

Part L1 Compliance Report

PROJECT DETAILS

Project reference: 242812

Client:

Property: St Katherines, Forge Lane, Shorne, Gravesend Kent DA12 3DP

Local Authority:

Agent: DAC Architects

Document references:

- Drawings WD-01-7,09, 10-13, DDS 1-8

Assessor: Dr Yanli Suo

Certification No: STRO030184

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Software: Stroma FSAP 10

Prepared on: 4-Dec-24

RESULT SUMMARY

Problem:

Proposed extension does not comply with the requirements of A.D. L1: 10.7. i.e. areas of openings exceed 25% floor area + area of windows and doors no longer exposed.

Solution:

With reference to A.D. L1:10.10, the whole dwelling calculation method (refer to the methodology section for more details) has been used. SAP 10 calculations have been carried out to ascertain that the submitted design achieves a:

PASS

Methodology (whole dwelling calculation method):

Following the above guidance (A.D. L1: 10.10), a “notional dwelling” has been created in the software including the existing dwelling and a notional extension of the same shape and size as the proposed extension. The notional extension is constructed in accordance with L1:Table 4.2 for new thermal elements and having maximum allowable new openings of 7.38m² including:

- 1) 25% new floor area: 4.21m²
- 2) Plus areas of existing windows and doors no longer exposed: 3.17m²

A “proposed dwelling” is then created in the software including the existing dwelling and the proposed works.

To achieve compliance, the dwelling primary energy rate (DPER), the dwelling emission rate (DER) and the dwelling fabric energy efficiency rate (DFEE) for the dwelling and proposed extension do not exceed those for the dwelling plus a notional extension (see A.D. L1:10.10).

Findings:

Proposed DER (kgCO ₂ /m ²)	33.65	Notional DER	33.84
Proposed DFEE (kWh/m ²)	127.23	Notional DFEE	127.82
Proposed DPER (kWhPE/m ²)	182.69	Notional DPER	183.75

Since the proposed dwellings DPER, DER and DFEE are lower than those for the dwelling plus a notional extension, the proposed design is found to be compliant.

Summary for Input Data



Property Reference	excessive glazing	Issued on Date	04/12/2024
Assessment Reference	notional	Prop Type Ref	
Property	St Katherines, St Katherines, Forge Lane, Gravesend, Kent, DA12 3DP		

SAP Rating	66 D	DER	33.84	TER	8.70
Environmental	59 D	% DER < TER			-288.97
CO ₂ Emissions (t/year)	13.31	DFEE	127.82	TFEE	47.99
Compliance Check	See BREL	% DFEE < TFEE			-166.36
% DPER < TPER	-291.38	DPER	183.75	TPER	46.95

Assessor Details	Dr. Yanli Suo	Assessor ID	AY89-0001
Client			

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

Orientation	East	
Property Tenture	1	
Transaction Type	5	
Terrain Type	Rural	
1.0 Property Type	House, Detached	
Which Floor	0	
2.0 Number of Storeys	4	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	0	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	174.38	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	No	
Smart gas meter fitted	No	

7.0 Measurements	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	1.00 m	216.32 m²	2.88 m
1st Storey:	1.00 m	199.50 m²	2.94 m
2nd Storey:	1.00 m	10.81 m²	1.84 m
3rd Storey:	1.00 m	10.81 m²	2.50 m

8.0 Living Area	35.29	m²
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9.0 External Walls	Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
	existing wall	Solid Wall	Solid wall : dense plaster, 200 mm dense block, insulated externally	0.70	190.00	417.69	355.40	0.00	None	62.29	Enter Gross Area
	new wall	Cavity Wall	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure	0.18	60.00	33.02	25.64	0.00	None	7.38	Enter Gross Area

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	Openings
	existing ceiling	External Plane Roof	Plasterboard, insulated at ceiling level	0.70	9.00	199.50	199.50	None	0.00	Enter Gross Area	0.00
	new flat roof	External Flat Roof	Plasterboard, insulated flat roof	0.15	9.00	6.92	6.92	None	0.00	Enter Gross Area	0.00
	new pitched roof	External Slope Roof	Plasterboard, insulated slope	0.15	9.00	11.67	11.67	None	0.00	Enter Gross Area	0.00

11.0 Heat Loss Floors	Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
	existing floor	Ground Floor - Timber	Lowest occupied	Suspended timber, insulation between joists	0.70	None	0.00	20.00	199.50
	new floor	Ground Floor - Solid	Lowest occupied	Suspended concrete floor, carpeted	0.18	None	0.00	75.00	16.82

12.0 Opening Types

Summary for Input Data

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
existing windows	SAP table	Window	Single glazed		Air Filled	0.85	Wood	0.70	4.80
new windows	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.80	1.40
existing door	SAP table	Solid Door			Air Filled	0.00			3.00

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
front door	existing door	existing wall	East	2.21	0
w1-5	existing windows	existing wall	East	6.50	0
w6	existing windows	existing wall	East	1.20	0
w7-8	existing windows	existing wall	East	2.71	0
w9-12	existing windows	existing wall	East	8.28	0
w13	existing windows	existing wall	East	5.85	0
w14	existing windows	existing wall	East	1.08	0
w15,16	existing windows	existing wall	West	3.20	0
w17	existing windows	existing wall	West	0.44	0
w18	existing windows	existing wall	West	0.97	0
w19,26,27	existing windows	existing wall	West	4.07	0
w20-25	existing windows	existing wall	West	2.88	0
w28	existing windows	existing wall	West	0.82	0
w29	existing windows	existing wall	West	1.09	0
w30	existing windows	existing wall	West	1.48	0
w31	existing windows	existing wall	West	1.07	0
w32,33	existing windows	existing wall	West	3.06	0
w34	existing windows	existing wall	West	1.81	0
w35	existing windows	existing wall	North	2.22	0
w36	existing windows	existing wall	North	3.38	0
w37	existing windows	existing wall	North	1.94	0
w38,39	existing windows	existing wall	North	2.44	0
w40-42	existing windows	existing wall	South	3.59	0
max allowable glazing	new windows	new wall	North	7.38	0

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

Y-value

 W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys

Number of open flues

Number of chimneys/flues attached to closed fire

Number of flues attached to solid fuel boiler

Number of flues attached to other heater

Number of blocked chimneys

Number of intermittent extract fans

Number of passive vents

Number of flueless gas fires

21.0 Fixed Cooling System

22.0 Pressure Testing

Property Tested?

Test Method

22.0 Lighting

No Fixed Lighting

Name	Efficacy	Power	Capacity	Count
Lighting	30.00	10.00	300.00	100

24.0 Main Heating 1

Percentage of Heat

 %

Database Ref. No.

Summary for Input Data

Fuel Type	Mains gas
SAP Code	104
In Winter	84.00
In Summer	75.00
Controls SAP Code	2105
Delayed Start Stat	No
HETAS approved System	No
Is MHS Pumped	Pump in heated space
Heating Pump Age	Unknown
Heat Emitter	Radiators
Underfloor Heating	Yes - Pipes in Concrete
Flow Temperature	Unknown
Boiler Interlock	Yes

25.0 Main Heating 2

26.0 Heat Networks

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

27.0 Secondary Heating

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	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	No
Summer Immersion	No
Cold Water Source	From mains
Bath Count	2
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	Combi boiler or unvented hot water system	11.00		No	
shower	Combi boiler or unvented hot water system	11.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	None
Cylinder Stat	No
Cylinder In Heated Space	No
Independent Time Control	No
In Airing Cupboard	No

31.0 Thermal Store

Summary for Input Data



34.0 Small-scale Hydro

Electricity Generated	None	
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

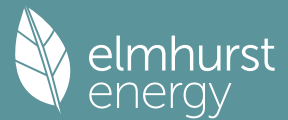
Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout



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Assessor Details	Dr. Yanli Suo			Assessor ID	AY89-0001
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	216.3200 (1b)	x 2.8800 (2b)	= 623.0016 (1b) - (3b)
First floor	199.5000 (1c)	x 2.9400 (2c)	= 586.5300 (1c) - (3c)
Second floor	10.8100 (1d)	x 1.8400 (2d)	= 19.8904 (1d) - (3d)
Third floor	10.8100 (1e)	x 2.5000 (2e)	= 27.0250 (1e) - (3e)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	437.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 1256.4470 (5)

2. Ventilation rate

Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	No	
Pressure Test Method	Blower Door	
Measured/design AP50	15.0000	(17)
Infiltration rate	0.7500	(18)
Number of sides sheltered	0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7500 (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	0.9562	0.9375	0.9188	0.8250	0.8062	0.7125	0.7125	0.6938	0.7500	0.8062	0.8438	0.8813 (22b)
Effective ac	0.9572	0.9395	0.9221	0.8403	0.8250	0.7538	0.7538	0.7406	0.7812	0.8250	0.8560	0.8883 (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
existing windows (Uw = 4.80)			60.0800	4.0268	241.9329		(27)
new windows (Uw = 1.40)			7.3800	1.3258	9.7841		(27)
existing door			2.2100	3.0000	6.6300		(26)
existing floor			199.5000	0.7000	139.6500	20.0000	3990.0000 (28a)
new floor			16.8200	0.1800	3.0276	75.0000	1261.5000 (28a)
existing wall	417.6900	62.2900	355.4000	0.7000	248.7800	190.0000	67526.0000 (29a)
new wall	33.0200	7.3800	25.6400	0.1800	4.6152	60.0000	1538.4000 (29a)
existing ceiling	199.5000		199.5000	0.7000	139.6500	9.0000	1795.5000 (30)
new flat roof	6.9200		6.9200	0.1500	1.0380	9.0000	62.2800 (30)
new pitched roof	11.6700		11.6700	0.1500	1.7505	9.0000	105.0300 (30)
Total net area of external elements Aum(A, m ²)			885.1200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	796.8583		(33)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =		76278.7100	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K						174.3753	(35)
Thermal bridges (Default value 0.200 * total exposed area)						177.0240	(36)
Point Thermal bridges						(36a) =	0.0000

Full SAP Calculation Printout



Total fabric heat loss

(33) + (36) + (36a) = 973.8823 (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	396.8844	389.5231	382.3076	348.4167	342.0758	312.5579	312.5579	307.0916	323.9277	342.0758	354.9033	368.3139	(38)
Heat transfer coeff	1370.7666	1363.4054	1356.1899	1322.2990	1315.9581	1286.4402	1286.4402	1280.9739	1297.8100	1315.9581	1328.7856	1342.1962	(39)
Average = Sum(39)m / 12 =												1322.2686	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	3.1336	3.1168	3.1003	3.0228	3.0083	2.9408	2.9408	2.9283	2.9668	3.0083	3.0376	3.0683	(40)
HLP (average)												3.0227	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.3106 (42)
Hot water usage for mixer showers													
109.6258	107.9784	105.5777	100.9844	97.5947	93.8145	91.6659	94.0484	96.6601	100.7188	105.4107	109.2058	109.2058	(42a)
Hot water usage for baths													
36.2198	35.6819	34.9244	33.5277	32.4819	31.3222	30.6958	31.4480	32.2670	33.5079	34.9334	36.0974	36.0974	(42b)
Hot water usage for other uses													
51.0883	49.2305	47.3728	45.5150	43.6573	41.7995	41.7995	43.6573	45.5150	47.3728	49.2305	51.0883	51.0883	(42c)
Average daily hot water use (litres/day)												181.0967	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
196.9339	192.8908	187.8748	180.0271	173.7338	166.9363	164.1612	169.1537	174.4421	181.5995	189.5746	196.3914	196.3914	(44)
Energy conte	311.8952	274.6739	288.7566	246.4481	233.8791	205.2676	198.5388	209.4476	215.1046	246.4288	270.0838	307.5015	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
46.7843	41.2011	43.3135	36.9672	35.0819	30.7901	29.7808	31.4171	32.2657	36.9643	40.5126	46.1252	46.1252	(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	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	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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
362.8541	320.7013	339.7155	295.7632	284.8380	254.5827	249.4977	260.4065	264.4196	297.3877	319.3989	358.4604	358.4604	(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													
362.8541	320.7013	339.7155	295.7632	284.8380	254.5827	249.4977	260.4065	264.4196	297.3877	319.3989	358.4604	358.4604	(64)
Total per year (kWh/year)													
12Total per year (kWh/year) = Sum(64)m =												3608.0256	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
116.4449	102.8359	108.7513	94.2728	90.5045	80.5802	78.7539	82.3810	83.8510	94.6773	102.1316	114.9840	114.9840	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
291.1837	322.3820	291.1837	300.8899	291.1837	300.8899	291.1837	291.1837	300.8899	291.1837	300.8899	291.1837	291.1837	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
561.9383	567.7694	553.0751	521.7926	482.3040	445.1904	420.3962	414.5650	429.2593	460.5418	500.0304	537.1440	537.1440	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	(69)
Pumps, fans	7.0000	7.0000	7.0000	7.0000	7.0000	0.0000	0.0000	0.0000	0.0000	7.0000	7.0000	7.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	(71)
Water heating gains (Table 5)													
156.5119	153.0296	146.1711	130.9344	121.6459	111.9170	105.8520	110.7272	116.4598	127.2544	141.8495	154.5484	154.5484	(72)
Total internal gains													
1089.2929	1122.8401	1070.0889	1033.2759	974.7927	930.6563	890.0909	889.1350	919.2680	958.6390	1022.4288	1062.5352	1062.5352	(73)

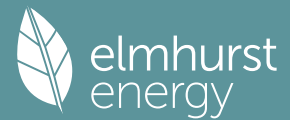
6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North				9.9800	10.6334		0.8500		0.7000		0.7700		43.7575 (74)
East				25.6200	19.6403		0.8500		0.7000		0.7700		207.4802 (76)
South				3.5900	46.7521		0.8500		0.7000		0.7700		69.2063 (78)
West				20.8900	19.6403		0.8500		0.7000		0.7700		169.1749 (80)
North				7.3800	10.6334		0.6300		0.8000		0.7700		27.4089 (74)
Solar gains	517.0278	986.1620	1588.9126	2304.1067	2838.9520	2919.1749	2773.4110	2367.4584	1839.9517	1158.4392	639.4706		428.8713 (83)
Total gains	1606.3207	2109.0021	2659.0015	3337.3826	3813.7446	3849.8311	3663.5019	3256.5934	2759.2197	2117.0783	1661.8994	1491.4064	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	15.4574	15.5409	15.6236	16.0240	16.1012	16.4707	16.4707	16.5410	16.3264	16.1012	15.9458	15.7865	
alpha	2.0305	2.0361	2.0416	2.0683	2.0734	2.0980	2.0980	2.1027	2.0884	2.0734	2.0631	2.0524	
util living area													

