Assessment Reference	New Build	Prop Type Ref	New Build		
Property	Flat E. 3. New Close				

SAP Rating	76 C	DER	6.62	TER	13.64
Environmental	95 A	% DER < TER			51.47
CO ₂ Emissions (t/year)	0.35	DFEE	37.32	TFEE	37.49
Compliance Check	See BREL	% DFEE < TFEE			0.45
% DPER < TPER	4.78	DPER	68.49	TPER	71.93

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

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

Orientation	North	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, Semi-Detached	
Position of Flat	Top-floor flat	
Which Floor	3	
2.0 Number of Storeys	1	
3.0 Date Built	2024	
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 m ²	0.00 m
Ground floor:	34.72 m	62.00 m ²	2.40 m
1st Storey:	0.00 m	0.00 m ²	0.00 m
2nd Storey:	0.00 m	0.00 m ²	0.00 m
3rd Storey:	0.00 m	0.00 m ²	0.00 m
4th Storey:	0.00 m	0.00 m ²	0.00 m
5th Storey:	0.00 m	0.00 m ²	0.00 m
6th Storey:	0.00 m	0.00 m ²	0.00 m
7th Storey:	0.00 m	0.00 m ²	0.00 m

8.0 Living Area	27.40	m ²
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9.0 External Walls										
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area(m ²)	Nett Area (m ²)	Shelter Res	Shelter	Openings	Area Calculation Type
External Wall 1	Cavity Wall	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure	0.18	60.00	20.00	20.00	0.00	None	0.00	Enter Gross Area
Corridor Wall	Timber Frame	Timber framed wall (one layer of plasterboard)	0.18	9.00	6.60	4.85	0.90	Stairwell Access Corridor 4	1.75	Enter Gross Area
Dormer Wall	Timber Frame	Timber framed wall (one layer of plasterboard)	0.18	9.00	37.41	24.01	0.00	None	13.40	Enter Gross Area
Ashlar Wall	Timber Frame	Timber framed wall (one layer of plasterboard)	0.18	9.00	20.09	20.09	0.50	Room In Roof	0.00	Enter Gross Area

9.1 Party Walls									
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)	Shelter Res	Shelter		
Party Wall 1	Filled Cavity with Edge Sealing	Dense plaster both sides, dense blocks, cavity or cavity fill	0.00	180.00	8.03	0.00	None		

9.2 Internal Walls									
Description	Construction	Kappa (kJ/m ² K)	Area (m ²)						

Summary for Input Data

Internal Wall 1 Plasterboard on timber frame 9.00 110.30

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
Flat Roof	External Flat Roof	Plasterboard, insulated flat roof	0.14	9.00	50.40	50.40	None	0.00	Enter Gross Area	0.00
Sloped Roof	External Slope Roof	Plasterboard, insulated slope	0.15	9.00	11.60	6.98	None	0.00	Enter Gross Area	4.62

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Timber I-joists, carpeted	20.00	62.00

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	1.40
Door	Manufacturer	Solid Door			Air Filled	0.00	Wood	0.70	1.00
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 S	Windows	Dormer Wall	South	13.40	0
Door N	Door	Corridor Wall	North	1.75	0
Rooflight N	Rooflight	Sloped Roof	North	4.62	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)		9.05	0.00	0.00	No
E3 Sill		8.25	0.00	0.00	No
E4 Jamb		20.40	0.00	0.00	No
E7 Party floor between dwellings (in blocks of flats)		34.74	0.00	0.00	No
E14 Flat roof		17.64	0.00	0.00	No
E16 Corner (normal)		6.60	0.00	0.00	No
E18 Party wall between dwellings		4.80	0.00	0.00	No
E17 Corner (inverted – internal area greater than external area)		2.80	0.00	0.00	No

Y-value 0.04 W/m²K

Description Thermal Bridging

18.0 Pressure Testing

Yes

Designed AP₅₀ 4.50 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 1	95.00	12	1140	12

24.0 Main Heating 1

SAP table

Percentage of Heat 100.00 %

Database Ref. No. 0

Fuel Type Electricity

SAP Code 191

Summary for Input Data

In Winter	100.00
In Summer	100.00
Controls SAP Code	2110
Delayed Start Stat	Yes
HETAS approved System	No
Oil Pump Inside	No
Fan Assisted Flue	No
Is MHS Pumped	Pump in heated space
Heating Pump Age	2013 or later
Heat Emitter	Radiators
Boiler Interlock	Yes
Combi boiler type	No Combi

25.0 Main Heating 2	None
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26.0 Heat Networks	None
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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
Immersion Heater	Single
Summer Immersion	No
Cold Water Source	From mains
Bath Count	1
Supplementary Immersion	No
Immersion Only Heating Hot Water	No

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	80146
Brand Model	Recoup, Pipe HEX
Details	Year: 2019 + current Efficiency: 70.7 Utilisation factor: 0.972

29.0 Hot Water Cylinder	
Cylinder Stat	No
Cylinder In Heated Space	Yes
Independent Time Control	No
Insulation Type	Measured Loss
Cylinder Volume	120.00
Loss	1.00
In Airing Cupboard	No

L
kWh/day

31.0 Thermal Store	None
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32.0 Photovoltaic Unit	One Dwelling
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Summary for Input Data



Export Capable Meter?	Yes
Connected To Dwelling	Yes
Diverter	Yes
Battery Capacity [kWh]	0.00

PV Cells kWp	Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
1.00	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
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Recommendations

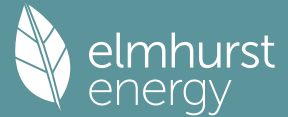
Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout



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

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	62.0000 (1b)	x 2.4000 (2b)	= 148.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 148.8000 (5)

2. Ventilation rate

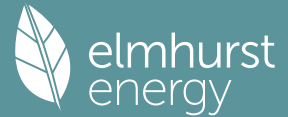
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.2016 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.5000 (17)
Infiltration rate	0.4266 (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) = 0.3946 (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	0.5031	0.4933	0.4834	0.4341	0.4242	0.3749	0.3749	0.3650	0.3946	0.4242	0.4439	0.4637 (22b)
Effective ac	0.6266	0.6217	0.6168	0.5942	0.5900	0.5703	0.5703	0.5666	0.5779	0.5900	0.5985	0.6075 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (U _w = 1.40)			13.4000	1.3258	17.7652		(27)
Door			1.7500	1.0000	1.7500		(26)
Rooflight N			4.6200	1.2357	5.7091		(27a)
External Wall 1	20.0000		20.0000	0.1800	3.6000	60.0000	1200.0000 (29a)
Corridor Wall	6.6000	1.7500	4.8500	0.1500	0.7275	9.0000	43.6500 (29a)
Dormer Wall	37.4100	13.4000	24.0100	0.1800	4.3218	9.0000	216.0900 (29a)
Ashlar Wall	20.0900		20.0900	0.1700	3.4153	9.0000	180.8100 (29a)
Flat Roof	50.4000		50.4000	0.1400	7.0560	9.0000	453.6000 (30)
Sloped Roof	11.6000	4.6200	6.9800	0.1500	1.0470	9.0000	62.8200 (30)
Total net area of external elements A _{um} (A, m ²)			146.1000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.3919		(33)
Party Wall 1			8.0300	0.0000	0.0000	180.0000	1445.4000 (32)
Party Floor 1			62.0000			30.0000	1860.0000 (32d)
Internal Wall 1			110.3000			9.0000	992.7000 (32c)
Heat capacity C _m = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		6455.0700 (34)
Thermal mass parameter (TMP = C _m / TFA) in kJ/m ² K							104.1140 (35)
Thermal bridges (User defined value 0.035 * total exposed area)							5.1135 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	50.5054 (37)

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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	30.7673	30.5259	30.2893	29.1782	28.9703	28.0025	28.0025	27.8233	28.3753	28.9703	29.3909	29.8305	(38)
Heat transfer coeff	81.2726	81.0313	80.7947	79.6836	79.4757	78.5079	78.5079	78.3287	78.8807	79.4757	79.8962	80.3359	(39)
Average = Sum(39)m / 12 =												79.6826	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.3108	1.3070	1.3031	1.2852	1.2819	1.2663	1.2663	1.2634	1.2723	1.2819	1.2886	1.2957	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.0376 (42)
Hot water usage for mixer showers													
58.3831	57.5057	56.2272	53.7810	51.9757	49.9625	48.8182	50.0871	51.4780	53.6395	56.1383	58.1594	(42a)	
Hot water usage for baths													
25.2299	24.8552	24.3275	23.3546	22.6261	21.8183	21.3820	21.9060	22.4765	23.3408	24.3338	25.1446	(42b)	
Hot water usage for other uses													
35.4969	34.2061	32.9153	31.6245	30.3337	29.0429	29.0429	30.3337	31.6245	32.9153	34.2061	35.4969	(42c)	
Average daily hot water use (litres/day)												109.4892	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
119.1099	116.5670	113.4700	108.7601	104.9355	100.8238	99.2431	102.3267	105.5789	109.8956	114.6781	118.8009	(44)	
Energy content (annual)	188.6409	165.9898	174.3992	148.8871	141.2634	123.9746	120.0260	126.7019	130.1894	149.1274	163.3800	186.0135	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1818.5931	
28.2961	24.8985	26.1599	22.3331	21.1895	18.5962	18.0039	19.0053	19.5284	22.3691	24.5070	27.9020	(46)	
Water storage loss:													
Store volume												120.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.0000	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.6000	(55)
Total storage loss													
18.6000	16.8000	18.6000	18.0000	18.6000	18.0000	18.6000	18.6000	18.6000	18.0000	18.6000	18.0000	18.6000	(56)
If cylinder contains dedicated solar storage													
18.6000	16.8000	18.6000	18.0000	18.6000	18.0000	18.6000	18.6000	18.6000	18.0000	18.6000	18.0000	18.6000	(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													
207.2409	182.7898	192.9992	166.8871	159.8634	141.9746	138.6260	145.3019	148.1894	167.7274	181.3800	204.6135	(62)	
WWHRS	-51.9889	-45.9794	-48.1470	-39.8676	-37.1552	-31.7940	-29.8018	-31.6912	-32.8953	-38.7799	-43.9329	-51.0262	(63a)
PV diverter	-4.0217	-8.8227	-18.2781	-28.7348	-39.0638	-39.7027	-39.1729	-32.3672	-22.9776	-12.8848	-5.4487	-3.1416	(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	151.2303	127.9877	126.5740	98.2846	83.6444	70.4780	69.6513	81.2435	92.3165	116.0626	131.9984	150.4457	(64)
12Total per year (kWh/year)												1299.9170	(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													
77.6031	68.6316	72.8677	63.9050	61.8501	55.6216	54.7886	57.0084	57.6880	64.4648	68.7239	76.7295	(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	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	89.7611	99.3783	89.7611	92.7531	89.7611	92.7531	89.7611	89.7611	92.7531	89.7611	92.7531	89.7611	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	177.9613	179.8080	175.1544	165.2475	152.7418	140.9882	133.1361	131.2894	135.9430	145.8499	158.3556	170.1092	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	(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)	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	(71)
Water heating gains (Table 5)	104.3052	102.1304	97.9405	88.7569	83.1318	77.2522	73.6406	76.6242	80.1222	86.6463	95.4498	103.1310	(72)
Total internal gains	428.5913	437.8804	419.4197	403.3212	382.1984	364.5572	350.1015	351.2383	362.3820	378.8210	403.1222	419.5650	(73)

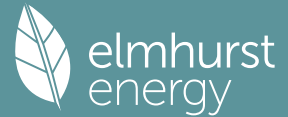
6. Solar gains

[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
South					13.4000	46.7521	0.7600	0.7000			0.7700			230.9673 (78)
North					4.6200	16.7973	0.7600	0.7000			1.0000			37.1566 (82)
Solar gains	268.1238	449.4571	612.7093	783.1936	919.2860	936.5052	892.5626	783.8284	668.7431	494.4933	319.4165			230.8035 (83)
Total gains	696.7152	887.3375	1032.1290	1186.5148	1301.4844	1301.0624	1242.6641	1135.0667	1031.1250	873.3142	722.5387			650.3685 (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	22.0625	22.1282	22.1930	22.5024	22.5613	22.8394	22.8394	22.8917	22.7315	22.5613	22.4425	22.3197
alpha	2.4708	2.4752	2.4795	2.5002	2.5041	2.5226	2.5226	2.5261	2.5154	2.5041	2.4962	2.4880
util living area												

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	0.8960	0.8331	0.7562	0.6371	0.4989	0.3639	0.2699	0.3053	0.4720	0.6947	0.8463	0.9086 (86)
MIT	18.7688	19.2767	19.8067	20.3607	20.7240	20.9105	20.9692	20.9574	20.8225	20.3244	19.4699	18.6791 (87)
Th 2	19.8323	19.8354	19.8384	19.8524	19.8551	19.8674	19.8674	19.8696	19.8626	19.8551	19.8497	19.8442 (88)
util rest of house												
	0.8818	0.8125	0.7278	0.5985	0.4502	0.3056	0.2034	0.2345	0.4076	0.6510	0.8236	0.8958 (89)
MIT 2	17.3012	17.9217	18.5600	19.2122	19.6099	19.8042	19.8522	19.8473	19.7269	19.1967	18.1833	17.1980 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	17.9498	18.5205	19.1110	19.7197	20.1023	20.2931	20.3459	20.3379	20.2111	19.6951	18.7519	17.8526 (91)
Temperature adjustment												-0.1500
adjusted MIT	17.7998	18.3705	18.9610	19.5697	19.9523	20.1431	20.1959	20.1879	20.0611	19.5451	18.6019	17.7026 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8502	0.7817	0.7037	0.5884	0.4545	0.3201	0.2230	0.2548	0.4193	0.6380	0.7937	0.8652	(94)
Useful gains	592.3284	693.5937	726.3006	698.0994	591.5422	416.5029	277.0849	289.2436	432.3291	557.1811	573.5146	562.7125	(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	1097.1639	1091.5348	1006.7797	850.2024	655.8551	435.1776	282.3027	296.7013	470.2133	710.9153	918.9568	1084.7407	(97)
Space heating kWh	375.5977	267.4164	208.6765	109.5142	47.8488	0.0000	0.0000	0.0000	0.0000	114.3782	248.7184	388.3890	(98a)
Space heating requirement - total per year (kWh/year)												1760.5391	
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	375.5977	267.4164	208.6765	109.5142	47.8488	0.0000	0.0000	0.0000	0.0000	114.3782	248.7184	388.3890	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1760.5391	
Space heating per m2										(98c) / (4) =		28.3958	(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 %)													100.0000 (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	375.5977	267.4164	208.6765	109.5142	47.8488	0.0000	0.0000	0.0000	0.0000	114.3782	248.7184	388.3890	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	375.5977	267.4164	208.6765	109.5142	47.8488	0.0000	0.0000	0.0000	0.0000	114.3782	248.7184	388.3890	(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	151.2303	127.9877	126.5740	98.2846	83.6444	70.4780	69.6513	81.2435	92.3165	116.0626	131.9984	150.4457	(64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)
Fuel for water heating, kWh/month	151.2303	127.9877	126.5740	98.2846	83.6444	70.4780	69.6513	81.2435	92.3165	116.0626	131.9984	150.4457	(217)
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	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822	(231)
Lighting	17.6273	14.1413	12.7327	9.3285	7.2056	5.8870	6.5732	8.5441	11.0979	14.5611	16.4467	18.1172	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-20.9318	-32.1745	-49.7973	-58.7238	-64.1283	-57.6905	-56.9369	-52.9075	-45.2909	-37.4546	-23.7516	-17.7991	(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	0.3571	0.1875	-1.0668	-4.7346	-10.3089	-14.0523	-13.8634	-11.0159	-7.4099	-1.6519	0.1009	0.3329	(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												1760.5391	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												100.0000	
Water heating fuel used												1299.9170	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
Total electricity for the above, kWh/year												41.0000	(231)
Electricity for lighting (calculated in Appendix L)												142.2627	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-580.7123	(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												2663.0064	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1760.5391	0.1558	274.3324 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1299.9170	0.1434	186.3796 (264)
Space and water heating			460.7120 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	142.2627	0.1443	20.5329 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-517.5869	0.1339	-69.3168
PV Unit electricity exported	-63.1254	0.1091	-6.8852
Total			-76.2020 (269)
Total CO2, kg/year			410.7301 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			6.6200 (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	1760.5391	1.5769	2776.1183 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1299.9170	1.5303	1989.2354 (278)
Space and water heating			4765.3537 (279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248 (281)
Energy for lighting	142.2627	1.5338	218.2072 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-517.5869	1.4949	-773.7595
PV Unit electricity exported	-63.1254	0.3993	-25.2035
Total			-798.9630 (283)
Total Primary energy kWh/year			4246.6227 (286)
Dwelling Primary energy Rate (DPER)			68.4900 (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	62.0000 (1b)	x 2.4000 (2b)	= 148.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 148.8000 (5)