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	0.9958	0.9923	0.9854	0.9688	0.9369	0.8806	0.8087	0.8472	0.9392	0.9823	0.9937	0.9965 (86)
MIT	16.3510	16.6521	17.2579	18.1610	19.0684	19.9082	20.3919	20.2921	19.5717	18.4128	17.2690	16.3512 (87)
Th 2	18.6847	18.6927	18.7007	18.7386	18.7458	18.7799	18.7799	18.7863	18.7667	18.7458	18.7313	18.7162 (88)
util rest of house												
	0.9944	0.9897	0.9798	0.9547	0.9002	0.7815	0.5835	0.6560	0.8844	0.9720	0.9910	0.9953 (89)
MIT 2	14.7281	15.0323	15.6399	16.5541	17.4443	18.2459	18.6296	18.5783	17.9550	16.8150	15.6681	14.7436 (90)
Living area fraction									FLA = Living area / (4) =			0.0807 (91)
MIT	14.8591	15.1630	15.7705	16.6838	17.5753	18.3800	18.7717	18.7166	18.0854	16.9439	15.7973	14.8733 (92)
Temperature adjustment												0.0000
adjusted MIT	14.8591	15.1630	15.7705	16.6838	17.5753	18.3800	18.7717	18.7166	18.0854	16.9439	15.7973	14.8733 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9897	0.9819	0.9666	0.9321	0.8679	0.7522	0.5821	0.6457	0.8533	0.9559	0.9843	0.9914	(94)
Useful gains	1589.8516	2070.8746	2570.2988	3110.6557	3309.8951	2895.9580	2132.6890	2102.8250	2354.5759	2023.8191	1635.7926	1478.5317	(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	14473.9945	13992.6416	12572.5162	10292.4693	7731.6441	4862.7744	2793.8254	2967.4958	5172.3227	8348.3552	11556.7849	14325.6002	(97)
Space heating kWh	9585.8024	8011.4275	7441.6498	5170.9057	3289.7813	0.0000	0.0000	0.0000	0.0000	4705.4548	7143.1144	9558.2190	(98a)
Space heating requirement - total per year (kWh/year)												54906.3549	
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	9585.8024	8011.4275	7441.6498	5170.9057	3289.7813	0.0000	0.0000	0.0000	0.0000	4705.4548	7143.1144	9558.2190	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												54906.3549	
Space heating per m2										(98c) / (4) =		125.5175	(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 %)													84.0000 (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	9585.8024	8011.4275	7441.6498	5170.9057	3289.7813	0.0000	0.0000	0.0000	0.0000	4705.4548	7143.1144	9558.2190	(98)
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000	(210)
Space heating fuel (main heating system)	11411.6695	9537.4137	8859.1069	6155.8402	3916.4063	0.0000	0.0000	0.0000	0.0000	5601.7319	8503.7077	11378.8322	(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	362.8541	320.7013	339.7155	295.7632	284.8380	254.5827	249.4977	260.4065	264.4196	297.3877	319.3989	358.4604	(64)
Efficiency of water heater (217)m	83.6340	83.6138	83.5622	83.4582	83.2044	75.0000	75.0000	75.0000	75.0000	83.4051	83.5708	83.6372	(216)
Fuel for water heating, kWh/month	433.8597	383.5506	406.5420	354.3850	342.3353	339.4436	332.6636	347.2087	352.5595	356.5584	382.1897	428.5896	(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	9.7671	8.8219	9.7671	9.4521	9.7671	9.4521	9.7671	9.7671	9.4521	9.7671	9.4521	9.7671	(231)
Lighting	105.4506	84.5964	76.1696	55.8051	43.1055	35.2176	39.3223	51.1126	66.3902	87.1075	98.3877	108.3814	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)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	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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												65364.7083	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												75.0000	
Water heating fuel used												4459.8857	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												115.0000	(230c)
Total electricity for the above, kWh/year												115.0000	(231)
Electricity for lighting (calculated in Appendix L)												851.0464	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(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												70790.6404	(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	65364.7083	0.2100	13726.5887 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	4459.8857	0.2100	936.5760 (264)
Space and water heating			14663.1647 (265)
Pumps, fans and electric keep-hot	115.0000	0.1387	15.9519 (267)
Energy for lighting	851.0464	0.1443	122.8323 (268)
Total CO2, kg/year			14801.9489 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			33.8400 (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	65364.7083	1.1300	73862.1203 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	4459.8857	1.1300	5039.6708 (278)
Space and water heating			78901.7912 (279)
Pumps, fans and electric keep-hot	115.0000	1.5128	173.9720 (281)
Energy for lighting	851.0464	1.5338	1305.3634 (282)
Total Primary energy kWh/year			80381.1266 (286)
Dwelling Primary energy Rate (DPER)			183.7500 (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	216.3200 (1b)	x	2.8800 (2b)	=	623.0016 (1b) - (3b)	
First floor	199.5000 (1c)	x	2.9400 (2c)	=	586.5300 (1c) - (3c)	
Second floor	10.8100 (1d)	x	1.8400 (2d)	=	19.8904 (1d) - (3d)	
Third floor	10.8100 (1e)	x	2.5000 (2e)	=	27.0250 (1e) - (3e)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	437.4400				(4)	
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	1256.4470 (5)	

2. Ventilation rate

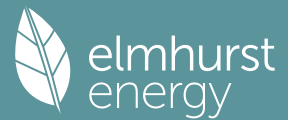
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.0318 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.2818 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2818 (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	0.3593	0.3523	0.3452	0.3100	0.3030	0.2677	0.2677	0.2607	0.2818	0.3030	0.3171	0.3312 (22b)
Effective ac	0.5646	0.5621	0.5596	0.5481	0.5459	0.5358	0.5358	0.5340	0.5397	0.5459	0.5503	0.5548 (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			2.2100	1.0000	2.2100		(26)
TER Opening Type (Uw = 1.20)			67.4600	1.1450	77.2443		(27)
existing floor			199.5000	0.1300	25.9350		(28a)
new floor			16.8200	0.1300	2.1866		(28a)
existing wall	417.6900	62.2900	355.4000	0.1800	63.9720		(29a)
new wall	33.0200	7.3800	25.6400	0.1800	4.6152		(29a)
existing ceiling	199.5000		199.5000	0.1100	21.9450		(30)
new flat roof	6.9200		6.9200	0.1100	0.7612		(30)
new pitched roof	11.6700		11.6700	0.1100	1.2837		(30)
Total net area of external elements Aum(A, m2)			885.1200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	200.1530		(33)

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Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 174.3753 (35)
 Thermal bridges (User defined value 0.050 * total exposed area) 44.2560 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 244.4090 (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	234.0833	233.0438	232.0249	227.2391	226.3437	222.1754	222.1754	221.4035	223.7810	226.3437	228.1551	230.0488 (38)
Average = Sum(39)m / 12 =	478.4923	477.4528	476.4339	471.6481	470.7527	466.5844	466.5844	465.8125	468.1900	470.7527	472.5641	474.4578 (39)
												471.6438
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0938	1.0915	1.0891	1.0782	1.0762	1.0666	1.0666	1.0649	1.0703	1.0762	1.0803	1.0846 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	3.3106 (42)											
Hot water usage for mixer showers	79.7279	78.5297	76.7838	73.4432	70.9780	68.2287	66.6661	68.3988	70.2982	73.2500	76.6624	79.4224 (42a)
Hot water usage for baths	34.4088	33.8978	33.1782	31.8513	30.8578	29.7561	29.1610	29.8756	30.6537	31.8325	33.1867	34.2925 (42b)
Hot water usage for other uses	48.5339	46.7690	45.0041	43.2393	41.4744	39.7095	39.7095	41.4744	43.2393	45.0041	46.7690	48.5339 (42c)
Average daily hot water use (litres/day)												149.5305 (43)
Daily hot water use	162.6705	159.1965	154.9661	148.5338	143.3101	137.6944	135.5367	139.7489	144.1912	150.0867	156.6180	162.2488 (44)
Energy conte	257.6304	226.6937	238.1771	203.3353	192.9230	169.3113	163.9199	173.0383	177.8021	203.6662	223.1311	254.0423 (45)
Energy content (annual)										Total = Sum(45)m =		2483.6708
Distribution loss (46)m = 0.15 x (45)m	38.6446	34.0041	35.7266	30.5003	28.9385	25.3967	24.5880	25.9557	26.6703	30.5499	33.4697	38.1064 (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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	308.5893	272.7211	289.1360	252.6504	243.8819	218.6264	214.8788	223.9972	227.1172	254.6251	272.4462	305.0012 (62)
WWHRS	-36.4482	-32.2351	-33.7548	-27.9503	-26.0487	-22.2900	-20.8933	-22.2180	-23.0621	-27.1877	-30.8004	-35.7733 (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	272.1410	240.4860	255.3812	224.7001	217.8332	196.3364	193.9854	201.7792	204.0551	227.4374	241.6458	269.2280 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2745.0089 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												0.0000 (64a)
Heat gains from water heating, kWh/month	98.4018	86.8825	91.9336	79.9378	76.8866	68.6248	67.2431	70.2750	71.4480	80.4587	86.5199	97.2088 (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	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	297.8998	329.8176	297.8998	307.8298	297.8998	307.8298	297.8998	297.8998	307.8298	297.8998	307.8298	297.8998 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	561.9383	567.7694	553.0751	521.7926	482.3040	445.1904	420.3962	414.5650	429.2593	460.5418	500.0304	537.1440 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530 (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)	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241 (71)
Water heating gains (Table 5)	132.2605	129.2894	123.5667	111.0247	103.3422	95.3122	90.3805	94.4556	99.2333	108.1435	120.1665	130.6570 (72)
Total internal gains	1067.7576	1102.5355	1050.2006	1016.3061	959.2051	920.9914	881.3355	879.5794	908.9815	942.2441	1003.6857	1041.3599 (73)

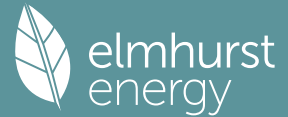
6. Solar gains

[Jan]												
				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d	Gains W
North				17.3600	10.6334		0.6300		0.7000		0.7700	56.4148 (74)
East				25.6200	19.6403		0.6300		0.7000		0.7700	153.7794 (76)
South				3.5900	46.7521		0.6300		0.7000		0.7700	51.2941 (78)
West				20.8900	19.6403		0.6300		0.7000		0.7700	125.3885 (80)
Solar gains	386.8768	737.9297	1189.5757	1726.8820	2129.9374	2191.2145	2081.3464	1775.1413	1378.0499	866.9520	478.4855	320.9271 (83)
Total gains	1454.6344	1840.4652	2239.7763	2743.1880	3089.1425	3112.2058	2962.6819	2654.7207	2287.0314	1809.1961	1482.1711	1362.2869 (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	44.2819	44.3783	44.4732	44.9245	45.0099	45.4120	45.4120	45.4873	45.2563	45.0099	44.8374	44.6584
alpha	3.9521	3.9586	3.9649	3.9950	4.0007	4.0275	4.0275	4.0325	4.0171	4.0007	3.9892	3.9772
util living area	0.9990	0.9973	0.9922	0.9714	0.9116	0.7842	0.6353	0.7077	0.9114	0.9882	0.9980	0.9993 (86)
MIT	18.8657	19.0886	19.4684	20.0031	20.4879	20.8207	20.9438	20.9132	20.6237	19.9810	19.3330	18.8374 (87)
Th 2	20.0059	20.0078	20.0097	20.0187	20.0204	20.0282	20.0282	20.0296	20.0252	20.0204	20.0170	20.0134 (88)
util rest of house	0.9988	0.9967	0.9900	0.9627	0.8824	0.7114	0.5182	0.5951	0.8697	0.9834	0.9973	0.9991 (89)
MIT 2	17.4663	17.7532	18.2403	18.9240	19.5192	19.8937	20.0010	19.9828	19.6944	18.9032	18.0727	17.4348 (90)
Living area fraction	17.5792	17.8609	18.3394	19.0111	19.5974	19.9685	20.0771	20.0579	19.7694	18.9901	18.1744	17.5479 (92)
MIT												0.0000
Temperature adjustment												0.0000
adjusted MIT	17.5792	17.8609	18.3394	19.0111	19.5974	19.9685	20.0771	20.0579	19.7694	18.9901	18.1744	17.5479 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9977	0.9942	0.9844	0.9502	0.8666	0.7062	0.5246	0.5988	0.8555	0.9757	0.9953	0.9983 (94)
Useful gains	1451.3259	1829.8001	2204.7413	2606.6301	2676.9356	2197.9075	1554.1394	1589.5187	1956.4768	1765.1654	1475.2289	1359.9149 (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	6353.9861	6188.2271	5640.6688	4768.8585	3717.7127	2504.8651	1622.3564	1703.8793	2654.3393	3949.6633	5233.3571	6333.0236 (97)
Space heating kWh	3647.5792	2928.8629	2556.3300	1556.8044	774.3381	0.0000	0.0000	0.0000	0.0000	1625.2664	2705.8523	3699.9929 (98a)
Space heating requirement - total per year (kWh/year)												19495.0263
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	3647.5792	2928.8629	2556.3300	1556.8044	774.3381	0.0000	0.0000	0.0000	0.0000	1625.2664	2705.8523	3699.9929 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												19495.0263
Space heating per m2										(98c) / (4) =		44.5662 (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 %)	92.4000 (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	3647.5792	2928.8629	2556.3300	1556.8044	774.3381	0.0000	0.0000	0.0000	0.0000	1625.2664	2705.8523	3699.9929 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	3947.5965	3169.7650	2766.5909	1684.8532	838.0283	0.0000	0.0000	0.0000	0.0000	1758.9463	2928.4116	4004.3213 (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	272.1410	240.4860	255.3812	224.7001	217.8332	196.3364	193.9854	201.7792	204.0551	227.4374	241.6458	269.2280 (64)
Efficiency of water heater (217)m	88.2438	88.1834	88.0436	87.7151	86.8577	80.3000	80.3000	80.3000	80.3000	87.7464	88.1262	80.3000 (216)
Fuel for water heating, kWh/month	308.3966	272.7112	290.0623	256.1703	250.7934	244.5036	241.5759	251.2817	254.1159	259.1987	274.2042	305.0436 (219)

Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	61.8977	49.6566	44.7103	32.7567	25.3022	20.6721	23.0815	30.0022	38.9699	51.1306	57.7519	63.6180 (232)

Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-160.6821	-208.1997	-275.0375	-282.9916	-284.1564	-257.3796	-253.4332	-248.5910	-238.4510	-223.8103	-169.6085	-141.0948 (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	-156.0530	-317.6839	-613.2569	-896.3915	-1162.8826	-1161.1025	-1148.0799	-982.6550	-734.2502	-446.4953	-205.5674	-124.3039 (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												21098.5133 (211)

Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)

Efficiency of water heater												80.3000
Water heating fuel used												3208.0574 (219)

Space cooling fuel												0.0000 (221)
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Electricity for pumps and fans:												
Total electricity for the above, kWh/year												86.0000 (231)

Electricity for lighting (calculated in Appendix L)												499.5498 (232)
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Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-10692.1580 (233)

Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)

Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
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Appendix Q - special features												
Energy saved or generated												-0.0000 (236)

Energy used												0.0000 (237)
Total delivered energy for all uses												14199.9625 (238)

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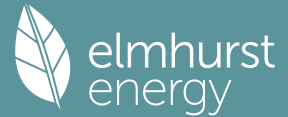
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	21098.5133	0.2100	4430.6878 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3208.0574	0.2100	673.6921 (264)
Space and water heating			5104.3798 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	499.5498	0.1443	72.1005 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2743.4358	0.1365	-374.5577
PV Unit electricity exported	-7948.7221	0.1267	-1007.1258
Total			-1381.6835 (269)
Total CO2, kg/year			3806.7260 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.7000 (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	21098.5133	1.1300	23841.3200 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3208.0574	1.1300	3625.1049 (278)
Space and water heating			27466.4249 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	499.5498	1.5338	766.2262 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2743.4358	1.5047	-4128.0278
PV Unit electricity exported	-7948.7221	0.4651	-3697.1156
Total			-7825.1434 (283)
Total Primary energy kWh/year			20537.6085 (286)
Target Primary Energy Rate (TPER)			46.9500 (287)

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Property Reference	excessive glazing			Issued on Date	04/12/2024
Assessment Reference	notional	Prop Type Ref			
Property	St Katherines, St Katherines, Forge Lane, Gravesend, Kent, DA12 3DP				
SAP Rating	66 D	DER	33.84	TER	8.70
Environmental	59 D	% DER < TER			-288.97
CO ₂ Emissions (t/year)	13.31	DFEE	127.82	TFEE	47.99
Compliance Check	See BREL	% DFEE < TFEE			-166.36
% DPER < TPER	-291.38	DPER	183.75	TPER	46.95
Assessor Details	Dr. Yanli Suo			Assessor ID	AY89-0001
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	216.3200 (1b)	x 2.8800 (2b)	= 623.0016 (1b) - (3b)
First floor	199.5000 (1c)	x 2.9400 (2c)	= 586.5300 (1c) - (3c)
Second floor	10.8100 (1d)	x 1.8400 (2d)	= 19.8904 (1d) - (3d)
Third floor	10.8100 (1e)	x 2.5000 (2e)	= 27.0250 (1e) - (3e)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	437.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	1256.4470 (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	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

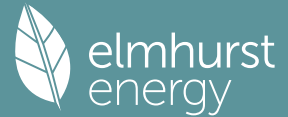
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0318 (8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.7818	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7818	(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	0.9968	0.9773	0.9577	0.8600	0.8405	0.7427	0.7427	0.7232	0.7818	0.8405	0.8796	0.9187 (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	0.9968	0.9776	0.9586	0.8698	0.8532	0.7758	0.7758	0.7615	0.8056	0.8532	0.8868	0.9220 (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
existing windows (Uw = 4.80)			60.0800	4.0268	241.9329		(27)
new windows (Uw = 1.40)			7.3800	1.3258	9.7841		(27)
existing door			2.2100	3.0000	6.6300		(26)
existing floor			199.5000	0.7000	139.6500	20.0000	3990.0000 (28a)
new floor			16.8200	0.1800	3.0276	75.0000	1261.5000 (28a)
existing wall	417.6900	62.2900	355.4000	0.7000	248.7800	190.0000	67526.0000 (29a)
new wall	33.0200	7.3800	25.6400	0.1800	4.6152	60.0000	1538.4000 (29a)
existing ceiling	199.5000		199.5000	0.7000	139.6500	9.0000	1795.5000 (30)
new flat roof	6.9200		6.9200	0.1500	1.0380	9.0000	62.2800 (30)
new pitched roof	11.6700		11.6700	0.1500	1.7505	9.0000	105.0300 (30)
Total net area of external elements Aum(A, m ²)			885.1200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	796.8583		(33)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	76278.7100 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							174.3753 (35)