2. Ventilation rate

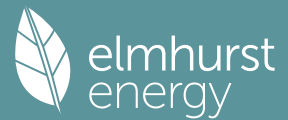
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1344 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3844 (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) = 0.3556 (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	0.4534	0.4445	0.4356	0.3911	0.3822	0.3378	0.3378	0.3289	0.3556	0.3822	0.4000	0.4178 (22b)
Effective ac	0.6028	0.5988	0.5949	0.5765	0.5731	0.5571	0.5571	0.5541	0.5632	0.5731	0.5800	0.5873 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			1.7500	1.0000	1.7500		(26)
TER Opening Type (Uw = 1.20)			10.2200	1.1450	11.7023		(27)
Rooflight N			3.5300	2.0221	7.1379		(27a)
External Wall 1	20.0000		20.0000	0.1800	3.6000		(29a)

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Corridor Wall	6.6000	1.7500	4.8500	0.1800	0.8730	(29a)
Dormer Wall	37.4100	10.2200	27.1900	0.1800	4.8942	(29a)
Ashlar Wall	20.0900		20.0900	0.1800	3.6162	(29a)
Flat Roof	50.4000		50.4000	0.1100	5.5440	(30)
Sloped Roof	11.6000	3.5300	8.0700	0.1100	0.8877	(30)
Total net area of external elements Aum(A, m2)			146.1000			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	40.0053		(33)
Party Wall 1			8.0300	0.0000	0.0000	(32)

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

List of Thermal Bridges 104.1140 (35)

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.0500	0.0500	0.4525
E3 Sill	8.2500	0.0500	0.4125
E4 Jamb	20.4000	0.0500	1.0200
E7 Party floor between dwellings (in blocks of flats)	34.7400	0.0700	2.4318
E14 Flat roof	17.6400	0.0800	1.4112
E16 Corner (normal)	6.6000	0.0900	0.5940
E18 Party wall between dwellings	4.8000	0.0600	0.2880
E17 Corner (inverted - internal area greater than external area)	2.8000	-0.0900	-0.2520

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.3580 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 46.3633 (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	29.5983	29.4024	29.2103	28.3081	28.1393	27.3536	27.3536	27.2081	27.6562	28.1393	28.4808	28.8378
Heat transfer coeff	75.9616	75.7656	75.5736	74.6714	74.5026	73.7168	73.7168	73.5713	74.0195	74.5026	74.8441	75.2011
Average = Sum(39)m / 12 =												74.6706

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2252	1.2220	1.2189	1.2044	1.2017	1.1890	1.1890	1.1866	1.1939	1.2017	1.2072	1.2129
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0376 (42)

Hot water usage for mixer showers 58.3831 57.5057 56.2272 53.7810 51.9757 49.9625 48.8182 50.0871 51.4780 53.6395 56.1383 58.1594 (42a)

Hot water usage for baths 25.2299 24.8552 24.3275 23.3546 22.6261 21.8183 21.3820 21.9060 22.4765 23.3408 24.3338 25.1446 (42b)

Hot water usage for other uses 35.4969 34.2061 32.9153 31.6245 30.3337 29.0429 29.0429 30.3337 31.6245 32.9153 34.2061 35.4969 (42c)

Average daily hot water use (litres/day) 109.4892 (43)

Daily hot water use 119.1099 116.5670 113.4700 108.7601 104.9355 100.8238 99.2431 102.3267 105.5789 109.8956 114.6781 118.8009 (44)

Energy conte 188.6409 165.9898 174.3992 148.8871 141.2634 123.9746 120.0260 126.7019 130.1894 149.1274 163.3800 186.0135 (45)

Energy content (annual) Total = Sum(45)m = 1818.5931

Distribution loss (46)m = 0.15 x (45)m 28.2961 24.8985 26.1599 22.3331 21.1895 18.5962 18.0039 19.0053 19.5284 22.3691 24.5070 27.9020 (46)

Water storage loss: 120.0000 (47)

Store volume 1.2247 (48)

a) If manufacturer declared loss factor is known (kWh/day): 0.5400 (49)

Temperature factor from Table 2b 0.6613 (55)

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

Total storage loss 20.5007 18.5168 20.5007 19.8394 20.5007 19.8394 20.5007 20.5007 19.8394 20.5007 19.8394 20.5007 (56)

If cylinder contains dedicated solar storage 20.5007 18.5168 20.5007 19.8394 20.5007 19.8394 20.5007 20.5007 19.8394 20.5007 19.8394 20.5007 (57)

Primary loss 23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 23.2624 22.5120 23.2624 22.5120 23.2624 23.2624 (59)

Combi loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (61)

Total heat required for water heating calculated for each month 232.4040 205.5178 218.1623 191.2385 185.0265 166.3260 163.7891 170.4650 172.5408 192.8905 205.7314 229.7766 (62)

WWHRS -26.6903 -23.6051 -24.7179 -20.4674 -19.0749 -16.3225 -15.2998 -16.2698 -16.8879 -19.9090 -22.5545 -26.1961 (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 205.7137 181.9126 193.4443 170.7711 165.9516 150.0034 148.4893 154.1952 155.6528 172.9815 183.1769 203.5805 (64)

12Total per year (kWh/year) Total per year (kWh/year) = Sum(64)m = 2085.8731 (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 97.7336 86.8140 92.9982 83.3861 81.9806 75.1027 74.9191 77.1389 77.1691 84.5953 88.2050 96.8600 (65)

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

Metabolic gains (Table 5), Watts 101.8790 101.8790 101.8790 101.8790 101.8790 101.8790 101.8790 101.8790 101.8790 101.8790 101.8790 101.8790 (66)

(66)m 89.7611 99.3783 89.7611 92.7531 89.7611 89.7611 89.7611 89.7611 92.7531 89.7611 92.7531 89.7611 (67)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 177.9613 179.8080 175.1544 165.2475 152.7418 140.9882 133.1361 131.2894 135.9430 145.8499 158.3556 170.1092 (68)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 33.1879 33.1879 33.1879 33.1879 33.1879 33.1879 33.1879 33.1879 33.1879 33.1879 33.1879 33.1879 (69)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 (70)

Pumps, fans 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 (70)

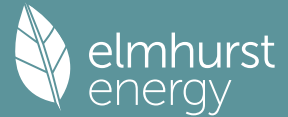
Losses e.g. evaporation (negative values) (Table 5) -81.5032 -81.5032 -81.5032 -81.5032 -81.5032 -81.5032 -81.5032 -81.5032 -81.5032 -81.5032 -81.5032 -81.5032 (71)

Water heating gains (Table 5) 131.3623 129.1875 124.9976 115.8140 110.1889 104.3093 100.6977 103.6813 107.1793 113.7034 122.5069 130.1881 (72)

Total internal gains 455.6484 464.9375 446.4768 430.3783 409.2555 391.6143 377.1586 378.2954 389.4391 405.8781 430.1793 446.6221 (73)

6. Solar gains

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[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
South	10.2200				46.7521	0.6300		0.7000		0.7700		146.0238 (78)
North	3.5300				16.7973	0.6300		0.7000		1.0000		23.5340 (82)
Solar gains	169.5577	284.2405	387.5214	495.4296	581.6007	592.5313	564.7136	495.8619	422.9870	312.7311	201.9960	145.9560 (83)
Total gains	625.2062	749.1780	833.9982	925.8079	990.8562	984.1456	941.8722	874.1573	812.4261	718.6092	632.1753	592.5781 (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	23.6050	23.6661	23.7262	24.0129	24.0673	24.3238	24.3238	24.3719	24.2244	24.0673	23.9575	23.8437
alpha	2.5737	2.5777	2.5817	2.6009	2.6045	2.6216	2.6216	2.6248	2.6150	2.6045	2.5972	2.5896
util living area	0.9108	0.8669	0.8108	0.7134	0.5849	0.4403	0.3303	0.3668	0.5434	0.7492	0.8709	0.9200 (86)
MIT	18.8117	19.2129	19.6838	20.2341	20.6427	20.8783	20.9579	20.9437	20.7809	20.2541	19.4578	18.7428 (87)
Th 2	19.8999	19.9024	19.9049	19.9165	19.9187	19.9288	19.9288	19.9307	19.9249	19.9187	19.9143	19.9097 (88)
util rest of house	0.8986	0.8498	0.7868	0.6784	0.5361	0.3768	0.2548	0.2884	0.4778	0.7100	0.8513	0.9089 (89)
MIT 2	17.3968	17.8921	18.4686	19.1297	19.5905	19.8392	19.9070	19.8996	19.7506	19.1737	18.2138	17.3173 (90)
Living area fraction	fLA = Living area / (4) = 0.4419 (91)											
MIT	18.0221	18.4758	19.0056	19.6178	20.0555	20.2984	20.3714	20.3610	20.2059	19.6512	18.7635	17.9473 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.0221	18.4758	19.0056	19.6178	20.0555	20.2984	20.3714	20.3610	20.2059	19.6512	18.7635	17.9473 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8720	0.8231	0.7642	0.6679	0.5426	0.3993	0.2866	0.3207	0.4958	0.6992	0.8263	0.8831 (94)
Useful gains	545.1906	616.6366	637.3807	618.3399	537.6522	392.9892	269.9228	280.3430	402.7851	502.4686	522.3640	523.3326 (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	1042.3525	1028.5785	945.0929	800.3103	622.5042	420.0702	278.0171	291.4185	451.9579	674.3351	872.9468	1033.8108 (97)
Space heating kWh	369.8884	276.8250	228.9379	131.0186	63.1299	0.0000	0.0000	0.0000	0.0000	127.8687	252.4196	379.7958 (98a)
Solar heating requirement - total per year (kWh/year)												1829.8840
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	369.8884	276.8250	228.9379	131.0186	63.1299	0.0000	0.0000	0.0000	0.0000	127.8687	252.4196	379.7958 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1829.8840
Space heating per m2	(98c) / (4) = 29.5143 (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)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	369.8884	276.8250	228.9379	131.0186	63.1299	0.0000	0.0000	0.0000	0.0000	127.8687	252.4196	379.7958 (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)	400.7459	299.9187	248.0367	141.9487	68.3965	0.0000	0.0000	0.0000	0.0000	138.5360	273.4773	411.4797 (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	205.7137	181.9126	193.4443	170.7711	165.9516	150.0034	148.4893	154.1952	155.6528	172.9815	183.1769	203.5805 (64)
Water heating requirement	85.3594	84.9985	84.4386	83.4729	82.0929	79.8000	79.8000	79.8000	79.8000	83.3923	84.7792	79.8000 (216)
Efficiency of water heater (217)m	85.3594	84.9985	84.4386	83.4729	82.0929	79.8000	79.8000	79.8000	79.8000	83.3923	84.7792	85.4374 (217)
Fuel for water heating, kWh/month	240.9970	214.0185	229.0948	204.5828	202.1511	187.9742	186.0768	193.2271	195.0537	207.4310	216.0636	238.2803 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
(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	18.6506	14.9622	13.4718	9.8700	7.6239	6.2288	6.9548	9.0401	11.7421	15.4063	17.4014	19.1689 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-21.1875	-30.8868	-45.8985	-53.4227	-59.1980	-55.8528	-55.1832	-51.3151	-44.7486	-36.1362	-23.6567	-18.2022 (233a)
(233a)m	-21.1875	-30.8868	-45.8985	-53.4227	-59.1980	-55.8528	-55.1832	-51.3151	-44.7486	-36.1362	-23.6567	-18.2022 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
(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)	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)
(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)	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)
(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)	-9.0725	-19.3548	-38.9669	-59.2526	-79.0484	-79.6654	-78.7138	-66.3150	-48.1808	-27.9031	-12.1867	-7.1534 (233b)
(233b)m	-9.0725	-19.3548	-38.9669	-59.2526	-79.0484	-79.6654	-78.7138	-66.3150	-48.1808	-27.9031	-12.1867	-7.1534 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
(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)	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)
(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)	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)
(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	1982.5395 (211)											
Space heating fuel - main system 1												

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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	2514.9510	(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)	150.5208	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1021.5018	(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	3712.5096	(238)

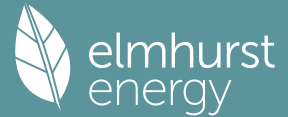
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1982.5395	0.2100	416.3333 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2514.9510	0.2100	528.1397 (264)
Space and water heating			944.4730 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	150.5208	0.1443	21.7248 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-495.6882	0.1339	-66.3594
PV Unit electricity exported	-525.8136	0.1255	-66.0105
Total			-132.3700 (269)
Total CO2, kg/year			845.7571 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.6400 (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	1982.5395	1.1300	2240.2697 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2514.9510	1.1300	2841.8947 (278)
Space and water heating			5082.1643 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	150.5208	1.5338	230.8738 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-495.6882	1.4947	-740.9214
PV Unit electricity exported	-525.8136	0.4608	-242.2954
Total			-983.2168 (283)
Total Primary energy kWh/year			4459.9221 (286)
Target Primary Energy Rate (TPER)			71.9300 (287)

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Property Reference	Flat E - 3 New Close				Issued on Date	30/05/2024	
Assessment Reference	New Build			Prop Type Ref	New Build		
Property	Flat E, 3, New Close						
SAP Rating	76 C		DER	6.62		TER	13.64
Environmental	95 A		% DER < TER				51.47
CO ₂ Emissions (t/year)	0.35		DFEE	37.32		TFEE	37.49
Compliance Check	See BREL		% DFEE < TFEE				0.45
% DPER < TPER	4.78		DPER	68.49		TPER	71.93
Assessor Details	Mr. Alexander Cotterill					Assessor ID	AV67-0001
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	62.0000 (1b)	2.4000 (2b)	148.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.0000		148.8000 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	148.8000 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1344 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.5000 (17)
Infiltration rate	0.3594 (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) = 0.3325 (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	0.4239	0.4156	0.4073	0.3657	0.3574	0.3158	0.3158	0.3075	0.3325	0.3574	0.3740	0.3906 (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	0.5898	0.5863	0.5829	0.5669	0.5639	0.5499	0.5499	0.5473	0.5553	0.5639	0.5699	0.5763 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.40)			13.4000	1.3258	17.7652		(27)
Door			1.7500	1.0000	1.7500		(26)
Rooflight N			4.6200	1.2357	5.7091		(27a)
External Wall 1	20.0000		20.0000	0.1800	3.6000	60.0000	1200.0000 (29a)
Corridor Wall	6.6000	1.7500	4.8500	0.1500	0.7275	9.0000	43.6500 (29a)
Dormer Wall	37.4100	13.4000	24.0100	0.1800	4.3218	9.0000	216.0900 (29a)
Ashlar Wall	20.0900		20.0900	0.1700	3.4153	9.0000	180.8100 (29a)
Flat Roof	50.4000		50.4000	0.1400	7.0560	9.0000	453.6000 (30)
Sloped Roof	11.6000	4.6200	6.9800	0.1500	1.0470	9.0000	62.8200 (30)
Total net area of external elements Aum(A, m ²)			146.1000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.3919		(33)
Party Wall 1			8.0300	0.0000	0.0000	180.0000	1445.4000 (32)
Party Floor 1			62.0000			30.0000	1860.0000 (32d)
Internal Wall 1			110.3000			9.0000	992.7000 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		6455.0700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							104.1140 (35)
Thermal bridges (User defined value 0.035 * total exposed area)							5.1135 (36)

$$\begin{aligned} (36a) &= 0.0000 \\ (33) + (36) + (36a) &= 50.5054 \quad (37) \end{aligned}$$
[illegible]

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.0376 (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	25.2299	24.8552	24.3275	23.3546	22.6261	21.8183	21.3820	21.9060	22.4765	23.3408	24.3338	25.1446	(42b)
Hot water usage for other uses	35.4969	34.2061	32.9153	31.6245	30.3337	29.0429	29.0429	30.3337	31.6245	32.9153	34.2061	35.4969	(42c)
Average daily hot water use (litres/day)													55.6619 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	60.7267	59.0612	57.2428	54.9791	52.9598	50.8612	50.4249	52.2397	54.1010	56.2561	58.5398	60.6414	(44)
Distribution loss (46)m = 0.15 x (45)m	96.1763	84.1024	87.9800	75.2636	71.2941	62.5398	60.9845	64.6836	66.7119	76.3390	83.4007	94.9499	(45)
	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	81.7499	71.4871	74.7830	63.9741	60.6000	53.1588	51.8369	54.9811	56.7051	64.8882	70.8906	80.7074	(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	81.7499	71.4871	74.7830	63.9741	60.6000	53.1588	51.8369	54.9811	56.7051	64.8882	70.8906	80.7074	(64)
12Total per year (kWh/year)													(64)
Electric shower(s)	46.7551	41.6592	45.4903	43.4108	44.2254	42.1867	43.5930	44.2254	43.4108	45.4903	44.6349	46.7551	(64a)
													(64a)
Heat gains from water heating, kWh/month	32.1263	28.2866	30.0683	26.8462	26.2063	23.8364	23.8575	24.8016	25.0290	27.5946	28.8814	31.8656	(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	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	89.7611	99.3783	89.7611	92.7531	89.7611	92.7531	89.7611	89.7611	92.7531	89.7611	92.7531	89.7611 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	177.9613	179.8080	175.1544	165.2475	152.7418	140.9882	133.1361	131.2894	135.9430	145.8499	158.3556	170.1092 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879 (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)	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032 (71)
Water heating gains (Table 5)	43.1804	42.0931	40.4144	37.2864	35.2236	33.1061	32.0665	33.3355	34.7625	37.0895	40.1130	42.8301 (72)
Total internal gains	364.4665	374.8431	358.8936	348.8507	331.2901	320.4111	308.5273	307.9497	317.0222	326.2642	344.7854	356.2641 (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			
South				13.4000	46.7521	0.7600	0.7000	0.7700	230.9673 (78)			
North				4.6200	16.7973	0.7600	0.7000	1.0000	37.1566 (82)			
Solar gains	268.1238	449.4571	612.7093	783.1936	919.2860	936.5052	892.5626	783.8284	668.7431	494.4933	319.4165	230.8035 (84)
Total gains	632.5904	824.3002	971.6029	1132.0443	1250.5761	1256.9163	1201.0899	1091.7780	985.7653	820.7574	664.2019	587.0676 (83)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, T_{hl} (°C)												21.0000 (85)
Utilisation factor for gains for living area, $n_{l,m}$ (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
τ_{au}	22.5633	22.6120	22.6600	22.8881	22.9313	23.1345	23.1345	23.1726	23.0558	22.9313	22.8441	22.7536
α	2.5042	2.5075	2.5107	2.5259	2.5288	2.5423	2.5423	2.5448	2.5371	2.5288	2.5229	2.5169
util living area												
	0.9116	0.8492	0.7718	0.6504	0.5090	0.3713	0.2756	0.3131	0.4844	0.7133	0.8646	0.9238 (86)

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MIT	18.6940	19.2263	19.7765	20.3457	20.7196	20.9089	20.9688	20.9562	20.8166	20.2954	19.4039	18.5900 (87)
Th 2	19.8552	19.8573	19.8595	19.8695	19.8714	19.8801	19.8801	19.8818	19.8767	19.8714	19.8676	19.8636 (88)
util rest of house												
	0.8991	0.8301	0.7446	0.6125	0.4605	0.3127	0.2084	0.2414	0.4197	0.6709	0.8439	0.9128 (89)
MIT 2	17.8045	18.3140	18.8325	19.3563	19.6762	19.8298	19.8681	19.8637	19.7667	19.3321	18.5036	17.7099 (90)
Living area fraction									fLA = Living area /	(4) =		0.4419 (91)
MIT	18.1976	18.7172	19.2496	19.7936	20.1373	20.3067	20.3545	20.3465	20.2307	19.7578	18.9015	18.0989 (92)
Temperature adjustment												0.0000
adjusted MIT	18.1976	18.7172	19.2496	19.7936	20.1373	20.3067	20.3545	20.3465	20.2307	19.7578	18.9015	18.0989 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8767	0.8079	0.7285	0.6098	0.4723	0.3355	0.2372	0.2717	0.4408	0.6662	0.8229	0.8913	(94)
Useful gains	554.5760	665.9124	707.7954	690.2742	590.6493	421.6459	284.9583	296.6865	434.5656	546.8141	546.5517	523.2555	(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													
	1104.4250	1095.6660	1008.8727	853.4125	659.7424	442.3040	290.9980	305.3774	476.7892	716.0823	926.3177	1095.2832	(97)
Space heating kWh													
	409.0876	288.7944	224.0015	117.4596	51.4052	0.0000	0.0000	0.0000	0.0000	125.9355	273.4315	425.5886	(98a)
Space heating requirement - total per year (kWh/year)												1915.7040	
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													
	409.0876	288.7944	224.0015	117.4596	51.4052	0.0000	0.0000	0.0000	0.0000	125.9355	273.4315	425.5886	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1915.7040	
Space heating per m2												30.8985	(99)
											(98c) / (4) =		

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	728.5602	573.5474	588.0820	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8948	0.9275	0.9100	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	651.8880	531.9377	535.1533	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1370.1144	1311.9300	1201.6530	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	517.1230	580.3143	495.8757	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area /	(4) =			(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	129.2808	145.0786	123.9689	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												398.3283	(107)
Energy for space heating												30.8985	(99)
Energy for space cooling												6.4246	(108)
Total												37.3231	(109)
Fabric Energy Efficiency (DFEE)												37.3	(109)

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

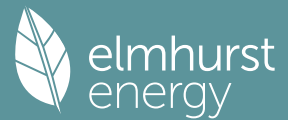
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	62.0000 (1b)	x	2.4000 (2b)	= 148.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.0000			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	148.8000 (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	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1344 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3844 (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) =	0.3556 (21)

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Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	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 infiltr rate													
	0.4534	0.4445	0.4356	0.3911	0.3822	0.3378	0.3378	0.3289	0.3556	0.3822	0.4000	0.4178	(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	0.6028	0.5988	0.5949	0.5765	0.5731	0.5571	0.5571	0.5541	0.5632	0.5731	0.5800	0.5873	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			1.7500	1.0000	1.7500		(26)
TER Opening Type (Uw = 1.20)			10.2200	1.1450	11.7023		(27)
Rooflight N			3.5300	2.0221	7.1379		(27a)
External Wall 1	20.0000		20.0000	0.1800	3.6000		(29a)
Corridor Wall	6.6000	1.7500	4.8500	0.1800	0.8730		(29a)
Dormer Wall	37.4100	10.2200	27.1900	0.1800	4.8942		(29a)
Ashlar Wall	20.0900		20.0900	0.1800	3.6162		(29a)
Flat Roof	50.4000		50.4000	0.1100	5.5440		(30)
Sloped Roof	11.6000	3.5300	8.0700	0.1100	0.8877		(30)
Total net area of external elements Aum(A, m2)			146.1000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.0053		(33)
Party Wall 1			8.0300	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							104.1140 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.0500	0.0500	0.4525
E3 Sill	8.2500	0.0500	0.4125
E4 Jamb	20.4000	0.0500	1.0200
E7 Party floor between dwellings (in blocks of flats)	34.7400	0.0700	2.4318
E14 Flat roof	17.6400	0.0800	1.4112
E16 Corner (normal)	6.6000	0.0900	0.5940
E18 Party wall between dwellings	4.8000	0.0600	0.2880
E17 Corner (inverted - internal area greater than external area)	2.8000	-0.0900	-0.2520
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			6.3580 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 46.3633 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	29.5983	29.4024	29.2103	28.3081	28.1393	27.3536	27.3536	27.2081	27.6562	28.1393	28.4808	28.8378	(38)
Average = Sum(39)m / 12 =	75.9616	75.7656	75.5736	74.6714	74.5026	73.7168	73.7168	73.5713	74.0195	74.5026	74.8441	75.2011	(39)
												74.6706	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.2252	1.2220	1.2189	1.2044	1.2017	1.1890	1.1890	1.1866	1.1939	1.2017	1.2072	1.2129	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

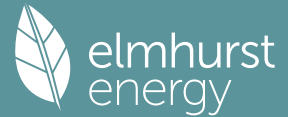
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.0376 (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	25.2299	24.8552	24.3275	23.3546	22.6261	21.8183	21.3820	21.9060	22.4765	23.3408	24.3338	25.1446	(42b)
Hot water usage for other uses	35.4969	34.2061	32.9153	31.6245	30.3337	29.0429	29.0429	30.3337	31.6245	32.9153	34.2061	35.4969	(42c)
Average daily hot water use (litres/day)													55.6619 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	60.7267	59.0612	57.2428	54.9791	52.9598	50.8612	50.4249	52.2397	54.1010	56.2561	58.5398	60.6414	(44)
Energy content (annual)	96.1763	84.1024	87.9800	75.2636	71.2941	62.5398	60.9845	64.6836	66.7119	76.3390	83.4007	94.9499	(45)
Distribution loss (46)m = 0.15 x (45)m													924.4260
Water 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	(46)
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	81.7499	71.4871	74.7830	63.9741	60.6000	53.1588	51.8369	54.9811	56.7051	64.8882	70.8906	80.7074	(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	81.7499	71.4871	74.7830	63.9741	60.6000	53.1588	51.8369	54.9811	56.7051	64.8882	70.8906	80.7074	(64)
12Total per year (kWh/year)													785.7621 (64)
Electric shower(s)	46.7551	41.6592	45.4903	43.4108	44.2254	42.1867	43.5930	44.2254	43.4108	45.4903	44.6349	46.7551	(64a)
Heat gains from water heating, kWh/month	32.1263	28.2866	30.0683	26.8462	26.2063	23.8364	23.8575	24.8016	25.0290	27.5946	28.8814	31.8656	(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	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	89.7611	99.3783	89.7611	92.7531	89.7611	92.7531	89.7611	89.7611	92.7531	89.7611	92.7531	89.7611	(67)

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Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	177.9613	179.8080	175.1544	165.2475	152.7418	140.9882	133.1361	131.2894	135.9430	145.8499	158.3556	170.1092 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879 (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)	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032 (71)
Water heating gains (Table 5)	43.1804	42.0931	40.4144	37.2864	35.2236	33.1061	32.0665	33.3355	34.7625	37.0895	40.1130	42.8301 (72)
Total internal gains	364.4665	374.8431	358.8936	348.8507	331.2901	320.4111	308.5273	307.9497	317.0222	326.2642	344.7854	356.2641 (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	
South				10.2200	46.7521	0.6300	0.7000		0.7700		146.0238 (78)	
North				3.5300	16.7973	0.6300	0.7000		1.0000		23.5340 (82)	
Solar gains	169.5577	284.2405	387.5214	495.4296	581.6007	592.5313	564.7136	495.8619	422.9870	312.7311	201.9960	145.9560 (83)
Total gains	534.0243	659.0836	746.4150	844.2804	912.8908	912.9424	873.2409	803.8116	740.0093	638.9953	546.7815	502.2201 (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	23.6050	23.6661	23.7262	24.0129	24.0673	24.3238	24.3238	24.3719	24.2244	24.0673	23.9575	23.8437
alpha	2.5737	2.5777	2.5817	2.6009	2.6045	2.6216	2.6216	2.6248	2.6150	2.6045	2.5972	2.5896
util living area	0.9346	0.8943	0.8417	0.7463	0.6174	0.4681	0.3535	0.3947	0.5803	0.7881	0.9010	0.9426 (86)
MIT	18.5915	19.0247	19.5334	20.1382	20.5922	20.8591	20.9505	20.9329	20.7429	20.1444	19.2754	18.5173 (87)
Th 2	19.8999	19.9024	19.9049	19.9165	19.9187	19.9288	19.9288	19.9307	19.9249	19.9187	19.9143	19.9097 (88)
util rest of house	0.9250	0.8798	0.8202	0.7128	0.5684	0.4021	0.2737	0.3117	0.5136	0.7518	0.8848	0.9342 (89)
MIT 2	17.7370	18.1577	18.6475	19.2207	19.6241	19.8473	19.9086	19.9015	19.7634	19.2441	18.4178	17.6714 (90)
Living area fraction	18.1146	18.5409	19.0390	19.6262	20.0519	20.2945	20.3690	20.3573	FLA = Living area / (4) =	19.6420	18.7968	18.0452 (91)
MIT	18.1146	18.5409	19.0390	19.6262	20.0519	20.2945	20.3690	20.3573	20.1963	19.6420	18.7968	18.0452 (92)
Temperature adjustment	18.1146	18.5409	19.0390	19.6262	20.0519	20.2945	20.3690	20.3573	20.1963	19.6420	18.7968	0.0000
adjusted MIT	18.1146	18.5409	19.0390	19.6262	20.0519	20.2945	20.3690	20.3573	20.1963	19.6420	18.7968	18.0452 (93)