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Thermal bridges (Default value 0.200 * total exposed area)
 Point Thermal bridges (36a) = 177.0240 (36)
 Total fabric heat loss (33) + (36) + (36a) = 973.8823 (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	413.3196	405.3202	397.4791	360.6499	353.7593	321.6823	321.6823	315.7421	334.0379	353.7593	367.6989	382.2722	(38)
Heat transfer coeff	1387.2019	1379.2024	1371.3614	1334.5322	1327.6416	1295.5645	1295.5645	1289.6243	1307.9201	1327.6416	1341.5812	1356.1545	(39)
Average = Sum(39)m / 12 =												1334.4992	
HLP	3.1712	3.1529	3.1350	3.0508	3.0350	2.9617	2.9617	2.9481	2.9899	3.0350	3.0669	3.1002	(40)
HLP (average)												3.0507	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.3106 (42)
Hot water usage for mixer showers													0.0000 (42a)
Hot water usage for baths													34.4088 (42b)
Hot water usage for other uses													48.5339 (42c)
Average daily hot water use (litres/day)													76.0241 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	82.9427	80.6668	78.1823	75.0906	72.3322	69.4656	68.8706	71.3500	73.8930	76.8367	79.9557	82.8264	(44)
Energy content (annual)	131.3609	114.8684	120.1633	102.7953	97.3730	85.4161	83.2930	88.3462	91.1174	104.2666	113.9115	129.6861	(45)
Distribution loss (46)m = 0.15 x (45)m													1262.5979
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Total heat required for water heating calculated for each month													
WWHRS	111.6568	97.6382	102.1388	87.3760	82.7671	72.6037	70.7990	75.0943	77.4498	88.6266	96.8248	110.2332	(62)
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	(63a)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
Output from w/h	111.6568	97.6382	102.1388	87.3760	82.7671	72.6037	70.7990	75.0943	77.4498	88.6266	96.8248	110.2332	(64)
12Total per year (kWh/year)													1073.2082 (64)
Electric shower(s)													1073 (64)
Heat gains from water heating, kWh/month													
	43.8764	38.6320	41.0651	36.6644	35.7903	32.5535	32.5824	33.8721	34.1829	37.6870	39.4445	43.5205	(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	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
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)													
Water heating gains (Table 5)													
Total internal gains	984.7546	1020.2985	972.1128	946.2643	894.2520	863.9524	828.0324	823.9348	850.2844	875.0392	928.3633	959.4821	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d		Gains W
North					9.9800	10.6334	0.8500	0.7000		0.7700		43.7575 (74)
East					25.6200	19.6403	0.8500	0.7000		0.7700		207.4802 (76)
South					3.5900	46.7521	0.8500	0.7000		0.7700		69.2063 (78)
West					20.8900	19.6403	0.8500	0.7000		0.7700		169.1749 (80)
North					7.3800	10.6334	0.6300	0.8000		0.7700		27.4089 (74)
Solar gains	517.0278	986.1620	1588.9126	2304.1067	2838.9520	2919.1749	2773.4110	2367.4584	1839.9517	1158.4392	639.4706	428.8713 (83)
Total gains	1501.7824	2006.4605	2561.0254	3250.3710	3733.2040	3783.1273	3601.4434	3191.3932	2690.2361	2033.4784	1567.8340	1388.3533 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	15.2743	15.3629	15.4507	15.8771	15.9595	16.3547	16.3547	16.4300	16.2002	15.9595	15.7937	15.6240	

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alpha	2.0183	2.0242	2.0300	2.0585	2.0640	2.0903	2.0903	2.0953	2.0800	2.0640	2.0529	2.0416
util living area	0.9963	0.9930	0.9864	0.9703	0.9394	0.8843	0.8140	0.8523	0.9420	0.9836	0.9943	0.9969 (86)
MIT	16.2978	16.6007	17.2107	18.1237	19.0381	19.8889	20.3780	20.2767	19.5488	18.3796	17.2273	16.3017 (87)
Th 2	18.6669	18.6755	18.6840	18.7248	18.7326	18.7693	18.7693	18.7762	18.7550	18.7326	18.7169	18.7007 (88)
util rest of house	0.9950	0.9905	0.9811	0.9568	0.9037	0.7867	0.5897	0.6631	0.8889	0.9740	0.9919	0.9958 (89)
MIT 2	14.6665	14.9729	15.5851	16.5109	17.4092	18.2244	18.6150	18.5627	17.9284	16.7759	15.6196	14.6867 (90)
Living area fraction	14.7981	15.1042	15.7163	16.6411	17.5406	18.3587	18.7572	18.7010	18.0591	16.9053	15.7493	14.8170 (92)
MIT	14.7981	15.1042	15.7163	16.6411	17.5406	18.3587	18.7572	18.7010	18.0591	16.9053	15.7493	14.8170 (92)
Temperature adjustment												0.0000
adjusted MIT	14.7981	15.1042	15.7163	16.6411	17.5406	18.3587	18.7572	18.7010	18.0591	16.9053	15.7493	14.8170 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9908	0.9833	0.9685	0.9347	0.8716	0.7570	0.5877	0.6520	0.8580	0.9587	0.9858	0.9924 (94)
Useful gains	1488.0272	1973.0095	2480.4668	3038.0815	3253.9578	2863.8590	2116.6225	2080.7697	2308.3496	1949.3963	1545.5174	1377.7623 (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	14562.9911	14073.7213	12638.8385	10330.6808	7754.2573	4869.6615	2794.8469	2967.3642	5178.2500	8371.1708	11603.7831	14398.3309 (97)
Space heating kWh	9727.7731	8131.6784	7557.8285	5250.6715	3348.2228	0.0000	0.0000	0.0000	0.0000	4777.8002	7241.9513	9687.3030 (98a)
Space heating requirement - total per year (kWh/year)												55723.2289
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	9727.7731	8131.6784	7557.8285	5250.6715	3348.2228	0.0000	0.0000	0.0000	0.0000	4777.8002	7241.9513	9687.3030 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												55723.2289
Space heating per m2												(98c) / (4) = 127.3849 (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	12178.3066	9587.1776	9801.1450	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.3242	0.3803	0.3368	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	3948.4916	3645.7450	3300.9400	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	4271.5626	4064.8152	3591.6098	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	232.6111	311.7882	216.2583	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	58.1528	77.9471	54.0646	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												190.1644 (107)
Energy for space heating												127.3849 (99)
Energy for space cooling												0.4347 (108)
Total												127.8196 (109)
Fabric Energy Efficiency (DFEE)												127.8 (109)

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

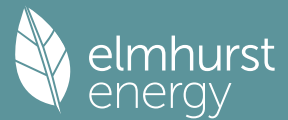
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	216.3200 (1b)	x 2.8800 (2b)	= 623.0016 (1b) - (3b)
First floor	199.5000 (1c)	x 2.9400 (2c)	= 586.5300 (1c) - (3c)
Second floor	10.8100 (1d)	x 1.8400 (2d)	= 19.8904 (1d) - (3d)
Third floor	10.8100 (1e)	x 2.5000 (2e)	= 27.0250 (1e) - (3e)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	437.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	1256.4470 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.0318 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)

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Infiltration rate	0.2818 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = $1 - [0.075 \times (19)] = 1.0000$ (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2818 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
	0.3593	0.3523	0.3452	0.3100	0.3030	0.2677	0.2677	0.2607	0.2818	0.3030	0.3171	0.3312	(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	0.5646	0.5621	0.5596	0.5481	0.5459	0.5358	0.5358	0.5340	0.5397	0.5459	0.5503	0.5548	(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			2.2100	1.0000	2.2100			(26)
TER Opening Type (Uw = 1.20)			67.4600	1.1450	77.2443			(27)
existing floor			199.5000	0.1300	25.9350			(28a)
new floor			16.8200	0.1300	2.1866			(28a)
existing wall	417.6900	62.2900	355.4000	0.1800	63.9720			(29a)
new wall	33.0200	7.3800	25.6400	0.1800	4.6152			(29a)
existing ceiling	199.5000		199.5000	0.1100	21.9450			(30)
new flat roof	6.9200		6.9200	0.1100	0.7612			(30)
new pitched roof	11.6700		11.6700	0.1100	1.2837			(30)
Total net area of external elements Aum (A, m2)			885.1200					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 200.1530			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							174.3753	(35)
Thermal bridges (User defined value 0.050 * total exposed area)							44.2560	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss						(33) + (36) + (36a) =	244.4090	(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	234.0833	233.0438	232.0249	227.2391	226.3437	222.1754	222.1754	221.4035	223.7810	226.3437	228.1551	230.0488	(38)
Average = Sum(39)m / 12 =	478.4923	477.4528	476.4339	471.6481	470.7527	466.5844	466.5844	465.8125	468.1900	470.7527	472.5641	474.4578	(39)
												471.6438	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0938	1.0915	1.0891	1.0782	1.0762	1.0666	1.0666	1.0649	1.0703	1.0762	1.0803	1.0846	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

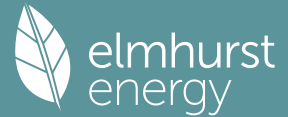
4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.3106 (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	34.4088	33.8978	33.1782	31.8513	30.8578	29.7561	29.1610	29.8756	30.6537	31.8325	33.1867	34.2925	(42b)
Hot water usage for other uses	48.5339	46.7690	45.0041	43.2393	41.4744	39.7095	39.7095	41.4744	43.2393	45.0041	46.7690	48.5339	(42c)
Average daily hot water use (litres/day)												76.0241	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	82.9427	80.6668	78.1823	75.0906	72.3322	69.4656	68.8706	71.3500	73.8930	76.8367	79.9557	82.8264	(44)
Energy content (annual)	131.3609	114.8684	120.1633	102.7953	97.3730	85.4161	83.2930	88.3462	91.1174	104.2666	113.9115	129.6861	(45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	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	111.6568	97.6382	102.1388	87.3760	82.7671	72.6037	70.7990	75.0943	77.4498	88.6266	96.8248	110.2332	(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	111.6568	97.6382	102.1388	87.3760	82.7671	72.6037	70.7990	75.0943	77.4498	88.6266	96.8248	110.2332	(64)
12Total per year (kWh/year)												1073.2082	(64)
Electric shower(s)	63.8487	56.8897	62.1214	59.2817	60.3941	57.6101	59.5305	60.3941	59.2817	62.1214	60.9533	63.8487	(64a)
Heat gains from water heating, kWh/month	43.8764	38.6320	41.0651	36.6644	35.7903	32.5535	32.5824	33.8721	34.1829	37.6870	39.4445	43.5205	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	297.8998	329.8176	297.8998	307.8298	297.8998	307.8298	297.8998	297.8998	307.8298	297.8998	307.8298	297.8998	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	561.9383	567.7694	553.0751	521.7926	482.3040	445.1904	420.3962	414.5650	429.2593	460.5418	500.0304	537.1440	(68)
	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	(69)

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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)	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241 (71)
Water heating gains (Table 5)	58.9736	57.4881	55.1950	50.9228	48.1052	45.2131	43.7935	45.5270	47.4762	50.6546	54.7841	58.4953 (72)
Total internal gains	991.4707	1027.7341	978.8289	953.2042	900.9681	870.8923	834.7485	830.6508	857.2244	881.7552	935.3033	966.1981 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
North					17.3600	10.6334		0.6300	0.7000	0.7700		56.4148 (74)	
East					25.6200	19.6403		0.6300	0.7000	0.7700		153.7794 (76)	
South					3.5900	46.7521		0.6300	0.7000	0.7700		51.2941 (78)	
West					20.8900	19.6403		0.6300	0.7000	0.7700		125.3885 (80)	
Solar gains	386.8768	737.9297	1189.5757	1726.8820	2129.9374	2191.2145	2081.3464	1775.1413	1378.0499	866.9520	478.4855	320.9271	(83)
Total gains	1378.3475	1765.6639	2168.4046	2680.0862	3030.9055	3062.1068	2916.0949	2605.7922	2235.2743	1748.7072	1413.7887	1287.1252	(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	44.2819	44.3783	44.4732	44.9245	45.0099	45.4120	45.4120	45.4873	45.2563	45.0099	44.8374	44.6584
alpha	3.9521	3.9586	3.9649	3.9950	4.0007	4.0275	4.0275	4.0325	4.0171	4.0007	3.9892	3.9772
util living area	0.9992	0.9977	0.9930	0.9735	0.9160	0.7909	0.6428	0.7163	0.9167	0.9895	0.9983	0.9994 (86)
MIT	18.8409	19.0645	19.4459	19.9848	20.4748	20.8145	20.9414	20.9092	20.6121	19.9621	19.3108	18.8128 (87)
Th 2	20.0059	20.0078	20.0097	20.0187	20.0204	20.0282	20.0282	20.0296	20.0252	20.0204	20.0170	20.0134 (88)
util rest of house	0.9990	0.9971	0.9911	0.9653	0.8878	0.7188	0.5253	0.6039	0.8767	0.9852	0.9978	0.9993 (89)
MIT 2	18.0020	18.2267	18.6084	19.1480	19.6184	19.9192	20.0060	19.9912	19.7578	19.1312	18.4796	17.9794 (90)
Living area fraction	18.0696	18.2943	18.6760	19.2155	19.6875	19.9915	20.0814	20.0652	19.8267	19.1983	18.5467	18.0466 (92)
MIT	18.0696	18.2943	18.6760	19.2155	19.6875	19.9915	20.0814	20.0652	19.8267	19.1983	18.5467	18.0466 (93)
Temperature adjustment												0.0000
adjusted MIT	18.0696	18.2943	18.6760	19.2155	19.6875	19.9915	20.0814	20.0652	19.8267	19.1983	18.5467	18.0466 (93)

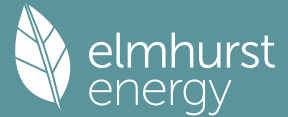
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9984	0.9956	0.9872	0.9563	0.8759	0.7157	0.5324	0.6086	0.8662	0.9799	0.9965	0.9988 (94)
Useful gains	1376.0964	1757.8164	2140.7547	2562.9538	2654.8397	2191.5971	1552.4077	1585.8339	1936.1515	1713.5966	1408.8383	1285.5422 (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	6588.6710	6395.1274	5801.0527	4865.2747	3760.1215	2515.5702	1624.3799	1707.3055	2681.1714	4047.6569	5409.2993	6569.6233 (97)
Space heating kWh	3878.1554	3116.2730	2723.2617	1657.6711	822.3297	0.0000	0.0000	0.0000	0.0000	1736.5409	2880.3319	3931.3564 (98a)
Space heating requirement - total per year (kWh/year)												20745.9201
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	3878.1554	3116.2730	2723.2617	1657.6711	822.3297	0.0000	0.0000	0.0000	0.0000	1736.5409	2880.3319	3931.3564 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												20745.9201
Space heating per m2										(98c) / (4) =		47.4257 (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	4385.8934	3452.7246	3540.1750	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6916	0.7770	0.7146	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	3033.2445	2682.7619	2529.7330	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	3421.2875	3256.5436	2900.1164	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	279.3909	426.8935	275.5653	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	69.8477	106.7234	68.8913	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												245.4624 (107)
Energy for space heating												47.4257 (99)
Energy for space cooling												0.5611 (108)
Total												47.9869 (109)
Fabric Energy Efficiency (TFEE)												48.0 (109)

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Property Reference	excessive glazing			Issued on Date	04/12/2024
Assessment Reference	notional	Prop Type Ref			
Property	St Katherines, St Katherines, Forge Lane, Gravesend, Kent, DA12 3DP				
SAP Rating	66 D	DER	33.84	TER	8.70
Environmental	59 D	% DER < TER			-288.97
CO ₂ Emissions (t/year)	13.31	DFEE	127.82	TFEE	47.99
Compliance Check	See BREL	% DFEE < TFEE			-166.36
% DPER < TPER	-291.38	DPER	183.75	TPER	46.95
Assessor Details	Dr. Yanli Suo			Assessor ID	AY89-0001
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	216.3200 (1b)	x 2.8800 (2b)	= 623.0016 (1b) - (3b)
First floor	199.5000 (1c)	x 2.9400 (2c)	= 586.5300 (1c) - (3c)
Second floor	10.8100 (1d)	x 1.8400 (2d)	= 19.8904 (1d) - (3d)
Third floor	10.8100 (1e)	x 2.5000 (2e)	= 27.0250 (1e) - (3e)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	437.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 1256.4470 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.7500 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.7500 (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	0.9562	0.9375	0.9188	0.8250	0.8062	0.7125	0.7125	0.6938	0.7500	0.8062	0.8438	0.8813 (22b)
Effective ac	0.9572	0.9395	0.9221	0.8403	0.8250	0.7538	0.7538	0.7406	0.7812	0.8250	0.8560	0.8883 (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	
existing windows (Uw = 4.80)			60.0800	4.0268	241.9329			(27)
new windows (Uw = 1.40)			7.3800	1.3258	9.7841			(27)
existing door			2.2100	3.0000	6.6300			(26)
existing floor			199.5000	0.7000	139.6500	20.0000	3990.0000	(28a)
new floor			16.8200	0.1800	3.0276	75.0000	1261.5000	(28a)
existing wall	417.6900	62.2900	355.4000	0.7000	248.7800	190.0000	67526.0000	(29a)
new wall	33.0200	7.3800	25.6400	0.1800	4.6152	60.0000	1538.4000	(29a)
existing ceiling	199.5000		199.5000	0.7000	139.6500	9.0000	1795.5000	(30)
new flat roof	6.9200		6.9200	0.1500	1.0380	9.0000	62.2800	(30)
new pitched roof	11.6700		11.6700	0.1500	1.7505	9.0000	105.0300	(30)
Total net area of external elements Aum(A, m2)			885.1200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	796.8583			(33)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			76278.7100	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							174.3753	(35)
Thermal bridges (Default value 0.200 * total exposed area)							177.0240	(36)
Point Thermal bridges						(36a) =	0.0000	