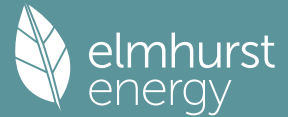
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9052	0.8580	0.8005	0.7030	0.5748	0.4253	0.3072	0.3457	0.5314	0.7414	0.8645	0.9155 (94)
Useful gains	483.3964	565.4844	597.4895	593.5291	524.7439	388.3111	268.2783	277.8952	393.2410	473.7304	472.6975	459.7667 (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	1049.3818	1033.5097	947.6174	800.9385	622.2415	419.7771	277.8409	291.1454	451.2448	673.6495	875.4365	1041.1757 (97)
Space heating kWh	421.0931	314.5130	260.4951	149.3347	72.5382	0.0000	0.0000	0.0000	0.0000	148.7398	289.9720	432.5683 (98a)
Space heating requirement - total per year (kWh/year)	2089.2543											
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	421.0931	314.5130	260.4951	149.3347	72.5382	0.0000	0.0000	0.0000	0.0000	148.7398	289.9720	432.5683 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2089.2543											
Space heating per m2	(98c) / (4) = 33.6977 (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	692.9383	545.5046	559.1421	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8382	0.8854	0.8630	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	580.8455	482.9693	482.5271	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	992.2302	950.9486	881.5103	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	296.1970	348.1766	296.8435	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	74.0493	87.0441	74.2109	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement	235.3043 (107)											
Energy for space heating	33.6977 (99)											
Energy for space cooling	3.7952 (108)											
Total	37.4929 (109)											
Fabric Energy Efficiency (TFEE)	37.5 (109)											

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Property Reference	Flat E - 3 New Close				Issued on Date	30/05/2024	
Assessment Reference	New Build			Prop Type Ref	New Build		
Property	Flat E, 3, New Close						
SAP Rating	76 C	DER	6.62	TER	13.64		
Environmental	95 A	% DER < TER				51.47	
CO ₂ Emissions (t/year)	0.35	DFEE	37.32	TFEE	37.49		
Compliance Check	See BREL	% DFEE < TFEE				0.45	
% DPER < TPER	4.78	DPER	68.49	TPER	71.93		
Assessor Details	Mr. Alexander Cotterill				Assessor ID	AV67-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	62.0000 (1b)	x 2.4000 (2b)	= 148.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 148.8000 (5)

2. Ventilation rate

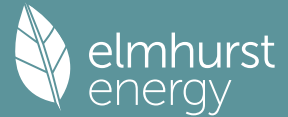
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.2016 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.5000 (17)
Infiltration rate	0.4266 (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) = 0.3946 (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	0.5031	0.4933	0.4834	0.4341	0.4242	0.3749	0.3749	0.3650	0.3946	0.4242	0.4439	0.4637 (22b)
Effective ac	0.6266	0.6217	0.6168	0.5942	0.5900	0.5703	0.5703	0.5666	0.5779	0.5900	0.5985	0.6075 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (U _w = 1.40)			13.4000	1.3258	17.7652		(27)
Door			1.7500	1.0000	1.7500		(26)
Rooflight N			4.6200	1.2357	5.7091		(27a)
External Wall 1	20.0000		20.0000	0.1800	3.6000	60.0000	1200.0000 (29a)
Corridor Wall	6.6000	1.7500	4.8500	0.1500	0.7275	9.0000	43.6500 (29a)
Dormer Wall	37.4100	13.4000	24.0100	0.1800	4.3218	9.0000	216.0900 (29a)
Ashlar Wall	20.0900		20.0900	0.1700	3.4153	9.0000	180.8100 (29a)
Flat Roof	50.4000		50.4000	0.1400	7.0560	9.0000	453.6000 (30)
Sloped Roof	11.6000	4.6200	6.9800	0.1500	1.0470	9.0000	62.8200 (30)
Total net area of external elements A _{um} (A, m ²)			146.1000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.3919		(33)
Party Wall 1			8.0300	0.0000	0.0000	180.0000	1445.4000 (32)
Party Floor 1			62.0000			30.0000	1860.0000 (32d)
Internal Wall 1			110.3000			9.0000	992.7000 (32c)
Heat capacity C _m = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		6455.0700 (34)
Thermal mass parameter (TMP = C _m / TFA) in kJ/m ² K							104.1140 (35)
Thermal bridges (User defined value 0.035 * total exposed area)							5.1135 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss					(33) + (36) + (36a) =		50.5054 (37)

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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	30.7673	30.5259	30.2893	29.1782	28.9703	28.0025	28.0025	27.8233	28.3753	28.9703	29.3909	29.8305	(38)
Heat transfer coeff	81.2726	81.0313	80.7947	79.6836	79.4757	78.5079	78.5079	78.3287	78.8807	79.4757	79.8962	80.3359	(39)
Average = Sum(39)m / 12 =												79.6826	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.3108	1.3070	1.3031	1.2852	1.2819	1.2663	1.2663	1.2634	1.2723	1.2819	1.2886	1.2957	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.0376 (42)
Hot water usage for mixer showers													
58.3831	57.5057	56.2272	53.7810	51.9757	49.9625	48.8182	50.0871	51.4780	53.6395	56.1383	58.1594	(42a)	
Hot water usage for baths													
25.2299	24.8552	24.3275	23.3546	22.6261	21.8183	21.3820	21.9060	22.4765	23.3408	24.3338	25.1446	(42b)	
Hot water usage for other uses													
35.4969	34.2061	32.9153	31.6245	30.3337	29.0429	29.0429	30.3337	31.6245	32.9153	34.2061	35.4969	(42c)	
Average daily hot water use (litres/day)												109.4892	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
119.1099	116.5670	113.4700	108.7601	104.9355	100.8238	99.2431	102.3267	105.5789	109.8956	114.6781	118.8009	(44)	
Energy content (annual)	188.6409	165.9898	174.3992	148.8871	141.2634	123.9746	120.0260	126.7019	130.1894	149.1274	163.3800	186.0135	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1818.5931	
28.2961	24.8985	26.1599	22.3331	21.1895	18.5962	18.0039	19.0053	19.5284	22.3691	24.5070	27.9020	(46)	
Water storage loss:													
Store volume												120.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.0000	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.6000	(55)
Total storage loss													
18.6000	16.8000	18.6000	18.0000	18.6000	18.0000	18.6000	18.6000	18.6000	18.0000	18.6000	18.0000	18.6000	(56)
If cylinder contains dedicated solar storage													
18.6000	16.8000	18.6000	18.0000	18.6000	18.0000	18.6000	18.6000	18.6000	18.0000	18.6000	18.0000	18.6000	(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													
207.2409	182.7898	192.9992	166.8871	159.8634	141.9746	138.6260	145.3019	148.1894	167.7274	181.3800	204.6135	(62)	
WWHRS	-51.9889	-45.9794	-48.1470	-39.8676	-37.1552	-31.7940	-29.8018	-31.6912	-32.8953	-38.7799	-43.9329	-51.0262	(63a)
PV diverter	-4.0217	-8.8227	-18.2781	-28.7348	-39.0638	-39.7027	-39.1729	-32.3672	-22.9776	-12.8848	-5.4487	-3.1416	(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	151.2303	127.9877	126.5740	98.2846	83.6444	70.4780	69.6513	81.2435	92.3165	116.0626	131.9984	150.4457	(64)
12Total per year (kWh/year)												1299.9170	(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													
77.6031	68.6316	72.8677	63.9050	61.8501	55.6216	54.7886	57.0084	57.6880	64.4648	68.7239	76.7295	(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	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	89.7611	99.3783	89.7611	92.7531	89.7611	92.7531	89.7611	89.7611	92.7531	89.7611	92.7531	89.7611	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	177.9613	179.8080	175.1544	165.2475	152.7418	140.9882	133.1361	131.2894	135.9430	145.8499	158.3556	170.1092	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	(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)	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	(71)
Water heating gains (Table 5)	104.3052	102.1304	97.9405	88.7569	83.1318	77.2522	73.6406	76.6242	80.1222	86.6463	95.4498	103.1310	(72)
Total internal gains	428.5913	437.8804	419.4197	403.3212	382.1984	364.5572	350.1015	351.2383	362.3820	378.8210	403.1222	419.5650	(73)

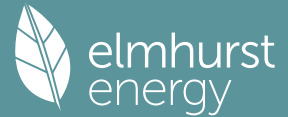
6. Solar gains

[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
South					13.4000	46.7521	0.7600	0.7000			0.7700			230.9673 (78)
North					4.6200	16.7973	0.7600	0.7000			1.0000			37.1566 (82)
Solar gains	268.1238	449.4571	612.7093	783.1936	919.2860	936.5052	892.5626	783.8284	668.7431	494.4933	319.4165			230.8035 (83)
Total gains	696.7152	887.3375	1032.1290	1186.5148	1301.4844	1301.0624	1242.6641	1135.0667	1031.1250	873.3142	722.5387			650.3685 (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	22.0625	22.1282	22.1930	22.5024	22.5613	22.8394	22.8394	22.8917	22.7315	22.5613	22.4425	22.3197
alpha	2.4708	2.4752	2.4795	2.5002	2.5041	2.5226	2.5226	2.5261	2.5154	2.5041	2.4962	2.4880
util living area												

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	0.8960	0.8331	0.7562	0.6371	0.4989	0.3639	0.2699	0.3053	0.4720	0.6947	0.8463	0.9086 (86)
MIT	18.7688	19.2767	19.8067	20.3607	20.7240	20.9105	20.9692	20.9574	20.8225	20.3244	19.4699	18.6791 (87)
Th 2	19.8323	19.8354	19.8384	19.8524	19.8551	19.8674	19.8674	19.8696	19.8626	19.8551	19.8497	19.8442 (88)
util rest of house												
	0.8818	0.8125	0.7278	0.5985	0.4502	0.3056	0.2034	0.2345	0.4076	0.6510	0.8236	0.8958 (89)
MIT 2	17.3012	17.9217	18.5600	19.2122	19.6099	19.8042	19.8522	19.8473	19.7269	19.1967	18.1833	17.1980 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	17.9498	18.5205	19.1110	19.7197	20.1023	20.2931	20.3459	20.3379	20.2111	19.6951	18.7519	17.8526 (91)
Temperature adjustment												-0.1500
adjusted MIT	17.7998	18.3705	18.9610	19.5697	19.9523	20.1431	20.1959	20.1879	20.0611	19.5451	18.6019	17.7026 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8502	0.7817	0.7037	0.5884	0.4545	0.3201	0.2230	0.2548	0.4193	0.6380	0.7937	0.8652	(94)
Useful gains	592.3284	693.5937	726.3006	698.0994	591.5422	416.5029	277.0849	289.2436	432.3291	557.1811	573.5146	562.7125	(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	1097.1639	1091.5348	1006.7797	850.2024	655.8551	435.1776	282.3027	296.7013	470.2133	710.9153	918.9568	1084.7407	(97)
Space heating kWh	375.5977	267.4164	208.6765	109.5142	47.8488	0.0000	0.0000	0.0000	0.0000	114.3782	248.7184	388.3890	(98a)
Space heating requirement - total per year (kWh/year)												1760.5391	
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	375.5977	267.4164	208.6765	109.5142	47.8488	0.0000	0.0000	0.0000	0.0000	114.3782	248.7184	388.3890	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1760.5391	
Space heating per m2										(98c) / (4) =		28.3958	(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 %)													100.0000 (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	375.5977	267.4164	208.6765	109.5142	47.8488	0.0000	0.0000	0.0000	0.0000	114.3782	248.7184	388.3890	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	375.5977	267.4164	208.6765	109.5142	47.8488	0.0000	0.0000	0.0000	0.0000	114.3782	248.7184	388.3890	(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	151.2303	127.9877	126.5740	98.2846	83.6444	70.4780	69.6513	81.2435	92.3165	116.0626	131.9984	150.4457	(64)
Efficiency of water heater	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)
Fuel for water heating, kWh/month	151.2303	127.9877	126.5740	98.2846	83.6444	70.4780	69.6513	81.2435	92.3165	116.0626	131.9984	150.4457	(217)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
(221)m	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822	(231)
Pumps and Fa	17.6273	14.1413	12.7327	9.3285	7.2056	5.8870	6.5732	8.5441	11.0979	14.5611	16.4467	18.1172	(232)
Lighting	-20.9318	-32.1745	-49.7973	-58.7238	-64.1283	-57.6905	-56.9369	-52.9075	-45.2909	-37.4546	-23.7516	-17.7991	(233a)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.3571	0.1875	-1.0668	-4.7346	-10.3089	-14.0523	-13.8634	-11.0159	-7.4099	-1.6519	0.1009	0.3329	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1760.5391	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												100.0000	
Water heating fuel used												1299.9170	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
Total electricity for the above, kWh/year												41.0000	(231)
Electricity for lighting (calculated in Appendix L)												142.2627	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-580.7123	(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												2663.0064	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1760.5391	0.1558	274.3324 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1299.9170	0.1434	186.3796 (264)
Space and water heating			460.7120 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	142.2627	0.1443	20.5329 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-517.5869	0.1339	-69.3168
PV Unit electricity exported	-63.1254	0.1091	-6.8852
Total			-76.2020 (269)
Total CO2, kg/year			410.7301 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			6.6200 (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	1760.5391	1.5769	2776.1183 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1299.9170	1.5303	1989.2354 (278)
Space and water heating			4765.3537 (279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248 (281)
Energy for lighting	142.2627	1.5338	218.2072 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-517.5869	1.4949	-773.7595
PV Unit electricity exported	-63.1254	0.3993	-25.2035
Total			-798.9630 (283)
Total Primary energy kWh/year			4246.6227 (286)
Dwelling Primary energy Rate (DPER)			68.4900 (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	62.0000 (1b)	x 2.4000 (2b)	= 148.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 148.8000 (5)

2. Ventilation rate

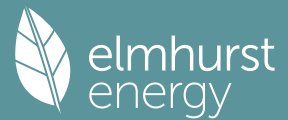
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1344 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3844 (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) = 0.3556 (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	0.4534	0.4445	0.4356	0.3911	0.3822	0.3378	0.3378	0.3289	0.3556	0.3822	0.4000	0.4178 (22b)
Effective ac	0.6028	0.5988	0.5949	0.5765	0.5731	0.5571	0.5571	0.5541	0.5632	0.5731	0.5800	0.5873 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			1.7500	1.0000	1.7500		(26)
TER Opening Type (Uw = 1.20)			10.2200	1.1450	11.7023		(27)
Rooflight N			3.5300	2.0221	7.1379		(27a)
External Wall 1	20.0000		20.0000	0.1800	3.6000		(29a)

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Corridor Wall	6.6000	1.7500	4.8500	0.1800	0.8730	(29a)
Dormer Wall	37.4100	10.2200	27.1900	0.1800	4.8942	(29a)
Ashlar Wall	20.0900		20.0900	0.1800	3.6162	(29a)
Flat Roof	50.4000		50.4000	0.1100	5.5440	(30)
Sloped Roof	11.6000	3.5300	8.0700	0.1100	0.8877	(30)
Total net area of external elements Aum(A, m2)			146.1000			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	40.0053		(33)
Party Wall 1			8.0300	0.0000	0.0000	(32)

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

List of Thermal Bridges 104.1140 (35)

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.0500	0.0500	0.4525
E3 Sill	8.2500	0.0500	0.4125
E4 Jamb	20.4000	0.0500	1.0200
E7 Party floor between dwellings (in blocks of flats)	34.7400	0.0700	2.4318
E14 Flat roof	17.6400	0.0800	1.4112
E16 Corner (normal)	6.6000	0.0900	0.5940
E18 Party wall between dwellings	4.8000	0.0600	0.2880
E17 Corner (inverted - internal area greater than external area)	2.8000	-0.0900	-0.2520

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.3580 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 46.3633 (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	29.5983	29.4024	29.2103	28.3081	28.1393	27.3536	27.3536	27.2081	27.6562	28.1393	28.4808	28.8378
Heat transfer coeff	75.9616	75.7656	75.5736	74.6714	74.5026	73.7168	73.7168	73.5713	74.0195	74.5026	74.8441	75.2011
Average = Sum(39)m / 12 =												74.6706

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2252	1.2220	1.2189	1.2044	1.2017	1.1890	1.1890	1.1866	1.1939	1.2017	1.2072	1.2129
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0376 (42)

Hot water usage for mixer showers 58.3831 57.5057 56.2272 53.7810 51.9757 49.9625 48.8182 50.0871 51.4780 53.6395 56.1383 58.1594 (42a)

Hot water usage for baths 25.2299 24.8552 24.3275 23.3546 22.6261 21.8183 21.3820 21.9060 22.4765 23.3408 24.3338 25.1446 (42b)

Hot water usage for other uses 35.4969 34.2061 32.9153 31.6245 30.3337 29.0429 29.0429 30.3337 31.6245 32.9153 34.2061 35.4969 (42c)

Average daily hot water use (litres/day) 109.4892 (43)

Daily hot water use 119.1099 116.5670 113.4700 108.7601 104.9355 100.8238 99.2431 102.3267 105.5789 109.8956 114.6781 118.8009 (44)

Energy conte 188.6409 165.9898 174.3992 148.8871 141.2634 123.9746 120.0260 126.7019 130.1894 149.1274 163.3800 186.0135 (45)

Energy content (annual) Total = Sum(45)m = 1818.5931

Distribution loss (46)m = 0.15 x (45)m 28.2961 24.8985 26.1599 22.3331 21.1895 18.5962 18.0039 19.0053 19.5284 22.3691 24.5070 27.9020 (46)

Water storage loss: 120.0000 (47)

Store volume 1.2247 (48)

a) If manufacturer declared loss factor is known (kWh/day): 0.5400 (49)

Temperature factor from Table 2b 0.6613 (55)

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

Total storage loss 20.5007 18.5168 20.5007 19.8394 20.5007 19.8394 20.5007 20.5007 19.8394 20.5007 19.8394 20.5007 (56)

If cylinder contains dedicated solar storage 20.5007 18.5168 20.5007 19.8394 20.5007 19.8394 20.5007 20.5007 19.8394 20.5007 19.8394 20.5007 (57)

Primary loss 23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 23.2624 22.5120 23.2624 22.5120 23.2624 23.2624 (59)

Combi loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (61)

Total heat required for water heating calculated for each month 232.4040 205.5178 218.1623 191.2385 185.0265 166.3260 163.7891 170.4650 172.5408 192.8905 205.7314 229.7766 (62)

WWHRS -26.6903 -23.6051 -24.7179 -20.4674 -19.0749 -16.3225 -15.2998 -16.2698 -16.8879 -19.9090 -22.5545 -26.1961 (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 205.7137 181.9126 193.4443 170.7711 165.9516 150.0034 148.4893 154.1952 155.6528 172.9815 183.1769 203.5805 (64)

12Total per year (kWh/year) Total per year (kWh/year) = Sum(64)m = 2085.8731 (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 97.7336 86.8140 92.9982 83.3861 81.9806 75.1027 74.9191 77.1389 77.1691 84.5953 88.2050 96.8600 (65)

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

Metabolic gains (Table 5), Watts 101.8790 101.8790 101.8790 101.8790 101.8790 101.8790 101.8790 101.8790 101.8790 101.8790 101.8790 101.8790 (66)

(66)m 89.7611 99.3783 89.7611 92.7531 89.7611 89.7611 89.7611 89.7611 92.7531 89.7611 92.7531 89.7611 (67)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 177.9613 179.8080 175.1544 165.2475 152.7418 140.9882 133.1361 131.2894 135.9430 145.8499 158.3556 170.1092 (68)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 33.1879 33.1879 33.1879 33.1879 33.1879 33.1879 33.1879 33.1879 33.1879 33.1879 33.1879 33.1879 (69)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 (70)

Pumps, fans -81.5032 -81.5032 -81.5032 -81.5032 -81.5032 -81.5032 -81.5032 -81.5032 -81.5032 -81.5032 -81.5032 -81.5032 (71)

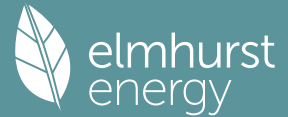
Losses e.g. evaporation (negative values) (Table 5) 131.3623 129.1875 124.9976 115.8140 110.1889 104.3093 100.6977 103.6813 107.1793 113.7034 122.5069 130.1881 (72)

Water heating gains (Table 5) 455.6484 464.9375 446.4768 430.3783 409.2555 391.6143 377.1586 378.2954 389.4391 405.8781 430.1793 446.6221 (73)

Total internal gains 455.6484 464.9375 446.4768 430.3783 409.2555 391.6143 377.1586 378.2954 389.4391 405.8781 430.1793 446.6221 (73)

6. Solar gains

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[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
South	10.2200				46.7521	0.6300		0.7000		0.7700		146.0238 (78)
North	3.5300				16.7973	0.6300		0.7000		1.0000		23.5340 (82)
Solar gains	169.5577	284.2405	387.5214	495.4296	581.6007	592.5313	564.7136	495.8619	422.9870	312.7311	201.9960	145.9560 (83)
Total gains	625.2062	749.1780	833.9982	925.8079	990.8562	984.1456	941.8722	874.1573	812.4261	718.6092	632.1753	592.5781 (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	23.6050	23.6661	23.7262	24.0129	24.0673	24.3238	24.3238	24.3719	24.2244	24.0673	23.9575	23.8437
alpha	2.5737	2.5777	2.5817	2.6009	2.6045	2.6216	2.6216	2.6248	2.6150	2.6045	2.5972	2.5896
util living area	0.9108	0.8669	0.8108	0.7134	0.5849	0.4403	0.3303	0.3668	0.5434	0.7492	0.8709	0.9200 (86)
MIT	18.8117	19.2129	19.6838	20.2341	20.6427	20.8783	20.9579	20.9437	20.7809	20.2541	19.4578	18.7428 (87)
Th 2	19.8999	19.9024	19.9049	19.9165	19.9187	19.9288	19.9288	19.9307	19.9249	19.9187	19.9143	19.9097 (88)
util rest of house	0.8986	0.8498	0.7868	0.6784	0.5361	0.3768	0.2548	0.2884	0.4778	0.7100	0.8513	0.9089 (89)
MIT 2	17.3968	17.8921	18.4686	19.1297	19.5905	19.8392	19.9070	19.8996	19.7506	19.1737	18.2138	17.3173 (90)
Living area fraction	fLA = Living area / (4) = 0.4419 (91)											
MIT	18.0221	18.4758	19.0056	19.6178	20.0555	20.2984	20.3714	20.3610	20.2059	19.6512	18.7635	17.9473 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.0221	18.4758	19.0056	19.6178	20.0555	20.2984	20.3714	20.3610	20.2059	19.6512	18.7635	17.9473 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8720	0.8231	0.7642	0.6679	0.5426	0.3993	0.2866	0.3207	0.4958	0.6992	0.8263	0.8831 (94)
Useful gains	545.1906	616.6366	637.3807	618.3399	537.6522	392.9892	269.9228	280.3430	402.7851	502.4686	522.3640	523.3326 (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	1042.3525	1028.5785	945.0929	800.3103	622.5042	420.0702	278.0171	291.4185	451.9579	674.3351	872.9468	1033.8108 (97)
Space heating kWh	369.8884	276.8250	228.9379	131.0186	63.1299	0.0000	0.0000	0.0000	0.0000	127.8687	252.4196	379.7958 (98a)
Space heating requirement - total per year (kWh/year)												1829.8840
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	369.8884	276.8250	228.9379	131.0186	63.1299	0.0000	0.0000	0.0000	0.0000	127.8687	252.4196	379.7958 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1829.8840
Space heating per m2	(98c) / (4) =											29.5143 (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)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	369.8884	276.8250	228.9379	131.0186	63.1299	0.0000	0.0000	0.0000	0.0000	127.8687	252.4196	379.7958 (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)	400.7459	299.9187	248.0367	141.9487	68.3965	0.0000	0.0000	0.0000	0.0000	138.5360	273.4773	411.4797 (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	205.7137	181.9126	193.4443	170.7711	165.9516	150.0034	148.4893	154.1952	155.6528	172.9815	183.1769	203.5805 (64)
Water heating requirement	85.3594	84.9985	84.4386	83.4729	82.0929	79.8000	79.8000	79.8000	79.8000	83.3923	84.7792	79.8000 (216)
Efficiency of water heater (217)m	240.9970	214.0185	229.0948	204.5828	202.1511	187.9742	186.0768	193.2271	195.0537	207.4310	216.0636	85.4374 (217)
Fuel for water heating, kWh/month												238.2803 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
(221)m	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)
Pumps and Fa	18.6506	14.9622	13.4718	9.8700	7.6239	6.2288	6.9548	9.0401	11.7421	15.4063	17.4014	19.1689 (232)
Lighting	Electricity generated by PVs (Appendix M) (negative quantity)											
Electricity generated by PVs (Appendix M) (negative quantity)	-21.1875	-30.8868	-45.8985	-53.4227	-59.1980	-55.8528	-55.1832	-51.3151	-44.7486	-36.1362	-23.6567	-18.2022 (233a)
(233a)m	Electricity generated by wind turbines (Appendix M) (negative quantity)											
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
(234a)m	Electricity generated by hydro-electric generators (Appendix M) (negative quantity)											
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
(235a)m	Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)											
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
(235c)m	Electricity generated by PVs (Appendix M) (negative quantity)											
Electricity generated by PVs (Appendix M) (negative quantity)	-9.0725	-19.3548	-38.9669	-59.2526	-79.0484	-79.6654	-78.7138	-66.3150	-48.1808	-27.9031	-12.1867	-7.1534 (233b)
(233b)m	Electricity generated by wind turbines (Appendix M) (negative quantity)											
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
(234b)m	Electricity generated by hydro-electric generators (Appendix M) (negative quantity)											
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
(235b)m	Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)											
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
(235d)m	Annual totals kWh/year											
Annual totals kWh/year												1982.5395 (211)
Space heating fuel - main system 1												

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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	2514.9510	(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)	150.5208	(232)

Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1021.5018	(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	3712.5096	(238)

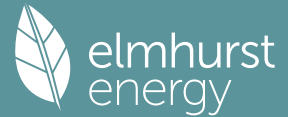
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1982.5395	0.2100	416.3333 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2514.9510	0.2100	528.1397 (264)
Space and water heating			944.4730 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	150.5208	0.1443	21.7248 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-495.6882	0.1339	-66.3594
PV Unit electricity exported	-525.8136	0.1255	-66.0105
Total			-132.3700 (269)
Total CO2, kg/year			845.7571 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.6400 (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	1982.5395	1.1300	2240.2697 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2514.9510	1.1300	2841.8947 (278)
Space and water heating			5082.1643 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	150.5208	1.5338	230.8738 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-495.6882	1.4947	-740.9214
PV Unit electricity exported	-525.8136	0.4608	-242.2954
Total			-983.2168 (283)
Total Primary energy kWh/year			4459.9221 (286)
Target Primary Energy Rate (TPER)			71.9300 (287)

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Property Reference	Flat E - 3 New Close				Issued on Date	30/05/2024		
Assessment Reference	New Build			Prop Type Ref	New Build			
Property	Flat E, 3, New Close							
SAP Rating	76 C		DER	6.62		TER	13.64	
Environmental	95 A		% DER < TER				51.47	
CO ₂ Emissions (t/year)	0.35		DFEE	37.32		TFEE	37.49	
Compliance Check	See BREL		% DFEE < TFEE				0.45	
% DPER < TPER	4.78		DPER	68.49		TPER	71.93	
Assessor Details	Mr. Alexander Cotterill					Assessor ID	AV67-0001	
Client								

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	62.0000 (1b)	2.4000 (2b)	148.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.0000		148.8000 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	148.8000 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.2016 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.5000 (17)
Infiltration rate	0.4266 (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) = 0.3946 (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	0.5031	0.4933	0.4834	0.4341	0.4242	0.3749	0.3749	0.3650	0.3946	0.4242	0.4439	0.4637 (22b)
Effective ac	0.6266	0.6217	0.6168	0.5942	0.5900	0.5703	0.5703	0.5666	0.5779	0.5900	0.5985	0.6075 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (U _w = 1.40)			13.4000	1.3258	17.7652		(27)
Door			1.7500	1.0000	1.7500		(26)
Rooflight N			4.6200	1.2357	5.7091		(27a)
External Wall 1	20.0000		20.0000	0.1800	3.6000	60.0000	1200.0000 (29a)
Corridor Wall	6.6000	1.7500	4.8500	0.1500	0.7275	9.0000	43.6500 (29a)
Dormer Wall	37.4100	13.4000	24.0100	0.1800	4.3218	9.0000	216.0900 (29a)
Ashlar Wall	20.0900		20.0900	0.1700	3.4153	9.0000	180.8100 (29a)
Flat Roof	50.4000		50.4000	0.1400	7.0560	9.0000	453.6000 (30)
Sloped Roof	11.6000	4.6200	6.9800	0.1500	1.0470	9.0000	62.8200 (30)
Total net area of external elements A _{um} (A, m ²)			146.1000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.3919		(33)
Party Wall 1			8.0300	0.0000	0.0000	180.0000	1445.4000 (32)
Party Floor 1			62.0000			30.0000	1860.0000 (32d)
Internal Wall 1			110.3000			9.0000	992.7000 (32c)
Heat capacity C _m = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		6455.0700 (34)
Thermal mass parameter (TMP = C _m / TFA) in kJ/m ² K							104.1140 (35)
Thermal bridges (User defined value 0.035 * total exposed area)							5.1135 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss					(33) + (36) + (36a) =		50.5054 (37)