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Total fabric heat loss

(33) + (36) + (36a) = 973.8823 (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	396.8844	389.5231	382.3076	348.4167	342.0758	312.5579	312.5579	307.0916	323.9277	342.0758	354.9033	368.3139	(38)
Heat transfer coeff	1370.7666	1363.4054	1356.1899	1322.2990	1315.9581	1286.4402	1286.4402	1280.9739	1297.8100	1315.9581	1328.7856	1342.1962	(39)
Average = Sum(39)m / 12 =												1322.2686	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	3.1336	3.1168	3.1003	3.0228	3.0083	2.9408	2.9408	2.9283	2.9668	3.0083	3.0376	3.0683	(40)
HLP (average)												3.0227	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.3106 (42)
Hot water usage for mixer showers													
109.6258	107.9784	105.5777	100.9844	97.5947	93.8145	91.6659	94.0484	96.6601	100.7188	105.4107	109.2058	109.2058	(42a)
Hot water usage for baths													
36.2198	35.6819	34.9244	33.5277	32.4819	31.3222	30.6958	31.4480	32.2670	33.5079	34.9334	36.0974	36.0974	(42b)
Hot water usage for other uses													
51.0883	49.2305	47.3728	45.5150	43.6573	41.7995	41.7995	43.6573	45.5150	47.3728	49.2305	51.0883	51.0883	(42c)
Average daily hot water use (litres/day)												181.0967	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
196.9339	192.8908	187.8748	180.0271	173.7338	166.9363	164.1612	169.1537	174.4421	181.5995	189.5746	196.3914	196.3914	(44)
Energy conte	311.8952	274.6739	288.7566	246.4481	233.8791	205.2676	198.5388	209.4476	215.1046	246.4288	270.0838	307.5015	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
46.7843	41.2011	43.3135	36.9672	35.0819	30.7901	29.7808	31.4171	32.2657	36.9643	40.5126	46.1252	46.1252	(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	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	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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
362.8541	320.7013	339.7155	295.7632	284.8380	254.5827	249.4977	260.4065	264.4196	297.3877	319.3989	358.4604	358.4604	(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													
362.8541	320.7013	339.7155	295.7632	284.8380	254.5827	249.4977	260.4065	264.4196	297.3877	319.3989	358.4604	358.4604	(64)
Total per year (kWh/year)													
12Total per year (kWh/year) = Sum(64)m =												3608.0256	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
116.4449	102.8359	108.7513	94.2728	90.5045	80.5802	78.7539	82.3810	83.8510	94.6773	102.1316	114.9840	114.9840	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
291.1837	322.3820	291.1837	300.8899	291.1837	300.8899	291.1837	291.1837	300.8899	291.1837	300.8899	291.1837	291.1837	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
561.9383	567.7694	553.0751	521.7926	482.3040	445.1904	420.3962	414.5650	429.2593	460.5418	500.0304	537.1440	537.1440	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	(69)
Pumps, fans	7.0000	7.0000	7.0000	7.0000	7.0000	0.0000	0.0000	0.0000	0.0000	7.0000	7.0000	7.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	(71)
Water heating gains (Table 5)													
156.5119	153.0296	146.1711	130.9344	121.6459	111.9170	105.8520	110.7272	116.4598	127.2544	141.8495	154.5484	154.5484	(72)
Total internal gains													
1089.2929	1122.8401	1070.0889	1033.2759	974.7927	930.6563	890.0909	889.1350	919.2680	958.6390	1022.4288	1062.5352	1062.5352	(73)

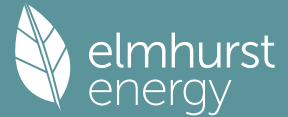
6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North				9.9800	10.6334		0.8500		0.7000		0.7700		43.7575 (74)
East				25.6200	19.6403		0.8500		0.7000		0.7700		207.4802 (76)
South				3.5900	46.7521		0.8500		0.7000		0.7700		69.2063 (78)
West				20.8900	19.6403		0.8500		0.7000		0.7700		169.1749 (80)
North				7.3800	10.6334		0.6300		0.8000		0.7700		27.4089 (74)
Solar gains	517.0278	986.1620	1588.9126	2304.1067	2838.9520	2919.1749	2773.4110	2367.4584	1839.9517	1158.4392	639.4706		428.8713 (83)
Total gains	1606.3207	2109.0021	2659.0015	3337.3826	3813.7446	3849.8311	3663.5019	3256.5934	2759.2197	2117.0783	1661.8994	1491.4064	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	15.4574	15.5409	15.6236	16.0240	16.1012	16.4707	16.4707	16.5410	16.3264	16.1012	15.9458	15.7865	
alpha	2.0305	2.0361	2.0416	2.0683	2.0734	2.0980	2.0980	2.1027	2.0884	2.0734	2.0631	2.0524	
util living area													

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	0.9958	0.9923	0.9854	0.9688	0.9369	0.8806	0.8087	0.8472	0.9392	0.9823	0.9937	0.9965 (86)
MIT	16.3510	16.6521	17.2579	18.1610	19.0684	19.9082	20.3919	20.2921	19.5717	18.4128	17.2690	16.3512 (87)
Th 2	18.6847	18.6927	18.7007	18.7386	18.7458	18.7799	18.7799	18.7863	18.7667	18.7458	18.7313	18.7162 (88)
util rest of house												
	0.9944	0.9897	0.9798	0.9547	0.9002	0.7815	0.5835	0.6560	0.8844	0.9720	0.9910	0.9953 (89)
MIT 2	14.7281	15.0323	15.6399	16.5541	17.4443	18.2459	18.6296	18.5783	17.9550	16.8150	15.6681	14.7436 (90)
Living area fraction									FLA = Living area / (4) =			0.0807 (91)
MIT	14.8591	15.1630	15.7705	16.6838	17.5753	18.3800	18.7717	18.7166	18.0854	16.9439	15.7973	14.8733 (92)
Temperature adjustment												0.0000
adjusted MIT	14.8591	15.1630	15.7705	16.6838	17.5753	18.3800	18.7717	18.7166	18.0854	16.9439	15.7973	14.8733 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9897	0.9819	0.9666	0.9321	0.8679	0.7522	0.5821	0.6457	0.8533	0.9559	0.9843	0.9914	(94)
Useful gains	1589.8516	2070.8746	2570.2988	3110.6557	3309.8951	2895.9580	2132.6890	2102.8250	2354.5759	2023.8191	1635.7926	1478.5317	(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	14473.9945	13992.6416	12572.5162	10292.4693	7731.6441	4862.7744	2793.8254	2967.4958	5172.3227	8348.3552	11556.7849	14325.6002	(97)
Space heating kWh	9585.8024	8011.4275	7441.6498	5170.9057	3289.7813	0.0000	0.0000	0.0000	0.0000	4705.4548	7143.1144	9558.2190	(98a)
Space heating requirement - total per year (kWh/year)												54906.3549	
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	9585.8024	8011.4275	7441.6498	5170.9057	3289.7813	0.0000	0.0000	0.0000	0.0000	4705.4548	7143.1144	9558.2190	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												54906.3549	
Space heating per m2										(98c) / (4) =		125.5175	(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 %)													84.0000 (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	9585.8024	8011.4275	7441.6498	5170.9057	3289.7813	0.0000	0.0000	0.0000	0.0000	4705.4548	7143.1144	9558.2190	(98)
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000	(210)
Space heating fuel (main heating system)	11411.6695	9537.4137	8859.1069	6155.8402	3916.4063	0.0000	0.0000	0.0000	0.0000	5601.7319	8503.7077	11378.8322	(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	362.8541	320.7013	339.7155	295.7632	284.8380	254.5827	249.4977	260.4065	264.4196	297.3877	319.3989	358.4604	(64)
Efficiency of water heater (217)m	83.6340	83.6138	83.5622	83.4582	83.2044	75.0000	75.0000	75.0000	75.0000	83.4051	83.5708	83.6372	(216)
Fuel for water heating, kWh/month	433.8597	383.5506	406.5420	354.3850	342.3353	339.4436	332.6636	347.2087	352.5595	356.5584	382.1897	428.5896	(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	9.7671	8.8219	9.7671	9.4521	9.7671	9.4521	9.7671	9.7671	9.4521	9.7671	9.4521	9.7671	(231)
Lighting	105.4506	84.5964	76.1696	55.8051	43.1055	35.2176	39.3223	51.1126	66.3902	87.1075	98.3877	108.3814	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)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	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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												65364.7083	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												75.0000	
Water heating fuel used												4459.8857	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												115.0000	(230c)
Total electricity for the above, kWh/year												115.0000	(231)
Electricity for lighting (calculated in Appendix L)												851.0464	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(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												70790.6404	(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	65364.7083	0.2100	13726.5887 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	4459.8857	0.2100	936.5760 (264)
Space and water heating			14663.1647 (265)
Pumps, fans and electric keep-hot	115.0000	0.1387	15.9519 (267)
Energy for lighting	851.0464	0.1443	122.8323 (268)
Total CO2, kg/year			14801.9489 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			33.8400 (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	65364.7083	1.1300	73862.1203 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	4459.8857	1.1300	5039.6708 (278)
Space and water heating			78901.7912 (279)
Pumps, fans and electric keep-hot	115.0000	1.5128	173.9720 (281)
Energy for lighting	851.0464	1.5338	1305.3634 (282)
Total Primary energy kWh/year			80381.1266 (286)
Dwelling Primary energy Rate (DPER)			183.7500 (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	216.3200 (1b)	x	2.8800 (2b)	=	623.0016 (1b) - (3b)	
First floor	199.5000 (1c)	x	2.9400 (2c)	=	586.5300 (1c) - (3c)	
Second floor	10.8100 (1d)	x	1.8400 (2d)	=	19.8904 (1d) - (3d)	
Third floor	10.8100 (1e)	x	2.5000 (2e)	=	27.0250 (1e) - (3e)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	437.4400				(4)	
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	1256.4470 (5)	

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.0318 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.2818 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2818 (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	0.3593	0.3523	0.3452	0.3100	0.3030	0.2677	0.2677	0.2607	0.2818	0.3030	0.3171	0.3312 (22b)
Effective ac	0.5646	0.5621	0.5596	0.5481	0.5459	0.5358	0.5358	0.5340	0.5397	0.5459	0.5503	0.5548 (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			2.2100	1.0000	2.2100		(26)
TER Opening Type (Uw = 1.20)			67.4600	1.1450	77.2443		(27)
existing floor			199.5000	0.1300	25.9350		(28a)
new floor			16.8200	0.1300	2.1866		(28a)
existing wall	417.6900	62.2900	355.4000	0.1800	63.9720		(29a)
new wall	33.0200	7.3800	25.6400	0.1800	4.6152		(29a)
existing ceiling	199.5000		199.5000	0.1100	21.9450		(30)
new flat roof	6.9200		6.9200	0.1100	0.7612		(30)
new pitched roof	11.6700		11.6700	0.1100	1.2837		(30)
Total net area of external elements Aum(A, m2)			885.1200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	200.1530		(33)

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Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 174.3753 (35)
 Thermal bridges (User defined value 0.050 * total exposed area) 44.2560 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 244.4090 (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	234.0833	233.0438	232.0249	227.2391	226.3437	222.1754	222.1754	221.4035	223.7810	226.3437	228.1551	230.0488 (38)
Average = Sum(39)m / 12 =	478.4923	477.4528	476.4339	471.6481	470.7527	466.5844	466.5844	465.8125	468.1900	470.7527	472.5641	474.4578 (39)
												471.6438
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0938	1.0915	1.0891	1.0782	1.0762	1.0666	1.0666	1.0649	1.0703	1.0762	1.0803	1.0846 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	3.3106 (42)											
Hot water usage for mixer showers	79.7279	78.5297	76.7838	73.4432	70.9780	68.2287	66.6661	68.3988	70.2982	73.2500	76.6624	79.4224 (42a)
Hot water usage for baths	34.4088	33.8978	33.1782	31.8513	30.8578	29.7561	29.1610	29.8756	30.6537	31.8325	33.1867	34.2925 (42b)
Hot water usage for other uses	48.5339	46.7690	45.0041	43.2393	41.4744	39.7095	39.7095	41.4744	43.2393	45.0041	46.7690	48.5339 (42c)
Average daily hot water use (litres/day)												149.5305 (43)
Daily hot water use	162.6705	159.1965	154.9661	148.5338	143.3101	137.6944	135.5367	139.7489	144.1912	150.0867	156.6180	162.2488 (44)
Energy conte	257.6304	226.6937	238.1771	203.3353	192.9230	169.3113	163.9199	173.0383	177.8021	203.6662	223.1311	254.0423 (45)
Energy content (annual)										Total = Sum(45)m =		2483.6708
Distribution loss (46)m = 0.15 x (45)m	38.6446	34.0041	35.7266	30.5003	28.9385	25.3967	24.5880	25.9557	26.6703	30.5499	33.4697	38.1064 (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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	308.5893	272.7211	289.1360	252.6504	243.8819	218.6264	214.8788	223.9972	227.1172	254.6251	272.4462	305.0012 (62)
WWHRS	-36.4482	-32.2351	-33.7548	-27.9503	-26.0487	-22.2900	-20.8933	-22.2180	-23.0621	-27.1877	-30.8004	-35.7733 (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	272.1410	240.4860	255.3812	224.7001	217.8332	196.3364	193.9854	201.7792	204.0551	227.4374	241.6458	269.2280 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m = 2745.0089 (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	98.4018	86.8825	91.9336	79.9378	76.8866	68.6248	67.2431	70.2750	71.4480	80.4587	86.5199	97.2088 (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	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	297.8998	329.8176	297.8998	307.8298	297.8998	307.8298	297.8998	297.8998	307.8298	297.8998	307.8298	297.8998 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	561.9383	567.7694	553.0751	521.7926	482.3040	445.1904	420.3962	414.5650	429.2593	460.5418	500.0304	537.1440 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530 (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)	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241 (71)
Water heating gains (Table 5)	132.2605	129.2894	123.5667	111.0247	103.3422	95.3122	90.3805	94.4556	99.2333	108.1435	120.1665	130.6570 (72)
Total internal gains	1067.7576	1102.5355	1050.2006	1016.3061	959.2051	920.9914	881.3355	879.5794	908.9815	942.2441	1003.6857	1041.3599 (73)

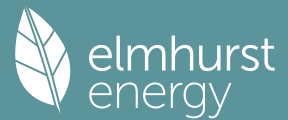
6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North				17.3600	10.6334		0.6300		0.7000		0.7700		56.4148 (74)
East				25.6200	19.6403		0.6300		0.7000		0.7700		153.7794 (76)
South				3.5900	46.7521		0.6300		0.7000		0.7700		51.2941 (78)
West				20.8900	19.6403		0.6300		0.7000		0.7700		125.3885 (80)
Solar gains	386.8768	737.9297	1189.5757	1726.8820	2129.9374	2191.2145	2081.3464	1775.1413	1378.0499	866.9520	478.4855	320.9271	(83)
Total gains	1454.6344	1840.4652	2239.7763	2743.1880	3089.1425	3112.2058	2962.6819	2654.7207	2287.0314	1809.1961	1482.1711	1362.2869	(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	44.2819	44.3783	44.4732	44.9245	45.0099	45.4120	45.4120	45.4873	45.2563	45.0099	44.8374	44.6584
alpha	3.9521	3.9586	3.9649	3.9950	4.0007	4.0275	4.0275	4.0325	4.0171	4.0007	3.9892	3.9772
util living area	0.9990	0.9973	0.9922	0.9714	0.9116	0.7842	0.6353	0.7077	0.9114	0.9882	0.9980	0.9993 (86)
MIT	18.8657	19.0886	19.4684	20.0031	20.4879	20.8207	20.9438	20.9132	20.6237	19.9810	19.3330	18.8374 (87)
Th 2	20.0059	20.0078	20.0097	20.0187	20.0204	20.0282	20.0282	20.0296	20.0252	20.0204	20.0170	20.0134 (88)
util rest of house	0.9988	0.9967	0.9900	0.9627	0.8824	0.7114	0.5182	0.5951	0.8697	0.9834	0.9973	0.9991 (89)
MIT 2	17.4663	17.7532	18.2403	18.9240	19.5192	19.8937	20.0010	19.9828	19.6944	18.9032	18.0727	17.4348 (90)
Living area fraction	17.5792	17.8609	18.3394	19.0111	19.5974	19.9685	20.0771	20.0579	19.7694	18.9901	18.1744	17.5479 (92)
MIT												0.0000
Temperature adjustment												0.0000
adjusted MIT	17.5792	17.8609	18.3394	19.0111	19.5974	19.9685	20.0771	20.0579	19.7694	18.9901	18.1744	17.5479 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9977	0.9942	0.9844	0.9502	0.8666	0.7062	0.5246	0.5988	0.8555	0.9757	0.9953	0.9983 (94)
Useful gains	1451.3259	1829.8001	2204.7413	2606.6301	2676.9356	2197.9075	1554.1394	1589.5187	1956.4768	1765.1654	1475.2289	1359.9149 (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	6353.9861	6188.2271	5640.6688	4768.8585	3717.7127	2504.8651	1622.3564	1703.8793	2654.3393	3949.6633	5233.3571	6333.0236 (97)
Space heating kWh	3647.5792	2928.8629	2556.3300	1556.8044	774.3381	0.0000	0.0000	0.0000	0.0000	1625.2664	2705.8523	3699.9929 (98a)
Space heating requirement - total per year (kWh/year)												19495.0263
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	3647.5792	2928.8629	2556.3300	1556.8044	774.3381	0.0000	0.0000	0.0000	0.0000	1625.2664	2705.8523	3699.9929 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												19495.0263
Space heating per m2										(98c) / (4) =		44.5662 (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 %)												92.4000 (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	3647.5792	2928.8629	2556.3300	1556.8044	774.3381	0.0000	0.0000	0.0000	0.0000	1625.2664	2705.8523	3699.9929 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	3947.5965	3169.7650	2766.5909	1684.8532	838.0283	0.0000	0.0000	0.0000	0.0000	1758.9463	2928.4116	4004.3213 (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	272.1410	240.4860	255.3812	224.7001	217.8332	196.3364	193.9854	201.7792	204.0551	227.4374	241.6458	269.2280 (64)
Efficiency of water heater (217)m	88.2438	88.1834	88.0436	87.7151	86.8577	80.3000	80.3000	80.3000	80.3000	87.7464	88.1262	80.3000 (216)
Fuel for water heating, kWh/month	308.3966	272.7112	290.0623	256.1703	250.7934	244.5036	241.5759	251.2817	254.1159	259.1987	274.2042	305.0436 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	61.8977	49.6566	44.7103	32.7567	25.3022	20.6721	23.0815	30.0022	38.9699	51.1306	57.7519	63.6180 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-160.6821	-208.1997	-275.0375	-282.9916	-284.1564	-257.3796	-253.4332	-248.5910	-238.4510	-223.8103	-169.6085	-141.0948 (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	-156.0530	-317.6839	-613.2569	-896.3915	-1162.8826	-1161.1025	-1148.0799	-982.6550	-734.2502	-446.4953	-205.5674	-124.3039 (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												21098.5133 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												3208.0574 (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)												499.5498 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-10692.1580 (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												14199.9625 (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	21098.5133	0.2100	4430.6878 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3208.0574	0.2100	673.6921 (264)
Space and water heating			5104.3798 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	499.5498	0.1443	72.1005 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2743.4358	0.1365	-374.5577
PV Unit electricity exported	-7948.7221	0.1267	-1007.1258
Total			-1381.6835 (269)
Total CO2, kg/year			3806.7260 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.7000 (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	21098.5133	1.1300	23841.3200 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3208.0574	1.1300	3625.1049 (278)
Space and water heating			27466.4249 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	499.5498	1.5338	766.2262 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2743.4358	1.5047	-4128.0278
PV Unit electricity exported	-7948.7221	0.4651	-3697.1156
Total			-7825.1434 (283)
Total Primary energy kWh/year			20537.6085 (286)
Target Primary Energy Rate (TPER)			46.9500 (287)

Summary for Input Data



Property Reference	excessive glazing	Issued on Date	04/12/2024
Assessment Reference	proposed	Prop Type Ref	
Property	St Katherines, St Katherines, Forge Lane, Gravesend, Kent, DA12 3DP		

SAP Rating	67 D	DER	33.65	TER	8.61
Environmental	59 D	% DER < TER			-290.82
CO ₂ Emissions (t/year)	13.21	DFEE	127.23	TFEE	47.96
Compliance Check	See BREL	% DFEE < TFEE			-165.28
% DPER < TPER	-293.39	DPER	182.69	TPER	46.44

Assessor Details	Dr. Yanli Suo	Assessor ID	AY89-0001
Client			

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

Orientation	East	
Property Tenture	1	
Transaction Type	5	
Terrain Type	Rural	
1.0 Property Type	House, Detached	
Which Floor	0	
2.0 Number of Storeys	4	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	0	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	172.44	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	No	
Smart gas meter fitted	No	

7.0 Measurements	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	1.00 m	216.32 m²	2.88 m
1st Storey:	1.00 m	199.50 m²	2.94 m
2nd Storey:	1.00 m	10.81 m²	1.84 m
3rd Storey:	1.00 m	10.81 m²	2.50 m

8.0 Living Area	35.29	m²
-----------------	-------	----

9.0 External Walls	Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
	existing wall	Solid Wall	Solid wall : dense plaster, 200 mm dense block, insulated externally	0.70	190.00	417.69	355.40	0.00	None	62.29	Enter Gross Area
	new wall	Cavity Wall	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure	0.15	60.00	33.02	11.51	0.00	None	21.51	Enter Gross Area

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	Openings
	existing ceiling	External Plane Roof	Plasterboard, insulated at ceiling level	0.70	9.00	199.50	199.50	None	0.00	Enter Gross Area	0.00
	new flat roof	External Flat Roof	Plasterboard, insulated flat roof	0.15	9.00	6.92	6.92	None	0.00	Enter Gross Area	0.00
	new pitched roof	External Slope Roof	Plasterboard, insulated slope	0.15	9.00	11.67	11.67	None	0.00	Enter Gross Area	0.00

11.0 Heat Loss Floors	Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
	existing floor	Ground Floor - Timber	Lowest occupied	Suspended timber, insulation between joists	0.70	None	0.00	20.00	199.50
	new floor	Ground Floor - Solid	Lowest occupied	Suspended concrete floor, carpeted	0.15	None	0.00	75.00	16.82

12.0 Opening Types

Summary for Input Data

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
existing windows	SAP table	Window	Single glazed		Air Filled	0.85	Wood	0.70	4.80
new windows	Manufacturer	Window	Triple Low-E Soft 0.05			0.57		0.80	1.40
existing door	SAP table	Solid Door			Air Filled	0.00			3.00

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
front door	existing door	existing wall	East	2.21	0
w1-5	existing windows	existing wall	East	6.50	0
w6	existing windows	existing wall	East	1.20	0
w7-8	existing windows	existing wall	East	2.71	0
w9-12	existing windows	existing wall	East	8.28	0
w13	existing windows	existing wall	East	5.85	0
w14	existing windows	existing wall	East	1.08	0
w15,16	existing windows	existing wall	West	3.20	0
w17	existing windows	existing wall	West	0.44	0
w18	existing windows	existing wall	West	0.97	0
w19,26,27	existing windows	existing wall	West	4.07	0
w20-25	existing windows	existing wall	West	2.88	0
w28	existing windows	existing wall	West	0.82	0
w29	existing windows	existing wall	West	1.09	0
w30	existing windows	existing wall	West	1.48	0
w31	existing windows	existing wall	West	1.07	0
w32,33	existing windows	existing wall	West	3.06	0
w34	existing windows	existing wall	West	1.81	0
w35	existing windows	existing wall	North	2.22	0
w36	existing windows	existing wall	North	3.38	0
w37	existing windows	existing wall	North	1.94	0
w38,39	existing windows	existing wall	North	2.44	0
w40-42	existing windows	existing wall	South	3.59	0
w43	new windows	new wall	North	5.26	0
w44,45	new windows	new wall	North	1.85	0
w46	new windows	new wall	East	7.20	0
w47	new windows	new wall	West	7.20	0

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

Y-value

 W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys

Number of open flues

Number of chimneys/flues attached to closed fire

Number of flues attached to solid fuel boiler

Number of flues attached to other heater

Number of blocked chimneys

Number of intermittent extract fans

Number of passive vents

Number of flueless gas fires

21.0 Fixed Cooling System

22.0 Pressure Testing

Property Tested?

Test Method

22.0 Lighting

No Fixed Lighting

Name	Efficacy	Power	Capacity	Count
Lighting	30.00	10.00	300.00	100

24.0 Main Heating 1

Summary for Input Data

Percentage of Heat	100.00	%
Database Ref. No.	0	
Fuel Type	Mains gas	
SAP Code	104	
In Winter	84.00	
In Summer	75.00	
Controls SAP Code	2105	
Delayed Start Stat	No	
HETAS approved System	No	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	Unknown	
Heat Emitter	Radiators	
Underfloor Heating	Yes - Pipes in Concrete	
Flow Temperature	Unknown	
Boiler Interlock	Yes	

25.0 Main Heating 2

None

26.0 Heat Networks

None

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

27.0 Secondary Heating

None

28.0 Water Heating

Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	No
Summer Immersion	No
Cold Water Source	From mains
Bath Count	2
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	Combi boiler or unvented hot water system	11.00		No	
shower	Combi boiler or unvented hot water system	11.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder

Cylinder Stat	No
Cylinder In Heated Space	No
Independent Time Control	No
In Airing Cupboard	No

Summary for Input Data



31.0 Thermal Store

None

34.0 Small-scale Hydro

None

Electricity Generated

0.00

Apportioned

0.00

kWh/Year

Connected to dwelling's electricity meter

Yes

Electricity Generation

Annual

Jan

Feb

Mar

Apr

May

Jun

Jul

Aug

Sep

Oct

Nov

Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

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Property Reference	excessive glazing			Issued on Date	04/12/2024
Assessment Reference	proposed	Prop Type Ref			
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Environmental	59 D	% DER < TER			-290.82
CO ₂ Emissions (t/year)	13.21	DFEE	127.23	TFEE	47.96
Compliance Check	See BREL	% DFEE < TFEE			-165.28
% DPER < TPER	-293.39	DPER	182.69	TPER	46.44
Assessor Details	Dr. Yanli Suo			Assessor ID	AY89-0001
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	216.3200 (1b)	x 2.8800 (2b)	= 623.0016 (1b) - (3b)
First floor	199.5000 (1c)	x 2.9400 (2c)	= 586.5300 (1c) - (3c)
Second floor	10.8100 (1d)	x 1.8400 (2d)	= 19.8904 (1d) - (3d)
Third floor	10.8100 (1e)	x 2.5000 (2e)	= 27.0250 (1e) - (3e)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	437.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 1256.4470 (5)

2. Ventilation rate

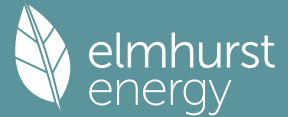
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	No	
Pressure Test Method	Blower Door	
Measured/design AP50	15.0000	(17)
Infiltration rate	0.7500	(18)
Number of sides sheltered	0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7500 (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	0.9562	0.9375	0.9188	0.8250	0.8062	0.7125	0.7125	0.6938	0.7500	0.8062	0.8438	0.8813 (22b)
Effective ac	0.9572	0.9395	0.9221	0.8403	0.8250	0.7538	0.7538	0.7406	0.7812	0.8250	0.8560	0.8883 (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
existing windows (Uw = 4.80)			60.0800	4.0268	241.9329		(27)
new windows (Uw = 1.40)			21.5100	1.3258	28.5170		(27)
existing door			2.2100	3.0000	6.6300		(26)
existing floor			199.5000	0.7000	139.6500	20.0000	3990.0000 (28a)
new floor			16.8200	0.1500	2.5230	75.0000	1261.5000 (28a)
existing wall	417.6900	62.2900	355.4000	0.7000	248.7800	190.0000	67526.0000 (29a)
new wall	33.0200	21.5100	11.5100	0.1500	1.7265	60.0000	690.6000 (29a)
existing ceiling	199.5000		199.5000	0.7000	139.6500	9.0000	1795.5000 (30)
new flat roof	6.9200		6.9200	0.1500	1.0380	9.0000	62.2800 (30)
new pitched roof	11.6700		11.6700	0.1500	1.7505	9.0000	105.0300 (30)
Total net area of external elements Aum(A, m ²)			885.1200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	812.1979		(33)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =		75430.9100 (34)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K						172.4372 (35)	
Thermal bridges (Default value 0.200 * total exposed area)						177.0240 (36)	
Point Thermal bridges						(36a) =	0.0000

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Total fabric heat loss

(33) + (36) + (36a) = 989.2219 (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	396.8844	389.5231	382.3076	348.4167	342.0758	312.5579	312.5579	307.0916	323.9277	342.0758	354.9033	368.3139	(38)
Heat transfer coeff	1386.1063	1378.7450	1371.5296	1337.6386	1331.2977	1301.7798	1301.7798	1296.3135	1313.1497	1331.2977	1344.1253	1357.5359	(39)
Average = Sum(39)m / 12 =												1337.6082	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	3.1687	3.1518	3.1354	3.0579	3.0434	2.9759	2.9759	2.9634	3.0019	3.0434	3.0727	3.1034	(40)
HLP (average)												3.0578	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.3106 (42)
Hot water usage for mixer showers													
109.6258	107.9784	105.5777	100.9844	97.5947	93.8145	91.6659	94.0484	96.6601	100.7188	105.4107	109.2058	109.2058	(42a)
Hot water usage for baths													
36.2198	35.6819	34.9244	33.5277	32.4819	31.3222	30.6958	31.4480	32.2670	33.5079	34.9334	36.0974	36.0974	(42b)
Hot water usage for other uses													
51.0883	49.2305	47.3728	45.5150	43.6573	41.7995	41.7995	43.6573	45.5150	47.3728	49.2305	51.0883	51.0883	(42c)
Average daily hot water use (litres/day)												181.0967	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	196.9339	192.8908	187.8748	180.0271	173.7338	166.9363	164.1612	169.1537	174.4421	181.5995	189.5746	196.3914	(44)
Energy conte	311.8952	274.6739	288.7566	246.4481	233.8791	205.2676	198.5388	209.4476	215.1046	246.4288	270.0838	307.5015	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
46.7843	41.2011	43.3135	36.9672	35.0819	30.7901	29.7808	31.4171	32.2657	36.9643	40.5126	46.1252	46.1252	(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	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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
362.8541	320.7013	339.7155	295.7632	284.8380	254.5827	249.4977	260.4065	264.4196	297.3877	319.3989	358.4604	358.4604	(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	362.8541	320.7013	339.7155	295.7632	284.8380	254.5827	249.4977	260.4065	264.4196	297.3877	319.3989	358.4604	(64)
												3608.0256	(64)
12Total per year (kWh/year)												3608	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
												0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													
Heat gains from water heating, kWh/month													
116.4449	102.8359	108.7513	94.2728	90.5045	80.5802	78.7539	82.3810	83.8510	94.6773	102.1316	114.9840	114.9840	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
284.9178	315.4447	284.9178	294.4151	284.9178	294.4151	284.9178	284.9178	294.4151	284.9178	294.4151	284.9178	284.9178	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
561.9383	567.7694	553.0751	521.7926	482.3040	445.1904	420.3962	414.5650	429.2593	460.5418	500.0304	537.1440	537.1440	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	(69)
Pumps, fans	7.0000	7.0000	7.0000	7.0000	7.0000	0.0000	0.0000	0.0000	0.0000	7.0000	7.0000	7.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	(71)
Water heating gains (Table 5)													
156.5119	153.0296	146.1711	130.9344	121.6459	111.9170	105.8520	110.7272	116.4598	127.2544	141.8495	154.5484	154.5484	(72)
Total internal gains	1083.0270	1115.9028	1063.8230	1026.8011	968.5268	924.1815	883.8250	882.8691	912.7932	952.3731	1015.9540	1056.2693	(73)