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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	30.7673	30.5259	30.2893	29.1782	28.9703	28.0025	28.0025	27.8233	28.3753	28.9703	29.3909	29.8305	(38)
Heat transfer coeff	81.2726	81.0313	80.7947	79.6836	79.4757	78.5079	78.5079	78.3287	78.8807	79.4757	79.8962	80.3359	(39)
Average = Sum(39)m / 12 =												79.6826	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3108	1.3070	1.3031	1.2852	1.2819	1.2663	1.2663	1.2634	1.2723	1.2819	1.2886	1.2957	(40)
HLP (average)												1.2852	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0376 (42)
Hot water usage for mixer showers	58.3831	57.5057	56.2272	53.7810	51.9757	49.9625	48.8182	50.0871	51.4780	53.6395	56.1383	58.1594 (42a)
Hot water usage for baths	25.2299	24.8552	24.3275	23.3546	22.6261	21.8183	21.3820	21.9060	22.4765	23.3408	24.3338	25.1446 (42b)
Hot water usage for other uses	35.4969	34.2061	32.9153	31.6245	30.3337	29.0429	29.0429	30.3337	31.6245	32.9153	34.2061	35.4969 (42c)
Average daily hot water use (litres/day)												109.4892 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	119.1099	116.5670	113.4700	108.7601	104.9355	100.8238	99.2431	102.3267	105.5789	109.8956	114.6781	118.8009 (44)
Energy conte	188.6409	165.9898	174.3992	148.8871	141.2634	123.9746	120.0260	126.7019	130.1894	149.1274	163.3800	186.0135 (45)
Energy content (annual)	Total = Sum(45)m =											1818.5931
Distribution loss (46)m = 0.15 x (45)m	28.2961	24.8985	26.1599	22.3331	21.1895	18.5962	18.0039	19.0053	19.5284	22.3691	24.5070	27.9020 (46)
Water storage loss:												
Store volume												120.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.0000 (48)
Temperature factor from Table 2b												0.6000 (49)
Enter (49) or (54) in (55)												0.6000 (55)
Total storage loss	18.6000	16.8000		18.0000	18.6000	18.0000	18.6000	18.6000	18.0000	18.6000	18.0000	18.6000 (56)
If cylinder contains dedicated solar storage	18.6000	16.8000	18.6000	18.0000	18.6000	18.0000	18.6000	18.6000	18.0000	18.6000	18.0000	18.6000 (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	207.2409	182.7898	192.9992	166.8871	159.8634	141.9746	138.6260	145.3019	148.1894	167.7274	181.3800	204.6135 (62)
WWHRS	-51.9889	-45.9794	-48.1470	-39.8676	-37.1552	-31.7940	-29.8018	-31.6912	-32.8953	-38.7799	-43.9329	-51.0262 (63a)
PV diverter	-4.0217	-8.8227	-18.2781	-28.7348	-39.0638	-39.7027	-39.1729	-32.3672	-22.9776	-12.8848	-5.4487	-3.1416 (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	151.2303	127.9877	126.5740	98.2846	83.6444	70.4780	69.6513	81.2435	92.3165	116.0626	131.9984	150.4457 (64)
	Total per year (kWh/year) = Sum(64)m =											1299.9170 (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	77.6031	68.6316	72.8677	63.9050	61.8501	55.6216	54.7886	57.0084	57.6880	64.4648	68.7239	76.7295 (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	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	20.1388	17.8871	14.5467	11.0128	8.2322	6.9500	7.5097	9.7614	13.1017	16.6356	19.4162	20.6985	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	265.6139	268.3702	261.4245	246.6381	227.9728	210.4302	198.7106	195.9543	202.9000	217.6864	236.3516	253.8943	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	(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)													
	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	(71)
Water heating gains (Table 5)													
	104.3052	102.1304	97.9405	88.7569	83.1318	77.2522	73.6406	76.6242	80.1222	86.6463	95.4498	103.1310	(72)
Total internal gains													
	483.0726	481.4023	466.9264	439.4225	412.3516	384.6470	369.8756	372.3546	386.1385	413.9830	444.2324	470.7385	(73)

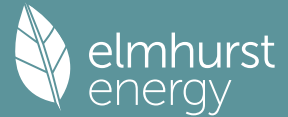
6. Solar gains

[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
South						13.4000	46.7521	0.7600	0.7000	0.7700				230.9673 (78)
North						4.6200	16.7973	0.7600	0.7000	1.0000				37.1566 (82)
Solar gains	268.1238	449.4571	612.7093	783.1936	919.2860	936.5052	892.5626	783.8284	668.7431	494.4933	319.4165	230.8035	(83)	
Total gains	751.1964	930.8594	1079.6357	1222.6160	1331.6375	1321.1522	1262.4382	1156.1829	1054.8816	908.4763	763.6488	701.5420	(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	22.0625	22.1282	22.1930	22.5024	22.5613	22.8394	22.8394	22.8917	22.7315	22.5613	22.4425	22.3197	
alpha	2.4708	2.4752	2.4795	2.5002	2.5041	2.5226	2.5226	2.5261	2.5154	2.5041	2.4962	2.4880	
util living area	0.8812	0.8201	0.7411	0.6255	0.4903	0.3590	0.2660	0.3002	0.4636	0.6801	0.8320	0.8950	(86)

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MIT	18.8835	19.3505	19.8666	20.3880	20.7349	20.9132	20.9702	20.9590	20.8297	20.3588	19.5430	18.7922 (87)
Th 2	19.8323	19.8354	19.8384	19.8524	19.8551	19.8674	19.8674	19.8696	19.8626	19.8551	19.8497	19.8442 (88)
util rest of house	0.8655	0.7985	0.7120	0.5869	0.4420	0.3013	0.2003	0.2304	0.3998	0.6359	0.8079	0.8808 (89)
MIT 2	17.4411	18.0092	18.6283	19.2412	19.6201	19.8062	19.8528	19.8482	19.7328	19.2328	18.2694	17.3366 (90)
Living area fraction									fLA = Living area / (4) =			0.4419 (91)
MIT	18.0785	18.6020	19.1755	19.7480	20.1128	20.2954	20.3466	20.3391	20.2175	19.7304	18.8323	17.9799 (92)
Temperature adjustment												-0.1500
adjusted MIT	17.9285	18.4520	19.0255	19.5980	19.9628	20.1454	20.1966	20.1891	20.0675	19.5804	18.6823	17.8299 (93)

8. Space heating requirement

Utilisation	Jan 0.8334	Feb 0.7684	Mar 0.6892	Apr 0.5777	May 0.4467	Jun 0.3158	Jul 0.2197	Aug 0.2505	Sep 0.4117	Oct 0.6243	Nov 0.7788	Dec 0.8494 (94)
Useful gains	626.0786	715.2734	744.0912	706.3404	594.8142	417.2540	277.3231	289.6296	434.3467	567.1843	594.7158	595.9219 (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	1107.6262	1098.1334	1011.9976	852.4528	656.6896	435.3611	282.3623	296.7975	470.7236	713.7252	925.3790	1094.9696 (97)
Space heating kWh	358.2714	257.2819	199.3224	105.2009	46.0353	0.0000	0.0000	0.0000	0.0000	109.0264	238.0775	371.2915 (98a)
Space heating requirement - total per year (kWh/year)												1684.5073
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	358.2714	257.2819	199.3224	105.2009	46.0353	0.0000	0.0000	0.0000	0.0000	109.0264	238.0775	371.2915 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1684.5073
Space heating per m2										(98c) / (4) =		27.1695 (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 %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	Jan 358.2714	Feb 257.2819	Mar 199.3224	Apr 105.2009	May 46.0353	Jun 0.0000	Jul 0.0000	Aug 0.0000	Sep 0.0000	Oct 109.0264	Nov 238.0775	Dec 371.2915 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	358.2714	257.2819	199.3224	105.2009	46.0353	0.0000	0.0000	0.0000	0.0000	109.0264	238.0775	371.2915 (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	151.2303	127.9877	126.5740	98.2846	83.6444	70.4780	69.6513	81.2435	92.3165	116.0626	131.9984	150.4457 (64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)
Fuel for water heating, kWh/month	151.2303	127.9877	126.5740	98.2846	83.6444	70.4780	69.6513	81.2435	92.3165	116.0626	131.9984	150.4457 (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	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822 (231)
Lighting	17.6273	14.1413	12.7327	9.3285	7.2056	5.8870	6.5732	8.5441	11.0979	14.5611	16.4467	18.1172 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-20.8875	-32.1020	-49.6445	-58.5712	-64.0178	-57.6905	-56.9369	-52.9075	-45.2909	-37.3687	-23.7018	-17.7654 (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	0.3128	0.1150	-1.2197	-4.8873	-10.4194	-14.0523	-13.8634	-11.0159	-7.4099	-1.7378	0.0510	0.2992 (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												1684.5073 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												100.0000
Water heating fuel used												1299.9170 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
central heating pump												41.0000 (230c)
Total electricity for the above, kWh/year												41.0000 (231)
Electricity for lighting (calculated in Appendix L)												142.2627 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-580.7123 (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												2586.9747 (238)

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10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1684.5073	16.4900	277.7753 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1299.9170	16.4900	214.3563 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	41.0000	16.4900	6.7609 (249)
Energy for lighting	142.2627	16.4900	23.4591 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-516.8847	16.4900	-85.2343
PV Unit electricity exported	-63.8276	5.5900	-3.5680
Total			-88.8022 (252)
Total energy cost			433.5493 (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] = 1.4587 (257)
SAP value	76.3549
SAP rating (Section 12)	76 (258)
SAP band	C

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	1684.5073	0.1558	262.4779 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1299.9170	0.1434	186.3796 (264)
Space and water heating			448.8575 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	142.2627	0.1443	20.5329 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-516.8847	0.1339	-69.2135
PV Unit electricity exported	-63.8276	0.1097	-6.9989
Total			-76.2124 (269)
Total CO2, kg/year			398.8652 (272)
CO2 emissions per m2			6.4300 (273)
EI value			95.0049
EI rating			95 (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

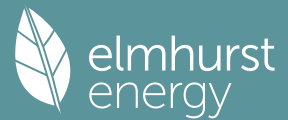
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	62.0000 (1b)	x 2.4000 (2b)	= 148.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 148.8000 (5)

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)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.2016 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.5000 (17)
Infiltration rate	0.4266 (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) = 0.3946 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.4143	0.3946	0.3946	0.3650	0.3650	0.3256	0.3354	0.3157	0.3256	0.3453	0.3453	0.3749 (22b)

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Effective ac 0.5858 0.5779 0.5779 0.5666 0.5666 0.5530 0.5563 0.5498 0.5530 0.5596 0.5596 0.5703 (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 = 1.40)			13.4000	1.3258	17.7652			(27)
Door			1.7500	1.0000	1.7500			(26)
Rooflight N			4.6200	1.2357	5.7091			(27a)
External Wall 1	20.0000		20.0000	0.1800	3.6000	60.0000	1200.0000	(29a)
Corridor Wall	6.6000	1.7500	4.8500	0.1500	0.7275	9.0000	43.6500	(29a)
Dormer Wall	37.4100	13.4000	24.0100	0.1800	4.3218	9.0000	216.0900	(29a)
Ashlar Wall	20.0900		20.0900	0.1700	3.4153	9.0000	180.8100	(29a)
Flat Roof	50.4000		50.4000	0.1400	7.0560	9.0000	453.6000	(30)
Sloped Roof	11.6000	4.6200	6.9800	0.1500	1.0470	9.0000	62.8200	(30)
Total net area of external elements Aum(A, m2)			146.1000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.3919			(33)
Party Wall 1			8.0300	0.0000	0.0000	180.0000	1445.4000	(32)
Party Floor 1			62.0000			30.0000	1860.0000	(32d)
Internal Wall 1			110.3000			9.0000	992.7000	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		6455.0700	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							104.1140	(35)
Thermal bridges (User defined value 0.035 * total exposed area)							5.1135	(36)
Point Thermal bridges							0.0000	(36a)
Total fabric heat loss						(33) + (36) + (36a) =	50.5054	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	28.7672	28.3753	28.3753	27.8233	27.8233	27.1542	27.3143	26.9989	27.1542	27.4792	27.4792	28.0025	(38)
Average = Sum(39)m / 12 =	79.2726	78.8807	78.8807	78.3287	78.3287	77.6596	77.8197	77.5043	77.6596	77.9846	77.9846	78.5079	(39)
	78.2343												
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.2786	1.2723	1.2723	1.2634	1.2634	1.2526	1.2552	1.2501	1.2526	1.2578	1.2578	1.2663	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

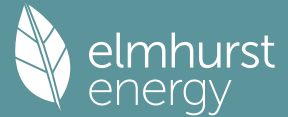
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.0376	(42)
Hot water usage for mixer showers	58.3831	57.5057	56.2272	53.7810	51.9757	49.9625	48.8182	50.0871	51.4780	53.6395	56.1383	58.1594	(42a)	
Hot water usage for baths	25.2299	24.8552	24.3275	23.3546	22.6261	21.8183	21.3820	21.9060	22.4765	23.3408	24.3338	25.1446	(42b)	
Hot water usage for other uses	35.4969	34.2061	32.9153	31.6245	30.3337	29.0429	29.0429	30.3337	31.6245	32.9153	34.2061	35.4969	(42c)	
Average daily hot water use (litres/day)													109.4892	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	119.1099	116.5670	113.4700	108.7601	104.9355	100.8238	99.2431	102.3267	105.5789	109.8956	114.6781	118.8009	(44)	
Energy content (annual)	188.6409	165.9898	174.3992	148.8871	141.2634	123.9746	120.0260	126.7019	130.1894	149.1274	163.3800	186.0135	(45)	
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1818.5931		
	28.2961	24.8985	26.1599	22.3331	21.1895	18.5962	18.0039	19.0053	19.5284	22.3691	24.5070	27.9020	(46)	
Water storage loss:														
Store volume													120.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):													1.0000	(48)
Temperature factor from Table 2b													0.6000	(49)
Enter (49) or (54) in (55)													0.6000	(55)
Total storage loss														
	18.6000	16.8000	18.6000	18.0000	18.6000	18.0000	18.6000	18.6000	18.0000	18.6000	18.0000	18.6000	(56)	
If cylinder contains dedicated solar storage														
	18.6000	16.8000	18.6000	18.0000	18.6000	18.0000	18.6000	18.6000	18.0000	18.6000	18.0000	18.6000	(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														
	207.2409	182.7898	192.9992	166.8871	159.8634	141.9746	138.6260	145.3019	148.1894	167.7274	181.3800	204.6135	(62)	
WWHRS	-51.9889	-45.9794	-48.1470	-39.8676	-37.1552	-31.7940	-29.8018	-31.6912	-32.8953	-38.7799	-43.9329	-51.0262	(63a)	
PV diverter	-4.7447	-8.9447	-18.2374	-29.9262	-39.2715	-43.7897	-42.5643	-36.2590	-25.6510	-14.3357	-6.6505	-3.6549	(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	150.5072	127.8657	126.6147	97.0932	83.4368	66.3909	66.2599	77.3517	89.6431	114.6117	130.7966	149.9323	(64)	
										Total per year (kWh/year) = Sum(64)m =		1280.5040	(64)	
Electric shower(s)														
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)	
													0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =														
Heat gains from water heating, kWh/month														
	77.6031	68.6316	72.8677	63.9050	61.8501	55.6216	54.7886	57.0084	57.6880	64.4648	68.7239	76.7295	(65)	

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
20.1388	17.8871	14.5467	11.0128	8.2322	6.9500	7.5097	9.7614	13.1017	16.6356	19.4162	20.6985	20.6985	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
265.6139	268.3702	261.4245	246.6381	227.9728	210.4302	198.7106	195.9543	202.9000	217.6864	236.3516	253.8943	253.8943	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	(71)
Water heating gains (Table 5)													
104.3052	102.1304	97.9405	88.7569	83.1318	77.2522	73.6406	76.6242	80.1222	86.6463	95.4498	103.1310	103.1310	(72)
Total internal gains													
483.0726	481.4023	466.9264	439.4225	412.3516	384.6470	369.8756	372.3546	386.1385	413.9830	444.2324	470.7385	470.7385	(73)