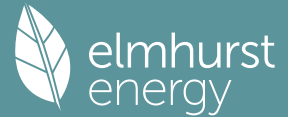
6. Solar gains

[Jan]					Area m2	Solar flux Table 6a		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
North					9.9800	10.6334		0.8500	0.7000	0.7700		43.7575 (74)	
East					25.6200	19.6403		0.8500	0.7000	0.7700		207.4802 (76)	
South					3.5900	46.7521		0.8500	0.7000	0.7700		69.2063 (78)	
West					20.8900	19.6403		0.8500	0.7000	0.7700		169.1749 (80)	
North					7.1100	10.6334		0.5700	0.8000	0.7700		23.8913 (74)	
East					7.2000	19.6403		0.5700	0.8000	0.7700		44.6867 (76)	
West					7.2000	19.6403		0.5700	0.8000	0.7700		44.6867 (80)	
Solar gains	602.8835	1154.2728	1865.4149	2705.6804	3328.8653	3419.5303	3250.2570	2778.6830	2161.0866	1357.8914	746.5692	499.4351	(83)
Total gains	1685.9105	2270.1756	2929.2380	3732.4815	4297.3921	4343.7118	4134.0820	3661.5520	3073.8799	2310.2646	1762.5232	1555.7043	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	15.1165	15.1972	15.2771	15.6642	15.7388	16.0957	16.0957	16.1636	15.9563	15.7388	15.5886	15.4346	

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alpha	2.0078	2.0131	2.0185	2.0443	2.0493	2.0730	2.0730	2.0776	2.0638	2.0493	2.0392	2.0290
util living area	0.9952	0.9909	0.9821	0.9612	0.9223	0.8566	0.7764	0.8197	0.9263	0.9787	0.9926	0.9960 (86)
MIT	16.3145	16.6343	17.2670	18.1994	19.1241	19.9608	20.4324	20.3311	19.6057	18.4184	17.2447	16.3101 (87)
Th 2	18.6680	18.6760	18.6838	18.7213	18.7285	18.7621	18.7621	18.7684	18.7491	18.7285	18.7141	18.6992 (88)
util rest of house	0.9936	0.9877	0.9753	0.9441	0.8789	0.7456	0.5395	0.6141	0.8627	0.9665	0.9896	0.9947 (89)
MIT 2	14.6873	15.0100	15.6437	16.5842	17.4850	18.2709	18.6305	18.5828	17.9742	16.8145	15.6390	14.6979 (90)
Living area fraction	14.8186	15.1411	15.7746	16.7145	17.6172	18.4072	18.7758	18.7238	18.1058	16.9439	15.7686	0.0807 (91)
MIT	14.8186	15.1411	15.7746	16.7145	17.6172	18.4072	18.7758	18.7238	18.1058	16.9439	15.7686	14.8280 (92)
Temperature adjustment												0.0000
adjusted MIT	14.8186	15.1411	15.7746	16.7145	17.6172	18.4072	18.7758	18.7238	18.1058	16.9439	15.7686	14.8280 (93)

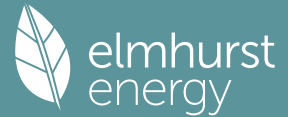
8. Space heating requirement												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9884	0.9787	0.9598	0.9181	0.8442	0.7179	0.5418	0.6073	0.8301	0.9480	0.9819	0.9903 (94)
Useful gains	1666.2762	2221.8999	2811.4762	3426.8571	3627.7475	3118.3639	2239.7976	2223.8355	2551.5770	2190.1418	1730.6362	1540.5579 (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	14579.8782	14119.8113	12720.4256	10452.9271	7877.5955	4956.1787	2832.4475	3012.4381	5260.2558	8445.5909	11651.6178	14427.8829 (97)
Space heating kWh	9607.7198	7995.3964	7372.2583	5058.7704	3161.8869	0.0000	0.0000	0.0000	0.0000	4654.0542	7143.1068	9588.1698 (98a)
Space heating requirement - total per year (kWh/year)												54581.3627
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	9607.7198	7995.3964	7372.2583	5058.7704	3161.8869	0.0000	0.0000	0.0000	0.0000	4654.0542	7143.1068	9588.1698 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												54581.3627
Space heating per m2										(98c) / (4) =		124.7745 (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 %)												84.0000 (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	9607.7198	7995.3964	7372.2583	5058.7704	3161.8869	0.0000	0.0000	0.0000	0.0000	4654.0542	7143.1068	9588.1698 (98)
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000 (210)
Space heating fuel (main heating system)	11437.7617	9518.3291	8776.4980	6022.3458	3764.1511	0.0000	0.0000	0.0000	0.0000	5540.5407	8503.6986	11414.4879 (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	362.8541	320.7013	339.7155	295.7632	284.8380	254.5827	249.4977	260.4065	264.4196	297.3877	319.3989	358.4604 (64)
Efficiency of water heater (217)m	83.6348	83.6131	83.5583	83.4469	83.1752	75.0000	75.0000	75.0000	75.0000	83.3989	83.5708	83.6383 (217)
Fuel for water heating, kWh/month	433.8556	383.5540	406.5610	354.4329	342.4556	339.4436	332.6636	347.2087	352.5595	356.5846	382.1897	428.5841 (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	9.7671	8.8219	9.7671	9.4521	9.7671	9.4521	9.7671	9.7671	9.4521	9.7671	9.4521	9.7671 (231)
Lighting	103.1814	82.7759	74.5306	54.6043	42.1779	34.4597	38.4761	50.0127	64.9616	85.2331	96.2706	106.0491 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)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 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (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												64977.8127 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												75.0000
Water heating fuel used												4460.0928 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans: central heating pump												115.0000 (230c)
Total electricity for the above, kWh/year												115.0000 (231)
Electricity for lighting (calculated in Appendix L)												832.7330 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (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												70385.6385 (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	64977.8127	0.2100	13645.3407 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	4460.0928	0.2100	936.6195 (264)
Space and water heating			14581.9602 (265)
Pumps, fans and electric keep-hot	115.0000	0.1387	15.9519 (267)
Energy for lighting	832.7330	0.1443	120.1891 (268)
Total CO2, kg/year			14718.1012 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			33.6500 (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	64977.8127	1.1300	73424.9284 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	4460.0928	1.1300	5039.9049 (278)
Space and water heating			78464.8333 (279)
Pumps, fans and electric keep-hot	115.0000	1.5128	173.9720 (281)
Energy for lighting	832.7330	1.5338	1277.2736 (282)
Total Primary energy kWh/year			79916.0789 (286)
Dwelling Primary energy Rate (DPER)			182.6900 (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	216.3200 (1b)	x 2.8800 (2b)	= 623.0016 (1b) - (3b)
First floor	199.5000 (1c)	x 2.9400 (2c)	= 586.5300 (1c) - (3c)
Second floor	10.8100 (1d)	x 1.8400 (2d)	= 19.8904 (1d) - (3d)
Third floor	10.8100 (1e)	x 2.5000 (2e)	= 27.0250 (1e) - (3e)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	437.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	1256.4470 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.0318 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.2818 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2818 (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	0.3593	0.3523	0.3452	0.3100	0.3030	0.2677	0.2677	0.2607	0.2818	0.3030	0.3171	0.3312 (22b)
Effective ac	0.5646	0.5621	0.5596	0.5481	0.5459	0.5358	0.5358	0.5340	0.5397	0.5459	0.5503	0.5548 (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			2.2100	1.0000	2.2100		(26)
TER Opening Type (Uw = 1.20)			81.5900	1.1450	93.4237		(27)
existing floor			199.5000	0.1300	25.9350		(28a)
new floor			16.8200	0.1300	2.1866		(28a)
existing wall	417.6900	62.2900	355.4000	0.1800	63.9720		(29a)
new wall	33.0200	21.5100	11.5100	0.1800	2.0718		(29a)
existing ceiling	199.5000		199.5000	0.1100	21.9450		(30)
new flat roof	6.9200		6.9200	0.1100	0.7612		(30)
new pitched roof	11.6700		11.6700	0.1100	1.2837		(30)

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Total net area of external elements Aum(A, m2) 885.1200 (31)
 Fabric heat loss, W/K = Sum (A x U) (26)...(30) + (32) = 213.7890 (33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 172.4372 (35)
 Thermal bridges (User defined value 0.050 * total exposed area) 44.2560 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 258.0450 (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	234.0833	233.0438	232.0249	227.2391	226.3437	222.1754	222.1754	221.4035	223.7810	226.3437	228.1551	230.0488 (38)
Average = Sum(39)m / 12 =	492.1283	491.0888	490.0699	485.2841	484.3887	480.2204	480.2204	479.4485	481.8259	484.3887	486.2001	488.0938 (39)
												485.2798
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1250	1.1226	1.1203	1.1094	1.1073	1.0978	1.0978	1.0960	1.1015	1.1073	1.1115	1.1158 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	3.3106 (42)											
Hot water usage for mixer showers	79.4224 (42a)											
Hot water usage for baths	34.2925 (42b)											
Hot water usage for other uses	48.5339 (42c)											
Average daily hot water use (litres/day)	149.5305 (43)											
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	162.6705	159.1965	154.9661	148.5338	143.3101	137.6944	135.5367	139.7489	144.1912	150.0867	156.6180	162.2488 (44)
Energy content (annual)	257.6304	226.6937	238.1771	203.3353	192.9230	169.3113	163.9199	173.0383	177.8021	203.6662	223.1311	254.0423 (45)
Distribution loss (46)m = 0.15 x (45)m	Total = Sum(45)m = 2483.6708											
Water storage loss:	38.6446	34.0041	35.7266	30.5003	28.9385	25.3967	24.5880	25.9557	26.6703	30.5499	33.4697	38.1064 (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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	308.5893	272.7211	289.1360	252.6504	243.8819	218.6264	214.8788	223.9972	227.1172	254.6251	272.4462	305.0012 (62)
WWHRS	-36.4482	-32.2351	-33.7548	-27.9503	-26.0487	-22.2900	-20.8933	-22.2180	-23.0621	-27.1877	-30.8004	-35.7733 (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	272.1410	240.4860	255.3812	224.7001	217.8332	196.3364	193.9854	201.7792	204.0551	227.4374	241.6458	269.2280 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m = 2745.0089 (64)											
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Heat gains from water heating, kWh/month	98.4018	86.8825	91.9336	79.9378	76.8866	68.6248	67.2431	70.2750	71.4480	80.4587	86.5199	97.2088 (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	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	287.9275	318.7769	287.9275	297.5251	287.9275	297.5251	287.9275	287.9275	297.5251	287.9275	297.5251	287.9275 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	561.9383	567.7694	553.0751	521.7926	482.3040	445.1904	420.3962	414.5650	429.2593	460.5418	500.0304	537.1440 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530 (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)	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241 (71)
Water heating gains (Table 5)	132.2605	129.2894	123.5667	111.0247	103.3422	95.3122	90.3805	94.4556	99.2333	108.1435	120.1665	130.6570 (72)
Total internal gains	1057.7853	1091.4948	1040.2283	1006.0014	949.2328	910.6867	871.3632	869.6071	898.6768	932.2719	993.3810	1031.3876 (73)

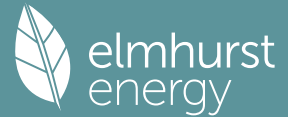
6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North				17.0900	10.6334		0.6300		0.7000		0.7700		55.5374 (74)
East				32.8200	19.6403		0.6300		0.7000		0.7700		196.9961 (76)
South				3.5900	46.7521		0.6300		0.7000		0.7700		51.2941 (78)
West				28.0900	19.6403		0.6300		0.7000		0.7700		168.6052 (80)
Solar gains	472.4328	905.3350	1465.1806	2128.4140	2621.4736	2694.1004	2560.2359	2186.9046	1698.4778	1065.5861	585.1754	391.2743	(83)
Total gains	1530.2181	1996.8298	2505.4089	3134.4154	3570.7065	3604.7872	3431.5991	3056.5117	2597.1546	1997.8580	1578.5564	1422.6619	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

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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	42.5764	42.6665	42.7552	43.1768	43.2566	43.6321	43.6321	43.7024	43.4867	43.2566	43.0955	42.9283
alpha	3.8384	3.8444	3.8503	3.8785	3.8838	3.9088	3.9088	3.9135	3.8991	3.8838	3.8730	3.8619
util living area	0.9987	0.9962	0.9882	0.9571	0.8761	0.7285	0.5766	0.6514	0.8809	0.9832	0.9973	0.9990 (86)
MIT	18.8145	19.0660	19.4858	20.0583	20.5484	20.8529	20.9558	20.9295	20.6594	19.9917	19.3010	18.7807 (87)
Th 2	19.9805	19.9824	19.9843	19.9932	19.9949	20.0026	20.0026	20.0041	19.9996	19.9949	19.9915	19.9880 (88)
util rest of house	0.9984	0.9953	0.9850	0.9448	0.8393	0.6501	0.4621	0.5373	0.8302	0.9766	0.9964	0.9988 (89)
MIT 2	17.3862	17.7094	18.2468	18.9741	19.5650	19.8967	19.9822	19.9679	19.7102	18.9005	18.0170	17.3476 (90)
Living area fraction									FLA = Living area / (4) =			0.0807 (91)
MIT	17.5014	17.8189	18.3468	19.0616	19.6444	19.9739	20.0608	20.0454	19.7868	18.9885	18.1206	17.4632 (92)
Temperature adjustment												0.0000
adjusted MIT	17.5014	17.8189	18.3468	19.0616	19.6444	19.9739	20.0608	20.0454	19.7868	18.9885	18.1206	17.4632 (93)

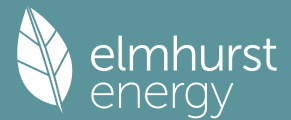
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9970	0.9919	0.9773	0.9294	0.8239	0.6476	0.4692	0.5425	0.8166	0.9667	0.9938	0.9978 (94)
Useful gains	1525.6663	1980.6962	2448.4296	2913.1795	2941.8154	2334.3590	1610.0854	1658.0592	2120.8965	1931.3246	1568.7351	1419.4682 (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	6496.8050	6344.3124	5805.7411	4931.2420	3848.1629	2580.6347	1661.9335	1747.7958	2740.0394	4063.3147	5358.2187	6473.6769 (97)
Space heating kWh	3698.5272	2932.3501	2497.8398	1453.0050	674.3225	0.0000	0.0000	0.0000	0.0000	1586.2006	2728.4282	3760.3313 (98a)
Space heating requirement - total per year (kWh/year)												19331.0047
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	3698.5272	2932.3501	2497.8398	1453.0050	674.3225	0.0000	0.0000	0.0000	0.0000	1586.2006	2728.4282	3760.3313 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												19331.0047
Space heating per m2										(98c) / (4) =		44.1912 (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 %)												92.4000 (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	3698.5272	2932.3501	2497.8398	1453.0050	674.3225	0.0000	0.0000	0.0000	0.0000	1586.2006	2728.4282	3760.3313 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	4002.7351	3173.5390	2703.2898	1572.5163	729.7863	0.0000	0.0000	0.0000	0.0000	1716.6673	2952.8443	4069.6226 (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	272.1410	240.4860	255.3812	224.7001	217.8332	196.3364	193.9854	201.7792	204.0551	227.4374	241.6458	269.2280 (64)
Efficiency of water heater (217)m	88.2522	88.1842	88.0255	87.6429	86.6345	80.3000	80.3000	80.3000	80.3000	87.7218	88.1321	80.3000 (216)
Fuel for water heating, kWh/month	308.3674	272.7088	290.1217	256.3816	251.4393	244.5036	241.5759	251.2817	254.1159	259.2712	274.1861	305.0106 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	59.8257	47.9944	43.2136	31.6601	24.4552	19.9801	22.3089	28.9979	37.6654	49.4190	55.8187	61.4884 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-160.5198	-207.9447	-274.6775	-282.6260	-283.8156	-257.0837	-253.1019	-248.1961	-238.0260	-223.4455	-169.3940	-140.9533 (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	-156.2153	-317.9390	-613.6169	-896.7570	-1163.2234	-1161.3984	-1148.4112	-983.0499	-734.6752	-446.8601	-205.7820	-124.4453 (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												20921.0007 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												3208.9637 (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)												482.8273 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-10692.1580 (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)

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Total delivered energy for all uses

14006.6337 (238)

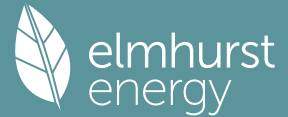
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	20921.0007	0.2100	4393.4102 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3208.9637	0.2100	673.8824 (264)
Space and water heating			5067.2925 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	482.8273	0.1443	69.6869 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2739.7843	0.1365	-374.0647
PV Unit electricity exported	-7952.3737	0.1267	-1007.6288
Total			-1381.6935 (269)
Total CO2, kg/year			3767.2152 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.6100 (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	20921.0007	1.1300	23640.7308 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3208.9637	1.1300	3626.1290 (278)
Space and water heating			27266.8598 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	482.8273	1.5338	740.5766 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2739.7843	1.5047	-4122.5538
PV Unit electricity exported	-7952.3737	0.4651	-3698.9634
Total			-7821.5172 (283)
Total Primary energy kWh/year			20316.0200 (286)
Target Primary Energy Rate (TPER)			46.4400 (287)

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Property Reference	excessive glazing			Issued on Date	04/12/2024
Assessment Reference	proposed	Prop Type Ref			
Property	St Katherines, St Katherines, Forge Lane, Gravesend, Kent, DA12 3DP				
SAP Rating	67 D	DER	33.65	TER	8.61
Environmental	59 D	% DER < TER			-290.82
CO ₂ Emissions (t/year)	13.21	DFEE	127.23	TFEE	47.96
Compliance Check	See BREL	% DFEE < TFEE			-165.28
% DPER < TPER	-293.39	DPER	182.69	TPER	46.44
Assessor Details	Dr. Yanli Suo			Assessor ID	AY89-0001
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	216.3200 (1b)	x 2.8800 (2b)	= 623.0016 (1b) - (3b)
First floor	199.5000 (1c)	x 2.9400 (2c)	= 586.5300 (1c) - (3c)
Second floor	10.8100 (1d)	x 1.8400 (2d)	= 19.8904 (1d) - (3d)
Third floor	10.8100 (1e)	x 2.5000 (2e)	= 27.0250 (1e) - (3e)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	437.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	1256.4470 (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	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0318 (8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000 (17)	
Infiltration rate		0.7818 (18)	
Number of sides sheltered		0 (19)	

Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7818 (21)

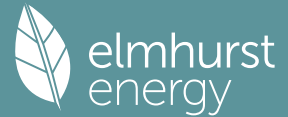
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.9968	0.9773	0.9577	0.8600	0.8405	0.7427	0.7427	0.7232	0.7818	0.8405	0.8796	0.9187 (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	0.9968	0.9776	0.9586	0.8698	0.8532	0.7758	0.7758	0.7615	0.8056	0.8532	0.8868	0.9220 (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
existing windows (Uw = 4.80)			60.0800	4.0268	241.9329		(27)
new windows (Uw = 1.40)			21.5100	1.3258	28.5170		(27)
existing door			2.2100	3.0000	6.6300		(26)
existing floor			199.5000	0.7000	139.6500	20.0000	3990.0000 (28a)
new floor			16.8200	0.1500	2.5230	75.0000	1261.5000 (28a)
existing wall	417.6900	62.2900	355.4000	0.7000	248.7800	190.0000	67526.0000 (29a)
new wall	33.0200	21.5100	11.5100	0.1500	1.7265	60.0000	690.6000 (29a)
existing ceiling	199.5000		199.5000	0.7000	139.6500	9.0000	1795.5000 (30)
new flat roof	6.9200		6.9200	0.1500	1.0380	9.0000	62.2800 (30)
new pitched roof	11.6700		11.6700	0.1500	1.7505	9.0000	105.0300 (30)
Total net area of external elements Aum(A, m ²)			885.1200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	812.1979		(33)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	75430.9100 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		172.4372 (35)

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Thermal bridges (Default value 0.200 * total exposed area)
Point Thermal bridges (36a) = 177.0240 (36)
Total fabric heat loss (33) + (36) + (36a) = 989.2219 (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	413.3196	405.3202	397.4791	360.6499	353.7593	321.6823	321.6823	315.7421	334.0379	353.7593	367.6989	382.2722	(38)
Heat transfer coeff	1402.5416	1394.5421	1386.7010	1349.8719	1342.9812	1310.9042	1310.9042	1304.9640	1323.2598	1342.9812	1356.9209	1371.4942	(39)
Average = Sum(39)m / 12 =												1349.8389	
HLP	3.2062	3.1880	3.1700	3.0858	3.0701	2.9968	2.9968	2.9832	3.0250	3.0701	3.1020	3.1353	(40)
HLP (average)												3.0858	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.3106 (42)
Hot water usage for mixer showers													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
34.4088	33.8978	33.1782	31.8513	30.8578	29.7561	29.1610	29.8756	30.6537	31.8325	33.1867	34.2925	34.2925	(42b)
Hot water usage for other uses													
48.5339	46.7690	45.0041	43.2393	41.4744	39.7095	39.7095	41.4744	43.2393	45.0041	46.7690	48.5339	48.5339	(42c)
Average daily hot water use (litres/day)												76.0241	(43)
Daily hot water use													
82.9427	80.6668	78.1823	75.0906	72.3322	69.4656	68.8706	71.3500	73.8930	76.8367	79.9557	82.8264	82.8264	(44)
Energy conte	131.3609	114.8684	120.1633	102.7953	97.3730	85.4161	83.2930	88.3462	91.1174	104.2666	113.9115	129.6861	(45)
Energy content (annual)												1262.5979	
Distribution loss (46)m = 0.15 x (45)m													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	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	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													
111.6568	97.6382	102.1388	87.3760	82.7671	72.6037	70.7990	75.0943	77.4498	88.6266	96.8248	110.2332	110.2332	(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													
111.6568	97.6382	102.1388	87.3760	82.7671	72.6037	70.7990	75.0943	77.4498	88.6266	96.8248	110.2332	110.2332	(64)
12Total per year (kWh/year)												1073.2082	(64)
Electric shower(s)												1073	(64)
63.8487	56.8897	62.1214	59.2817	60.3941	57.6101	59.5305	60.3941	59.2817	62.1214	60.9533	63.8487	63.8487	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												726.2756	(64a)
Heat gains from water heating, kWh/month													
43.8764	38.6320	41.0651	36.6644	35.7903	32.5535	32.5824	33.8721	34.1829	37.6870	39.4445	43.5205	43.5205	(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	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
284.9178	315.4447	284.9178	294.4151	284.9178	294.4151	284.9178	284.9178	294.4151	284.9178	294.4151	284.9178	284.9178	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
561.9383	567.7694	553.0751	521.7926	482.3040	445.1904	420.3962	414.5650	429.2593	460.5418	500.0304	537.1440	537.1440	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	(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)													
-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	(71)
Water heating gains (Table 5)													
58.9736	57.4881	55.1950	50.9228	48.1052	45.2131	43.7935	45.5270	47.4762	50.6546	54.7841	58.4953	58.4953	(72)
Total internal gains													
978.4887	1013.3612	965.8469	939.7895	887.9861	857.4776	821.7665	817.6689	843.8097	868.7733	921.8886	953.2162	953.2162	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North					9.9800	10.6334		0.8500		0.7000		0.7700		43.7575 (74)
East					25.6200	19.6403		0.8500		0.7000		0.7700		207.4802 (76)
South					3.5900	46.7521		0.8500		0.7000		0.7700		69.2063 (78)
West					20.8900	19.6403		0.8500		0.7000		0.7700		169.1749 (80)
North					7.1100	10.6334		0.5700		0.8000		0.7700		23.8913 (74)
East					7.2000	19.6403		0.5700		0.8000		0.7700		44.6867 (76)
West					7.2000	19.6403		0.5700		0.8000		0.7700		44.6867 (80)

Solar gains	602.8835	1154.2728	1865.4149	2705.6804	3328.8653	3419.5303	3250.2570	2778.6830	2161.0866	1357.8914	746.5692	499.4351	(83)	
Total gains	1581.3722	2167.6340	2831.2618	3645.4699	4216.8514	4277.0080	4072.0235	3596.3518	3004.8963	2226.6647	1668.4578	1452.6512	(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)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	14.9393	15.0250	15.1100	15.5222	15.6019	15.9836	15.9836	16.0564	15.8344	15.6019	15.4416	15.2775
alpha	1.9960	2.0017	2.0073	2.0348	2.0401	2.0656	2.0656	2.0704	2.0556	2.0401	2.0294	2.0185
util living area	0.9957	0.9916	0.9832	0.9629	0.9249	0.8604	0.7817	0.8249	0.9293	0.9801	0.9934	0.9965 (86)
MIT	16.2618	16.5835	17.2203	18.1625	19.0944	19.9422	20.4194	20.3165	19.5832	18.3855	17.2035	16.2612 (87)
Th 2	18.6504	18.6590	18.6674	18.7077	18.7154	18.7516	18.7516	18.7584	18.7375	18.7154	18.6999	18.6839 (88)
util rest of house	0.9943	0.9887	0.9768	0.9464	0.8827	0.7508	0.5451	0.6206	0.8674	0.9686	0.9906	0.9953 (89)
MIT 2	14.6264	14.9513	15.5894	16.5416	17.4509	18.2505	18.6166	18.5680	17.9484	16.7759	15.5911	14.6418 (90)
Living area fraction	14.7584	15.0829	15.7210	16.6724	17.5835	18.3869	18.7621	18.7091	18.0803	16.9057	15.7212	14.7724 (91)
MIT	14.7584	15.0829	15.7210	16.6724	17.5835	18.3869	18.7621	18.7091	18.0803	16.9057	15.7212	14.7724 (92)
Temperature adjustment												0.0000
adjusted MIT	14.7584	15.0829	15.7210	16.6724	17.5835	18.3869	18.7621	18.7091	18.0803	16.9057	15.7212	14.7724 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9895	0.9802	0.9618	0.9209	0.8480	0.7225	0.5468	0.6131	0.8348	0.9509	0.9835	0.9913 (94)
Useful gains	1564.8045	2124.8192	2723.2163	3356.9908	3575.6901	3090.0969	2226.6018	2205.0083	2508.3826	2117.2362	1640.9049	1440.0668 (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	14668.3022	14200.5439	12786.7850	10491.7183	7901.4006	4964.3169	2834.2792	3013.2647	5267.0060	8468.4559	11698.2322	14500.0349 (97)
Space heating kWh	9749.0023	8114.8870	7487.2951	5137.0038	3218.3286	0.0000	0.0000	0.0000	0.0000	4725.3074	7241.2756	9716.6162 (98a)
Space heating requirement - total per year (kWh/year)												55389.7161
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	9749.0023	8114.8870	7487.2951	5137.0038	3218.3286	0.0000	0.0000	0.0000	0.0000	4725.3074	7241.2756	9716.6162 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												55389.7161
Space heating per m2												126.6224 (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	12322.4994	9700.6910	9917.7264	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.3571	0.4163	0.3696	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	4399.7534	4038.3421	3665.1894	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	4855.8455	4621.5753	4071.4918	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	328.3863	433.9255	302.2890	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	82.0966	108.4814	75.5722	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												266.1502 (107)
Energy for space heating												126.6224 (99)
Energy for space cooling												0.6084 (108)
Total												127.2309 (109)
Fabric Energy Efficiency (DFEE)												127.2 (109)

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

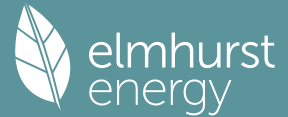
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	216.3200 (1b)	x 2.8800 (2b)	= 623.0016 (1b) - (3b)
First floor	199.5000 (1c)	x 2.9400 (2c)	= 586.5300 (1c) - (3c)
Second floor	10.8100 (1d)	x 1.8400 (2d)	= 19.8904 (1d) - (3d)
Third floor	10.8100 (1e)	x 2.5000 (2e)	= 27.0250 (1e) - (3e)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	437.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	1256.4470 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	(6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(7a)+(7b)+(7c) = 40.0000 / (5) = 0.0318 (8)
Pressure test	Yes

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Pressure Test Method
Measured/design AP50
Infiltration rate
Number of sides sheltered

Blower Door
5.0000 (17)
0.2818 (18)
0 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.2818 (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	0.3593	0.3523	0.3452	0.3100	0.3030	0.2677	0.2677	0.2607	0.2818	0.3030	0.3171	0.3312	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													(23c)
Effective ac	0.5646	0.5621	0.5596	0.5481	0.5459	0.5358	0.5358	0.5340	0.5397	0.5459	0.5503	0.5548	(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			2.2100	1.0000	2.2100			(26)
TER Opening Type (Uw = 1.20)			81.5900	1.1450	93.4237			(27)
existing floor			199.5000	0.1300	25.9350			(28a)
new floor			16.8200	0.1300	2.1866			(28a)
existing wall	417.6900	62.2900	355.4000	0.1800	63.9720			(29a)
new wall	33.0200	21.5100	11.5100	0.1800	2.0718			(29a)
existing ceiling	199.5000		199.5000	0.1100	21.9450			(30)
new flat roof	6.9200		6.9200	0.1100	0.7612			(30)
new pitched roof	11.6700		11.6700	0.1100	1.2837			(30)
Total net area of external elements Aum(A, m2)			885.1200					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 213.7890			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							172.4372	(35)
Thermal bridges (User defined value 0.050 * total exposed area)							44.2560	(36)
Point Thermal bridges							(36a) = 0.0000	
Total fabric heat loss							(33) + (36) + (36a) = 258.0450	(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	234.0833	233.0438	232.0249	227.2391	226.3437	222.1754	222.1754	221.4035	223.7810	226.3437	228.1551	230.0488	(38)
Heat transfer coeff	492.1283	491.0888	490.0699	485.2841	484.3887	480.2204	480.2204	479.4485	481.8259	484.3887	486.2001	488.0938	(39)
Average = Sum(39)m / 12 =													485.2798

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1250	1.1226	1.1203	1.1094	1.1073	1.0978	1.0978	1.0960	1.1015	1.1073	1.1115	1.1158	(40)
HLP (average)												1.1094	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

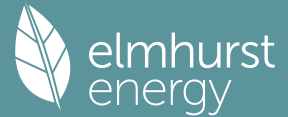
4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.3106	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	34.4088	33.8978	33.1782	31.8513	30.8578	29.7561	29.1610	29.8756	30.6537	31.8325	33.1867	34.2925	34.2925	(42b)
Hot water usage for other uses	48.5339	46.7690	45.0041	43.2393	41.4744	39.7095	39.7095	41.4744	43.2393	45.0041	46.7690	48.5339	48.5339	(42c)
Average daily hot water use (litres/day)													76.0241	(43)
Daily hot water use	82.9427	80.6668	78.1823	75.0906	72.3322	69.4656	68.8706	71.3500	73.8930	76.8367	79.9557	82.8264	82.8264	(44)
Energy conte	131.3609	114.8684	120.1633	102.7953	97.3730	85.4161	83.2930	88.3462	91.1174	104.2666	113.9115	129.6861	129.6861	(45)
Energy content (annual)													1262.5979	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	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	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	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	0.0000	(61)
Total heat required for water heating calculated for each month	111.6568	97.6382	102.1388	87.3760	82.7671	72.6037	70.7990	75.0943	77.4498	88.6266	96.8248	110.2332	110.2332	(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	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	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	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	0.0000	(63d)
Output from w/h	111.6568	97.6382	102.1388	87.3760	82.7671	72.6037	70.7990	75.0943	77.4498	88.6266	96.8248	110.2332	110.2332	(64)
Total per year (kWh/year) = Sum(64)m = 1073.2082													1073	(64)
12Total per year (kWh/year)														
Electric shower(s)	63.8487	56.8897	62.1214	59.2817	60.3941	57.6101	59.5305	60.3941	59.2817	62.1214	60.9533	63.8487	63.8487	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 726.2756													726.2756	(64a)
Heat gains from water heating, kWh/month	43.8764	38.6320	41.0651	36.6644	35.7903	32.5535	32.5824	33.8721	34.1829	37.6870	39.4445	43.5205	43.5205	(65)

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

Metabolic gains (Table 5), Watts														
(66)m	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	287.9275	318.7769	287.9275	297.5251	287.9275	287.9275	287.9275	287.9275	297.5251	287.9275	297.5251	287.9275	287.9275	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	561.9383	567.7694	553.0751	521.7926	482.3040	445.1904	420.3962	414.5650	429.2593	460.5418	500.0304	537.1440	537.1440	(68)