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6. Solar gains

[Jan]	Area m2				Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W	
South	13.4000				50.9848	0.7600		0.7000		0.7700	251.8782 (78)	
North	4.6200				18.8545	0.7600		0.7000		1.0000	41.7072 (82)	
Solar gains	293.5854	443.6106	601.3080	800.8885	923.2753	1009.3952	950.5528	848.5413	714.3784	522.0725	358.4082	250.2519 (83)
Total gains	776.6580	925.0129	1068.2344	1240.3109	1335.6269	1394.0422	1320.4284	1220.8959	1100.5169	936.0555	802.6406	720.9904 (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	22.6191	22.7315	22.7315	22.8917	22.8917	23.0889	23.0414	23.1352	23.0889	22.9927	22.9927	22.8394
alpha	2.5079	2.5154	2.5154	2.5261	2.5261	2.5393	2.5361	2.5423	2.5393	2.5328	2.5328	2.5226
util living area	0.8605	0.8050	0.7171	0.5814	0.4296	0.2706	0.1807	0.2003	0.3832	0.6250	0.7948	0.8763 (86)
MIT	19.1788	19.5510	20.0544	20.5414	20.8367	20.9658	20.9918	20.9893	20.9108	20.5417	19.8361	19.0963 (87)
Th 2	19.8576	19.8626	19.8626	19.8696	19.8696	19.8782	19.8761	19.8802	19.8782	19.8740	19.8740	19.8674 (88)
util rest of house	0.8422	0.7816	0.6852	0.5395	0.3777	0.2126	0.1160	0.1314	0.3166	0.5752	0.7661	0.8596 (89)
MIT 2	17.8219	18.2725	18.8696	19.4264	19.7360	19.8589	19.8738	19.8769	19.8189	19.4496	18.6379	17.7290 (90)
Living area fraction	18.4215	18.8375	19.3932	19.9191	20.2224	20.3481	20.3679	20.3685	20.3015	19.9322	19.1674	18.4419 (91)
MIT	18.4215	18.8375	19.3932	19.9191	20.2224	20.3481	20.3679	20.3685	20.3015	19.9322	19.1674	18.3332 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.2715	18.6875	19.2432	19.7691	20.0724	20.1981	20.2179	20.2185	20.1515	19.7822	19.0174	18.1832 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8112	0.7536	0.6661	0.5356	0.3872	0.2294	0.1358	0.1524	0.3333	0.5708	0.7409	0.8287 (94)
Useful gains	630.0162	697.1214	711.5922	664.2890	517.2205	319.7433	179.3764	186.0896	366.7760	534.3397	594.6760	597.4822 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	18.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	1044.1413	1032.3502	934.2010	773.0371	553.9746	326.0201	180.3769	187.4450	384.5292	638.0869	859.1882	1027.1367 (97)
Space heating kWh	308.1091	225.2737	165.6210	78.2986	27.3450	0.0000	0.0000	0.0000	0.0000	77.1879	190.4488	319.6630 (98a)
Space heating requirement - total per year (kWh/year)												1391.9472
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	308.1091	225.2737	165.6210	78.2986	27.3450	0.0000	0.0000	0.0000	0.0000	77.1879	190.4488	319.6630 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1391.9472
Space heating per m ²										(98c) / (4) =		22.4508 (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 %)												100.0000 (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	308.1091	225.2737	165.6210	78.2986	27.3450	0.0000	0.0000	0.0000	0.0000	77.1879	190.4488	319.6630 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	308.1091	225.2737	165.6210	78.2986	27.3450	0.0000	0.0000	0.0000	0.0000	77.1879	190.4488	319.6630 (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	150.5072	127.8657	126.6147	97.0932	83.4368	66.3909	66.2599	77.3517	89.6431	114.6117	130.7966	149.9323 (64)
Efficiency of water heater	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)
Fuel for water heating, kWh/month	150.5072	127.8657	126.6147	97.0932	83.4368	66.3909	66.2599	77.3517	89.6431	114.6117	130.7966	149.9323 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.3699	3.3699	3.4822	3.3699	3.4822 (231)
Lighting	17.6273	14.1413	12.7327	9.3285	7.2056	5.8870	6.5732	8.5441	11.0979	14.5611	16.4467	18.1172 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-22.9973	-32.1257	-49.0019	-58.7874	-62.9861	-60.0252	-58.8917	-55.6278	-47.7964	-39.1103	-26.4812	-19.4120 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.1958	-0.1299	-1.7947	-6.1884	-11.6775	-15.8238	-15.3292	-12.5976	-8.3975	-2.5775	-0.2532	0.2141 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)

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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	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	0.0000	(235d)
Annual totals kWh/year														
Space heating fuel - main system 1													1391.9472	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													100.0000	
Water heating fuel used													1280.5040	(219)
Space cooling fuel													0.0000	(221)
Electricity for pumps and fans:														
central heating pump													41.0000	(230c)
Total electricity for the above, kWh/year													41.0000	(231)
Electricity for lighting (calculated in Appendix L)													142.2627	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-607.6024	(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													2248.1114	(238)

10a. Fuel costs - using BEDF prices (542)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1391.9472	25.1600	350.2139	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1280.5040	25.1600	322.1748	(247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000	(247a)
Pumps, fans and electric keep-hot	41.0000	25.1600	10.3156	(249)
Energy for lighting	142.2627	25.1600	35.7933	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.2430	25.1600	-134.1639	
PV Unit electricity exported	-74.3594	5.8100	-4.3203	
Total			-138.4842	(252)
Total energy cost			580.0134	(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	1391.9472	0.1565	217.7722	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1280.5040	0.1437	183.9593	(264)
Space and water heating			401.7315	(265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872	(267)
Energy for lighting	142.2627	0.1443	20.5329	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.2430	0.1339	-71.3900	
PV Unit electricity exported	-74.3594	0.1115	-8.2928	
Total			-79.6828	(269)
Total CO2, kg/year			348.2688	(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	1391.9472	1.5792	2198.1537	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1280.5040	1.5313	1960.8929	(278)
Space and water heating			4159.0467	(279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248	(281)
Energy for lighting	142.2627	1.5338	218.2072	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.2430	1.4948	-797.0671	
PV Unit electricity exported	-74.3594	0.4085	-30.3730	
Total			-827.4401	(283)
Total Primary energy kWh/year			3611.8386	(286)

SAP 10 EPC IMPROVEMENTS

New Build

Current energy efficiency rating:	C 76
Current environmental impact rating:	A 95

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Energy Environmental

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Recommended measures (none) Typical annual savings efficiency impact
Total Savings £0 0.00 kg/m²

Potential energy efficiency rating: C 76
Potential environmental impact rating: A 95

Fuel prices for cost data on this page from database revision number 542 TEST (30 Apr 2024)
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	£718	£718	£0
Space heating	£361	£361	£0
Water heating	£322	£322	£0
Lighting	£36	£36	£0
Generated (PV)	-£138	-£138	£0
Total cost of fuels	£580	£580	£0
Total cost of uses	£581	£581	£0
Delivered energy	36 kWh/m²	36 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes
CO2 emissions per m²	6 kg/m²	6 kg/m²	0 kg/m²
Primary energy	58 kWh/m²	58 kWh/m²	0 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	62.0000 (1b)	x 2.4000 (2b)	= 148.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 148.8000 (5)

2. Ventilation rate

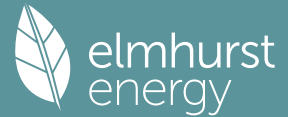
		m3 per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number 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)
Infiltration due to chimneys, flues and fans	(6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	
Pressure test	30.0000 / (5) =	0.2016 (8)
Pressure Test Method	Yes	
Measured/design AP50	Blower Door	4.5000 (17)
Infiltration rate		0.4266 (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) =	0.3946 (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	0.5031	0.4933	0.4834	0.4341	0.4242	0.3749	0.3749	0.3650	0.3946	0.4242	0.4439	0.4637 (22b)
Effective ac	0.6266	0.6217	0.6168	0.5942	0.5900	0.5703	0.5703	0.5666	0.5779	0.5900	0.5985	0.6075 (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 = 1.40)			13.4000	1.3258	17.7652		(27)
Door			1.7500	1.0000	1.7500		(26)
Rooflight N			4.6200	1.2357	5.7091		(27a)
External Wall 1	20.0000	1.7500	20.0000	0.1800	3.6000	60.0000	1200.0000 (29a)
Corridor Wall	6.6000		4.8500	0.1500	0.7275	9.0000	43.6500 (29a)
Dormer Wall	37.4100	13.4000	24.0100	0.1800	4.3218	9.0000	216.0900 (29a)
Ashlar Wall	20.0900		20.0900	0.1700	3.4153	9.0000	180.8100 (29a)
Flat Roof	50.4000		50.4000	0.1400	7.0560	9.0000	453.6000 (30)
Sloped Roof	11.6000	4.6200	6.9800	0.1500	1.0470	9.0000	62.8200 (30)
Total net area of external elements Aum(A, m2)			146.1000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		45.3919		(33)
Party Wall 1			8.0300	0.0000	0.0000	180.0000	1445.4000 (32)
Party Floor 1			62.0000			30.0000	1860.0000 (32d)
Internal Wall 1			110.3000			9.0000	992.7000 (32c)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =				6455.0700 (34)

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Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 104.1140 (35)
 Thermal bridges (User defined value 0.035 * total exposed area) 5.1135 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 50.5054 (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	30.7673	30.5259	30.2893	29.1782	28.9703	28.0025	28.0025	27.8233	28.3753	28.9703	29.3909	29.8305 (38)
Heat transfer coeff	81.2726	81.0313	80.7947	79.6836	79.4757	78.5079	78.5079	78.3287	78.8807	79.4757	79.8962	80.3359 (39)
Average = Sum(39)m / 12 =												79.6826
HLP	1.3108	1.3070	1.3031	1.2852	1.2819	1.2663	1.2663	1.2634	1.2723	1.2819	1.2886	1.2957 (40)
HLP (average)												1.2852
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0376 (42)
Hot water usage for mixer showers												
58.3831	57.5057	56.2272	53.7810	51.9757	49.9625	48.8182	50.0871	51.4780	53.6395	56.1383	58.1594 (42a)	
Hot water usage for baths												
25.2299	24.8552	24.3275	23.3546	22.6261	21.8183	21.3820	21.9060	22.4765	23.3408	24.3338	25.1446 (42b)	
Hot water usage for other uses												
35.4969	34.2061	32.9153	31.6245	30.3337	29.0429	29.0429	30.3337	31.6245	32.9153	34.2061	35.4969 (42c)	
Average daily hot water use (litres/day)												109.4892 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
119.1099	116.5670	113.4700	108.7601	104.9355	100.8238	99.2431	102.3267	105.5789	109.8956	114.6781	118.8009 (44)	
Energy content (annual)	188.6409	165.9898	174.3992	148.8871	141.2634	123.9746	120.0260	126.7019	130.1894	149.1274	163.3800	186.0135 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1818.5931
28.2961	24.8985	26.1599	22.3331	21.1895	18.5962	18.0039	19.0053	19.5284	22.3691	24.5070	27.9020 (46)	
Water storage loss:												
Store volume												120.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.0000 (48)
Temperature factor from Table 2b												0.6000 (49)
Enter (49) or (54) in (55)												0.6000 (55)
Total storage loss												
18.6000	16.8000	18.6000	18.0000	18.6000	18.0000	18.6000	18.6000	18.6000	18.0000	18.6000	18.6000 (56)	
If cylinder contains dedicated solar storage												
18.6000	16.8000	18.6000	18.0000	18.6000	18.0000	18.6000	18.6000	18.6000	18.0000	18.6000	18.6000 (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 (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 (61)	
Total heat required for water heating calculated for each month												
207.2409	182.7898	192.9992	166.8871	159.8634	141.9746	138.6260	145.3019	148.1894	167.7274	181.3800	204.6135 (62)	
WWHRS	-51.9889	-45.9794	-48.1470	-39.8676	-37.1552	-31.7940	-29.8018	-31.6912	-32.8953	-38.7799	-43.9329	-51.0262 (63a)
PV diverter	-4.0217	-8.8227	-18.2781	-28.7348	-39.0638	-39.7027	-39.1729	-32.3672	-22.9776	-12.8848	-5.4487	-3.1416 (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 (63c)	
FGHRS	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	151.2303	127.9877	126.5740	98.2846	83.6444	70.4780	69.6513	81.2435	92.3165	116.0626	131.9984	150.4457 (64)
Total per year (kWh/year) = Sum(64)m =												1299.9170 (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												
77.6031	68.6316	72.8677	63.9050	61.8501	55.6216	54.7886	57.0084	57.6880	64.4648	68.7239	76.7295 (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	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.1388	17.8871	14.5467	11.0128	8.2322	6.9500	7.5097	9.7614	13.1017	16.6356	19.4162	20.6985 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	265.6139	268.3702	261.4245	246.6381	227.9728	210.4302	198.7106	195.9543	202.9000	217.6864	236.3516	253.8943 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631 (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)	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032 (71)
Water heating gains (Table 5)	104.3052	102.1304	97.9405	88.7569	83.1318	77.2522	73.6406	76.6242	80.1222	86.6463	95.4498	103.1310 (72)
Total internal gains	483.0726	481.4023	466.9264	439.4225	412.3516	384.6470	369.8756	372.3546	386.1385	413.9830	444.2324	470.7385 (73)

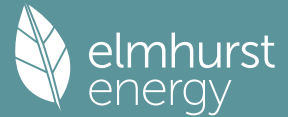
6. Solar gains

[Jan]												Gains
					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d			W
South					13.4000	46.7521	0.7600	0.7000	0.7700			230.9673 (78)
North					4.6200	16.7973	0.7600	0.7000	1.0000			37.1566 (82)
Solar gains	268.1238	449.4571	612.7093	783.1936	919.2860	936.5052	892.5626	783.8284	668.7431	494.4933	319.4165	230.8035 (83)
Total gains	751.1964	930.8594	1079.6357	1222.6160	1331.6375	1321.1522	1262.4382	1156.1829	1054.8816	908.4763	763.6488	701.5420 (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	

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tau	22.0625	22.1282	22.1930	22.5024	22.5613	22.8394	22.8394	22.8917	22.7315	22.5613	22.4425	22.3197
alpha	2.4708	2.4752	2.4795	2.5002	2.5041	2.5226	2.5226	2.5261	2.5154	2.5041	2.4962	2.4880
util living area	0.8812	0.8201	0.7411	0.6255	0.4903	0.3590	0.2660	0.3002	0.4636	0.6801	0.8320	0.8950 (86)
MIT	18.8835	19.3505	19.8666	20.3880	20.7349	20.9132	20.9702	20.9590	20.8297	20.3588	19.5430	18.7922 (87)
Th 2	19.8323	19.8354	19.8384	19.8524	19.8551	19.8674	19.8674	19.8696	19.8626	19.8551	19.8497	19.8442 (88)
util rest of house	0.8655	0.7985	0.7120	0.5869	0.4420	0.3013	0.2003	0.2304	0.3998	0.6359	0.8079	0.8808 (89)
MIT 2	17.4411	18.0092	18.6283	19.2412	19.6201	19.8062	19.8528	19.8482	19.7328	19.2328	18.2694	17.3366 (90)
Living area fraction	18.0785	18.6020	19.1755	19.7480	20.1128	20.2954	20.3466	20.3391	20.2175	19.7304	18.8323	17.9799 (91)
MIT	17.9285	18.4520	19.0255	19.5980	19.9628	20.1454	20.1966	20.1891	20.0675	19.5804	18.6823	17.8299 (92)
Temperature adjustment												-0.1500
adjusted MIT												17.8299 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.8334	0.7684	0.6892	0.5777	0.4467	0.3158	0.2197	0.2505	0.4117	0.6243	0.7788	0.8494 (94)
Useful gains	626.0786	715.2734	744.0912	706.3404	594.8142	417.2540	277.3231	289.6296	434.3467	567.1843	594.7158	595.9219 (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	1107.6262	1098.1334	1011.9976	852.4528	656.6896	435.3611	282.3623	296.7975	470.7236	713.7252	925.3790	1094.9696 (97)
Space heating kWh	358.2714	257.2819	199.3224	105.2009	46.0353	0.0000	0.0000	0.0000	0.0000	109.0264	238.0775	371.2915 (98a)
Space heating requirement - total per year (kWh/year)												1684.5073
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	358.2714	257.2819	199.3224	105.2009	46.0353	0.0000	0.0000	0.0000	0.0000	109.0264	238.0775	371.2915 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1684.5073
Space heating per m2										(98c) / (4) =		27.1695 (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 %)												100.0000 (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	358.2714	257.2819	199.3224	105.2009	46.0353	0.0000	0.0000	0.0000	0.0000	109.0264	238.0775	371.2915 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	358.2714	257.2819	199.3224	105.2009	46.0353	0.0000	0.0000	0.0000	0.0000	109.0264	238.0775	371.2915 (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	151.2303	127.9877	126.5740	98.2846	83.6444	70.4780	69.6513	81.2435	92.3165	116.0626	131.9984	150.4457 (64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)
Fuel for water heating, kWh/month	151.2303	127.9877	126.5740	98.2846	83.6444	70.4780	69.6513	81.2435	92.3165	116.0626	131.9984	150.4457 (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	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822 (231)
Lighting	17.6273	14.1413	12.7327	9.3285	7.2056	5.8870	6.5732	8.5441	11.0979	14.5611	16.4467	18.1172 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-20.8875	-32.1020	-49.6445	-58.5712	-64.0178	-57.6905	-56.9369	-52.9075	-45.2909	-37.3687	-23.7018	-17.7654 (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	0.3128	0.1150	-1.2197	-4.8873	-10.4194	-14.0523	-13.8634	-11.0159	-7.4099	-1.7378	0.0510	0.2992 (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												1684.5073 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												100.0000
Water heating fuel used												1299.9170 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
central heating pump												41.0000 (230c)
Total electricity for the above, kWh/year												41.0000 (231)
Electricity for lighting (calculated in Appendix L)												142.2627 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-580.7123 (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												2586.9747 (238)

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10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1684.5073	16.4900	277.7753 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1299.9170	16.4900	214.3563 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	41.0000	16.4900	6.7609 (249)
Energy for lighting	142.2627	16.4900	23.4591 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-516.8847	16.4900	-85.2343
PV Unit electricity exported	-63.8276	5.5900	-3.5680
Total			-88.8022 (252)
Total energy cost			433.5493 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.4587 (257)
SAP value		76.3549
SAP rating (Section 12)		76 (258)
SAP band		C

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	1684.5073	0.1558	262.4779 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1299.9170	0.1434	186.3796 (264)
Space and water heating			448.8575 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	142.2627	0.1443	20.5329 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-516.8847	0.1339	-69.2135
PV Unit electricity exported	-63.8276	0.1097	-6.9989
Total			-76.2124 (269)
Total CO2, kg/year			398.8652 (272)
CO2 emissions per m2			6.4300 (273)
EI value			95.0049
EI rating			95 (274)
EI band			A

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

1. Overall dwelling characteristics

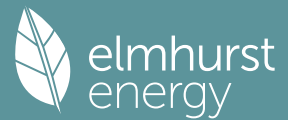
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	62.0000 (1b)	2.4000 (2b)	148.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.0000		148.8000 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	148.8000 (5)

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)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.2016 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.5000 (17)
Infiltration rate	0.4266 (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) = 0.3946 (21)

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

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Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate												
	0.4143	0.3946	0.3946	0.3650	0.3650	0.3256	0.3354	0.3157	0.3256	0.3453	0.3453	0.3749 (22b)
Effective ac	0.5858	0.5779	0.5779	0.5666	0.5666	0.5530	0.5563	0.5498	0.5530	0.5596	0.5596	0.5703 (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 = 1.40)			13.4000	1.3258	17.7652			(27)
Door			1.7500	1.0000	1.7500			(26)
Rooflight N			4.6200	1.2357	5.7091			(27a)
External Wall 1	20.0000		20.0000	0.1800	3.6000	60.0000	1200.0000	(29a)
Corridor Wall	6.6000	1.7500	4.8500	0.1500	0.7275	9.0000	43.6500	(29a)
Dormer Wall	37.4100	13.4000	24.0100	0.1800	4.3218	9.0000	216.0900	(29a)
Ashlar Wall	20.0900		20.0900	0.1700	3.4153	9.0000	180.8100	(29a)
Flat Roof	50.4000		50.4000	0.1400	7.0560	9.0000	453.6000	(30)
Sloped Roof	11.6000	4.6200	6.9800	0.1500	1.0470	9.0000	62.8200	(30)
Total net area of external elements Aum(A, m2)			146.1000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.3919			(33)
Party Wall 1			8.0300	0.0000	0.0000	180.0000	1445.4000	(32)
Party Floor 1			62.0000			30.0000	1860.0000	(32d)
Internal Wall 1			110.3000			9.0000	992.7000	(32c)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
Thermal bridges (User defined value 0.035 * total exposed area)
Point Thermal bridges
Total fabric heat loss

(28)...(30) + (32) + (32a)...(32e) = 6455.0700 (34)
104.1140 (35)
5.1135 (36)
(36a) = 0.0000
(33) + (36) + (36a) = 50.5054 (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	28.7672	28.3753	28.3753	27.8233	27.8233	27.1542	27.3143	26.9989	27.1542	27.4792	27.4792	28.0025	(38)
Heat transfer coeff	79.2726	78.8807	78.8807	78.3287	78.3287	77.6596	77.8197	77.5043	77.6596	77.9846	77.9846	78.5079	(39)
Average = Sum(39)m / 12 =												78.2343	
HLP	1.2786	1.2723	1.2723	1.2634	1.2634	1.2526	1.2552	1.2501	1.2526	1.2578	1.2578	1.2663	(40)
HLP (average)												1.2618	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

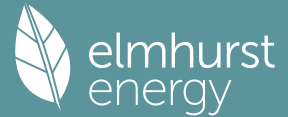
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.0376 (42)
Hot water usage for mixer showers	58.3831	57.5057	56.2272	53.7810	51.9757	49.9625	48.8182	50.0871	51.4780	53.6395	56.1383	58.1594	(42a)
Hot water usage for baths	25.2299	24.8552	24.3275	23.3546	22.6261	21.8183	21.3820	21.9060	22.4765	23.3408	24.3338	25.1446	(42b)
Hot water usage for other uses	35.4969	34.2061	32.9153	31.6245	30.3337	29.0429	29.0429	30.3337	31.6245	32.9153	34.2061	35.4969	(42c)
Average daily hot water use (litres/day)												109.4892	(43)
Daily hot water use	119.1099	116.5670	113.4700	108.7601	104.9355	100.8238	99.2431	102.3267	105.5789	109.8956	114.6781	118.8009	(44)
Energy conte	188.6409	165.9898	174.3992	148.8871	141.2634	123.9746	120.0260	126.7019	130.1894	149.1274	163.3800	186.0135	(45)
Energy content (annual)										Total = Sum(45)m =		1818.5931	
Distribution loss (46)m = 0.15 x (45)m	28.2961	24.8985	26.1599	22.3331	21.1895	18.5962	18.0039	19.0053	19.5284	22.3691	24.5070	27.9020	(46)
Water storage loss:													
Store volume												120.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.0000	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.6000	(55)
Total storage loss	18.6000	16.8000	18.6000	18.0000	18.6000	18.0000	18.6000	18.6000	18.0000	18.6000	18.0000	18.6000	(56)
If cylinder contains dedicated solar storage	18.6000	16.8000	18.6000	18.0000	18.6000	18.0000	18.6000	18.6000	18.0000	18.6000	18.0000	18.6000	(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	207.2409	182.7898	192.9992	166.8871	159.8634	141.9746	138.6260	145.3019	148.1894	167.7274	181.3800	204.6135	(62)
WWHRS	-51.9889	-45.9794	-48.1470	-39.8676	-37.1552	-31.7940	-29.8018	-31.6912	-32.8953	-38.7799	-43.9329	-51.0262	(63a)
PV diverter	-4.7447	-8.9447	-18.2374	-29.9262	-39.2715	-43.7897	-42.5643	-36.2590	-25.6510	-14.3357	-6.6505	-3.6549	(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	150.5072	127.8657	126.6147	97.0932	83.4368	66.3909	66.2599	77.3517	89.6431	114.6117	130.7966	149.9323	(64)
									Total per year (kWh/year) = Sum(64)m =			1280.5040	(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	77.6031	68.6316	72.8677	63.9050	61.8501	55.6216	54.7886	57.0084	57.6880	64.4648	68.7239	76.7295	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.1388	17.8871	14.5467	11.0128	8.2322	6.9500	7.5097	9.7614	13.1017	16.6356	19.4162	20.6985	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	265.6139	268.3702	261.4245	246.6381	227.9728	210.4302	198.7106	195.9543	202.9000	217.6864	236.3516	253.8943	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	(71)

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Water heating gains (Table 5)	104.3052	102.1304	97.9405	88.7569	83.1318	77.2522	73.6406	76.6242	80.1222	86.6463	95.4498	103.1310 (72)
Total internal gains	483.0726	481.4023	466.9264	439.4225	412.3516	384.6470	369.8756	372.3546	386.1385	413.9830	444.2324	470.7385 (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
South				13.4000	50.9848		0.7600		0.7000		0.7700		251.8782 (78)
North				4.6200	18.8545		0.7600		0.7000		1.0000		41.7072 (82)
Solar gains	293.5854	443.6106	601.3080	800.8885	923.2753	1009.3952	950.5528	848.5413	714.3784	522.0725	358.4082		250.2519 (83)
Total gains	776.6580	925.0129	1068.2344	1240.3109	1335.6269	1394.0422	1320.4284	1220.8959	1100.5169	936.0555	802.6406		720.9904 (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	22.6191	22.7315	22.7315	22.8917	22.8917	23.0889	23.0414	23.1352	23.0889	22.9927	22.9927	22.8394
alpha	2.5079	2.5154	2.5154	2.5261	2.5261	2.5393	2.5361	2.5423	2.5393	2.5328	2.5328	2.5226
util living area	0.8605	0.8050	0.7171	0.5814	0.4296	0.2706	0.1807	0.2003	0.3832	0.6250	0.7948	0.8763 (86)
MIT	19.1788	19.5510	20.0544	20.5414	20.8367	20.9658	20.9918	20.9893	20.9108	20.5417	19.8361	19.0963 (87)
Th 2	19.8576	19.8626	19.8626	19.8696	19.8696	19.8782	19.8761	19.8802	19.8782	19.8740	19.8740	19.8674 (88)
util rest of house	0.8422	0.7816	0.6852	0.5395	0.3777	0.2126	0.1160	0.1314	0.3166	0.5752	0.7661	0.8596 (89)
MIT 2	17.8219	18.2725	18.8696	19.4264	19.7360	19.8589	19.8738	19.8769	19.8189	19.4496	18.6379	17.7290 (90)
Living area fraction	18.4215	18.8375	19.3932	19.9191	20.2224	20.3481	20.3679	20.3685	20.3015	19.9322	19.1674	18.4419 (91)
MIT	18.4215	18.8375	19.3932	19.9191	20.2224	20.3481	20.3679	20.3685	20.3015	19.9322	19.1674	18.3332 (92)
Temperature adjustment	18.2715	18.6875	19.2432	19.7691	20.0724	20.1981	20.2179	20.2185	20.1515	19.7822	19.0174	-0.1500
adjusted MIT	18.2715	18.6875	19.2432	19.7691	20.0724	20.1981	20.2179	20.2185	20.1515	19.7822	19.0174	18.1832 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8112	0.7536	0.6661	0.5356	0.3872	0.2294	0.1358	0.1524	0.3333	0.5708	0.7409	0.8287 (94)
Useful gains	630.0162	697.1214	711.5922	664.2890	517.2205	319.7433	179.3764	186.0896	366.7760	534.3397	594.6760	597.4822 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	1044.1413	1032.3502	934.2010	773.0371	553.9746	326.0201	180.3769	187.4450	384.5292	638.0869	859.1882	1027.1367 (97)
Space heating kWh	308.1091	225.2737	165.6210	78.2986	27.3450	0.0000	0.0000	0.0000	0.0000	77.1879	190.4488	319.6630 (98a)
Space heating requirement - total per year (kWh/year)												1391.9472
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	308.1091	225.2737	165.6210	78.2986	27.3450	0.0000	0.0000	0.0000	0.0000	77.1879	190.4488	319.6630 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1391.9472
Space heating per m ²										(98c) / (4) =		22.4508 (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 %)												100.0000 (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	308.1091	225.2737	165.6210	78.2986	27.3450	0.0000	0.0000	0.0000	0.0000	77.1879	190.4488	319.6630 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	308.1091	225.2737	165.6210	78.2986	27.3450	0.0000	0.0000	0.0000	0.0000	77.1879	190.4488	319.6630 (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	150.5072	127.8657	126.6147	97.0932	83.4368	66.3909	66.2599	77.3517	89.6431	114.6117	130.7966	149.9323 (64)
Efficiency of water heater	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)
Fuel for water heating, kWh/month	150.5072	127.8657	126.6147	97.0932	83.4368	66.3909	66.2599	77.3517	89.6431	114.6117	130.7966	149.9323 (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	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822 (231)
Lighting	17.6273	14.1413	12.7327	9.3285	7.2056	5.8870	6.5732	8.5441	11.0979	14.5611	16.4467	18.1172 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-22.9973	-32.1257	-49.0019	-58.7874	-62.9861	-60.0252	-58.8917	-55.6278	-47.7964	-39.1103	-26.4812	-19.4120 (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)

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Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.1958	-0.1299	-1.7947	-6.1884	-11.6775	-15.8238	-15.3292	-12.5976	-8.3975	-2.5775	-0.2532	0.2141 (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	(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	(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												1391.9472 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												100.0000
Water heating fuel used												1280.5040 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
central heating pump												41.0000 (230c)
Total electricity for the above, kWh/year												41.0000 (231)
Electricity for lighting (calculated in Appendix L)												142.2627 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-607.6024 (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												2248.1114 (238)

10a. Fuel costs - using BEDF prices (542)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1391.9472	25.1600	350.2139	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1280.5040	25.1600	322.1748	(247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000	(247a)
Pumps, fans and electric keep-hot	41.0000	25.1600	10.3156	(249)
Energy for lighting	142.2627	25.1600	35.7933	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.2430	25.1600	-134.1639	
PV Unit electricity exported	-74.3594	5.8100	-4.3203	
Total			-138.4842	(252)
Total energy cost			580.0134	(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	1391.9472	0.1565	217.7722	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1280.5040	0.1437	183.9593	(264)
Space and water heating			401.7315	(265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872	(267)
Energy for lighting	142.2627	0.1443	20.5329	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.2430	0.1339	-71.3900	
PV Unit electricity exported	-74.3594	0.1115	-8.2928	
Total			-79.6828	(269)
Total CO2, kg/year			348.2688	(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	1391.9472	1.5792	2198.1537	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1280.5040	1.5313	1960.8929	(278)
Space and water heating			4159.0467	(279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248	(281)
Energy for lighting	142.2627	1.5338	218.2072	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.2430	1.4948	-797.0671	
PV Unit electricity exported	-74.3594	0.4085	-30.3730	
Total			-827.4401	(283)
Total Primary energy kWh/year			3611.8386	(286)