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Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5											
	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530 (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 (70)
Losses e.g. evaporation (negative values) (Table 5)											
	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241 (71)
Water heating gains (Table 5)	58.9736	57.4881	55.1950	50.9228	48.1052	45.2131	43.7935	45.5270	47.4762	50.6546	54.7841
Total internal gains	981.4984	1016.6934	968.8566	942.8995	890.9958	860.5876	824.7762	820.6786	846.9197	871.7830	924.9986
											956.2259 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g		FF		Access factor Table 6d		Gains W
North				17.0900	10.6334	0.6300		0.7000		0.7700		55.5374 (74)
East				32.8200	19.6403	0.6300		0.7000		0.7700		196.9961 (76)
South				3.5900	46.7521	0.6300		0.7000		0.7700		51.2941 (78)
West				28.0900	19.6403	0.6300		0.7000		0.7700		168.6052 (80)
Solar gains	472.4328	905.3350	1465.1806	2128.4140	2621.4736	2694.1004	2560.2359	2186.9046	1698.4778	1065.5861	585.1754	391.2743 (83)
Total gains	1453.9312	1922.0284	2434.0372	3071.3135	3512.4695	3554.6881	3385.0122	3007.5832	2545.3975	1937.3691	1510.1740	1347.5001 (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	42.5764	42.6665	42.7552	43.1768	43.2566	43.6321	43.6321	43.7024	43.4867	43.2566	43.0955	42.9283
alpha	3.8384	3.8444	3.8503	3.8785	3.8838	3.9088	3.9088	3.9135	3.8991	3.8838	3.8730	3.8619
util living area	0.9989	0.9967	0.9893	0.9597	0.8808	0.7347	0.5830	0.6590	0.8866	0.9848	0.9977	0.9992 (86)
MIT	18.7898	19.0419	19.4636	20.0410	20.5371	20.8482	20.9541	20.9265	20.6492	19.9732	19.2789	18.7562 (87)
Th 2	19.9805	19.9824	19.9843	19.9932	19.9949	20.0026	20.0026	20.0041	19.9996	19.9949	19.9915	19.9880 (88)
util rest of house	0.9987	0.9959	0.9864	0.9479	0.8450	0.6567	0.4678	0.5446	0.8373	0.9788	0.9969	0.9990 (89)
MIT 2	17.9340	18.1871	18.6083	19.1826	19.6504	19.9171	19.9860	19.9745	19.7660	19.1240	18.4307	17.9058 (90)
Living area fraction	18.0030	18.2561	18.6773	19.2519	19.7219	19.9922	20.0641	20.0513	19.8372	19.1925	18.4991	17.9744 (92)
MIT	18.0030	18.2561	18.6773	19.2519	19.7219	19.9922	20.0641	20.0513	19.8372	19.1925	18.4991	17.9744 (93)
Temperature adjustment												0.0000
adjusted MIT	18.0030	18.2561	18.6773	19.2519	19.7219	19.9922	20.0641	20.0513	19.8372	19.1925	18.4991	17.9744 (93)

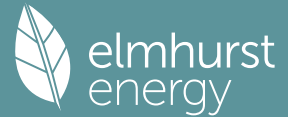
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9978	0.9937	0.9810	0.9366	0.8333	0.6558	0.4754	0.5506	0.8273	0.9719	0.9953	0.9984 (94)
Useful gains	1450.7718	1909.8691	2387.8262	2876.6215	2927.0362	2331.0959	1609.2358	1655.9732	2105.9113	1882.9360	1503.0175	1345.3285 (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	6743.6465	6559.0066	5967.7460	5023.5907	3885.7276	2589.4488	1663.5483	1750.6048	2764.3362	4162.1293	5542.2507	6723.1963 (97)
Space heating kWh	3937.8987	3124.2204	2663.4603	1545.8178	713.2664	0.0000	0.0000	0.0000	0.0000	1695.7198	2908.2479	4001.1336 (98a)
Space heating requirement - total per year (kWh/year)												20589.7650
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	3937.8987	3124.2204	2663.4603	1545.8178	713.2664	0.0000	0.0000	0.0000	0.0000	1695.7198	2908.2479	4001.1336 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												20589.7650
Space heating per m2												47.0688 (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	4514.0717	3553.6309	3643.8085	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7465	0.8236	0.7655	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	3369.6415	2926.6230	2789.4727	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	4008.2037	3815.3417	3380.1727	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	459.7648	661.2067	439.4808	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												
Intermittency factor (Table 10b)									fc = cooled area / (4) =			1.0000 (105)
	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	114.9412	165.3017	109.8702	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												390.1131 (107)
Energy for space heating												47.0688 (99)
Energy for space cooling												0.8918 (108)
Total												47.9606 (109)
Fabric Energy Efficiency (TFEE)												48.0 (109)

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Property Reference	excessive glazing			Issued on Date	04/12/2024
Assessment Reference	proposed	Prop Type Ref			
Property	St Katherines, St Katherines, Forge Lane, Gravesend, Kent, DA12 3DP				
SAP Rating	67 D	DER	33.65	TER	8.61
Environmental	59 D	% DER < TER			-290.82
CO ₂ Emissions (t/year)	13.21	DFEE	127.23	TFEE	47.96
Compliance Check	See BREL	% DFEE < TFEE			-165.28
% DPER < TPER	-293.39	DPER	182.69	TPER	46.44
Assessor Details	Dr. Yanli Suo			Assessor ID	AY89-0001
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	216.3200 (1b)	x 2.8800 (2b)	= 623.0016 (1b) - (3b)
First floor	199.5000 (1c)	x 2.9400 (2c)	= 586.5300 (1c) - (3c)
Second floor	10.8100 (1d)	x 1.8400 (2d)	= 19.8904 (1d) - (3d)
Third floor	10.8100 (1e)	x 2.5000 (2e)	= 27.0250 (1e) - (3e)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	437.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	1256.4470 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.7500 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.7500 (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	0.9562	0.9375	0.9188	0.8250	0.8062	0.7125	0.7125	0.6938	0.7500	0.8062	0.8438	0.8813 (22b)
Effective ac	0.9572	0.9395	0.9221	0.8403	0.8250	0.7538	0.7538	0.7406	0.7812	0.8250	0.8560	0.8883 (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
existing windows (Uw = 4.80)			60.0800	4.0268	241.9329		(27)
new windows (Uw = 1.40)			21.5100	1.3258	28.5170		(27)
existing door			2.2100	3.0000	6.6300		(26)
existing floor			199.5000	0.7000	139.6500	20.0000	3990.0000 (28a)
new floor			16.8200	0.1500	2.5230	75.0000	1261.5000 (28a)
existing wall	417.6900	62.2900	355.4000	0.7000	248.7800	190.0000	67526.0000 (29a)
new wall	33.0200	21.5100	11.5100	0.1500	1.7265	60.0000	690.6000 (29a)
existing ceiling	199.5000		199.5000	0.7000	139.6500	9.0000	1795.5000 (30)
new flat roof	6.9200		6.9200	0.1500	1.0380	9.0000	62.2800 (30)
new pitched roof	11.6700		11.6700	0.1500	1.7505	9.0000	105.0300 (30)
Total net area of external elements Aum(A, m ²)			885.1200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	812.1979		(33)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =		75430.9100 (34)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K						172.4372 (35)	
Thermal bridges (Default value 0.200 * total exposed area)						177.0240 (36)	
Point Thermal bridges						(36a) =	0.0000

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Total fabric heat loss

(33) + (36) + (36a) = 989.2219 (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	396.8844	389.5231	382.3076	348.4167	342.0758	312.5579	312.5579	307.0916	323.9277	342.0758	354.9033	368.3139	(38)
Heat transfer coeff	1386.1063	1378.7450	1371.5296	1337.6386	1331.2977	1301.7798	1301.7798	1296.3135	1313.1497	1331.2977	1344.1253	1357.5359	(39)
Average = Sum(39)m / 12 =												1337.6082	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	3.1687	3.1518	3.1354	3.0579	3.0434	2.9759	2.9759	2.9634	3.0019	3.0434	3.0727	3.1034	(40)
HLP (average)												3.0578	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.3106 (42)
Hot water usage for mixer showers													
109.6258	107.9784	105.5777	100.9844	97.5947	93.8145	91.6659	94.0484	96.6601	100.7188	105.4107	109.2058	109.2058	(42a)
Hot water usage for baths													
36.2198	35.6819	34.9244	33.5277	32.4819	31.3222	30.6958	31.4480	32.2670	33.5079	34.9334	36.0974	36.0974	(42b)
Hot water usage for other uses													
51.0883	49.2305	47.3728	45.5150	43.6573	41.7995	41.7995	43.6573	45.5150	47.3728	49.2305	51.0883	51.0883	(42c)
Average daily hot water use (litres/day)												181.0967	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	196.9339	192.8908	187.8748	180.0271	173.7338	166.9363	164.1612	169.1537	174.4421	181.5995	189.5746	196.3914	(44)
Energy conte	311.8952	274.6739	288.7566	246.4481	233.8791	205.2676	198.5388	209.4476	215.1046	246.4288	270.0838	307.5015	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
46.7843	41.2011	43.3135	36.9672	35.0819	30.7901	29.7808	31.4171	32.2657	36.9643	40.5126	46.1252	46.1252	(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	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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
362.8541	320.7013	339.7155	295.7632	284.8380	254.5827	249.4977	260.4065	264.4196	297.3877	319.3989	358.4604	358.4604	(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	362.8541	320.7013	339.7155	295.7632	284.8380	254.5827	249.4977	260.4065	264.4196	297.3877	319.3989	358.4604	(64)
												3608.0256	(64)
12Total per year (kWh/year)												3608.0256	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
												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													
116.4449	102.8359	108.7513	94.2728	90.5045	80.5802	78.7539	82.3810	83.8510	94.6773	102.1316	114.9840	114.9840	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
284.9178	315.4447	284.9178	294.4151	284.9178	294.4151	284.9178	294.4151	284.9178	294.4151	284.9178	294.4151	284.9178	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
561.9383	567.7694	553.0751	521.7926	482.3040	445.1904	420.3962	414.5650	429.2593	460.5418	500.0304	537.1440	537.1440	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	(69)
Pumps, fans	7.0000	7.0000	7.0000	7.0000	7.0000	0.0000	0.0000	0.0000	0.0000	7.0000	7.0000	7.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	(71)
Water heating gains (Table 5)													
156.5119	153.0296	146.1711	130.9344	121.6459	111.9170	105.8520	110.7272	116.4598	127.2544	141.8495	154.5484	154.5484	(72)
Total internal gains	1083.0270	1115.9028	1063.8230	1026.8011	968.5268	924.1815	883.8250	882.8691	912.7932	952.3731	1015.9540	1056.2693	(73)

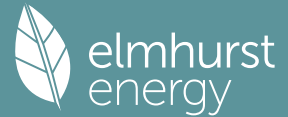
6. Solar gains

[Jan]					Area m2	Solar flux Table 6a		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
North					9.9800	10.6334		0.8500	0.7000	0.7700		43.7575 (74)	
East					25.6200	19.6403		0.8500	0.7000	0.7700		207.4802 (76)	
South					3.5900	46.7521		0.8500	0.7000	0.7700		69.2063 (78)	
West					20.8900	19.6403		0.8500	0.7000	0.7700		169.1749 (80)	
North					7.1100	10.6334		0.5700	0.8000	0.7700		23.8913 (74)	
East					7.2000	19.6403		0.5700	0.8000	0.7700		44.6867 (76)	
West					7.2000	19.6403		0.5700	0.8000	0.7700		44.6867 (80)	
Solar gains	602.8835	1154.2728	1865.4149	2705.6804	3328.8653	3419.5303	3250.2570	2778.6830	2161.0866	1357.8914	746.5692	499.4351	(83)
Total gains	1685.9105	2270.1756	2929.2380	3732.4815	4297.3921	4343.7118	4134.0820	3661.5520	3073.8799	2310.2646	1762.5232	1555.7043	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	15.1165	15.1972	15.2771	15.6642	15.7388	16.0957	16.0957	16.1636	15.9563	15.7388	15.5886	15.4346	

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alpha	2.0078	2.0131	2.0185	2.0443	2.0493	2.0730	2.0730	2.0776	2.0638	2.0493	2.0392	2.0290
util living area	0.9952	0.9909	0.9821	0.9612	0.9223	0.8566	0.7764	0.8197	0.9263	0.9787	0.9926	0.9960 (86)
MIT	16.3145	16.6343	17.2670	18.1994	19.1241	19.9608	20.4324	20.3311	19.6057	18.4184	17.2447	16.3101 (87)
Th 2	18.6680	18.6760	18.6838	18.7213	18.7285	18.7621	18.7621	18.7684	18.7491	18.7285	18.7141	18.6992 (88)
util rest of house	0.9936	0.9877	0.9753	0.9441	0.8789	0.7456	0.5395	0.6141	0.8627	0.9665	0.9896	0.9947 (89)
MIT 2	14.6873	15.0100	15.6437	16.5842	17.4850	18.2709	18.6305	18.5828	17.9742	16.8145	15.6390	14.6979 (90)
Living area fraction	14.8186	15.1411	15.7746	16.7145	17.6172	18.4072	18.7758	18.7238	18.1058	16.9439	15.7686	0.0807 (91)
MIT	14.8186	15.1411	15.7746	16.7145	17.6172	18.4072	18.7758	18.7238	18.1058	16.9439	15.7686	14.8280 (92)
Temperature adjustment												0.0000
adjusted MIT	14.8186	15.1411	15.7746	16.7145	17.6172	18.4072	18.7758	18.7238	18.1058	16.9439	15.7686	14.8280 (93)

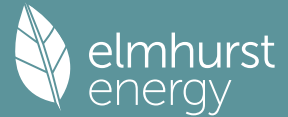
8. Space heating requirement												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9884	0.9787	0.9598	0.9181	0.8442	0.7179	0.5418	0.6073	0.8301	0.9480	0.9819	0.9903 (94)
Useful gains	1666.2762	2221.8999	2811.4762	3426.8571	3627.7475	3118.3639	2239.7976	2223.8355	2551.5770	2190.1418	1730.6362	1540.5579 (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	14579.8782	14119.8113	12720.4256	10452.9271	7877.5955	4956.1787	2832.4475	3012.4381	5260.2558	8445.5909	11651.6178	14427.8829 (97)
Space heating kWh	9607.7198	7995.3964	7372.2583	5058.7704	3161.8869	0.0000	0.0000	0.0000	0.0000	4654.0542	7143.1068	9588.1698 (98a)
Space heating requirement - total per year (kWh/year)												54581.3627
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	9607.7198	7995.3964	7372.2583	5058.7704	3161.8869	0.0000	0.0000	0.0000	0.0000	4654.0542	7143.1068	9588.1698 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												54581.3627
Space heating per m2										(98c) / (4) =		124.7745 (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 %)												84.0000 (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	9607.7198	7995.3964	7372.2583	5058.7704	3161.8869	0.0000	0.0000	0.0000	0.0000	4654.0542	7143.1068	9588.1698 (98)
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000 (210)
Space heating fuel (main heating system)	11437.7617	9518.3291	8776.4980	6022.3458	3764.1511	0.0000	0.0000	0.0000	0.0000	5540.5407	8503.6986	11414.4879 (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	362.8541	320.7013	339.7155	295.7632	284.8380	254.5827	249.4977	260.4065	264.4196	297.3877	319.3989	358.4604 (64)
Efficiency of water heater (217)m	83.6348	83.6131	83.5583	83.4469	83.1752	75.0000	75.0000	75.0000	75.0000	83.3989	83.5708	75.0000 (216)
Fuel for water heating, kWh/month	433.8556	383.5540	406.5610	354.4329	342.4556	339.4436	332.6636	347.2087	352.5595	356.5846	382.1897	428.5841 (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	9.7671	8.8219	9.7671	9.4521	9.7671	9.4521	9.7671	9.7671	9.4521	9.7671	9.4521	9.7671 (231)
Lighting	103.1814	82.7759	74.5306	54.6043	42.1779	34.4597	38.4761	50.0127	64.9616	85.2331	96.2706	106.0491 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)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 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (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												64977.8127 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												75.0000
Water heating fuel used												4460.0928 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans: central heating pump												115.0000 (230c)
Total electricity for the above, kWh/year												115.0000 (231)
Electricity for lighting (calculated in Appendix L)												832.7330 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (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												70385.6385 (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	64977.8127	0.2100	13645.3407 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	4460.0928	0.2100	936.6195 (264)
Space and water heating			14581.9602 (265)
Pumps, fans and electric keep-hot	115.0000	0.1387	15.9519 (267)
Energy for lighting	832.7330	0.1443	120.1891 (268)
Total CO2, kg/year			14718.1012 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			33.6500 (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	64977.8127	1.1300	73424.9284 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	4460.0928	1.1300	5039.9049 (278)
Space and water heating			78464.8333 (279)
Pumps, fans and electric keep-hot	115.0000	1.5128	173.9720 (281)
Energy for lighting	832.7330	1.5338	1277.2736 (282)
Total Primary energy kWh/year			79916.0789 (286)
Dwelling Primary energy Rate (DPER)			182.6900 (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	216.3200 (1b)	x 2.8800 (2b)	= 623.0016 (1b) - (3b)
First floor	199.5000 (1c)	x 2.9400 (2c)	= 586.5300 (1c) - (3c)
Second floor	10.8100 (1d)	x 1.8400 (2d)	= 19.8904 (1d) - (3d)
Third floor	10.8100 (1e)	x 2.5000 (2e)	= 27.0250 (1e) - (3e)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	437.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	1256.4470 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.0318 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.2818 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2818 (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	0.3593	0.3523	0.3452	0.3100	0.3030	0.2677	0.2677	0.2607	0.2818	0.3030	0.3171	0.3312 (22b)
Effective ac	0.5646	0.5621	0.5596	0.5481	0.5459	0.5358	0.5358	0.5340	0.5397	0.5459	0.5503	0.5548 (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			2.2100	1.0000	2.2100		(26)
TER Opening Type (Uw = 1.20)			81.5900	1.1450	93.4237		(27)
existing floor			199.5000	0.1300	25.9350		(28a)
new floor			16.8200	0.1300	2.1866		(28a)
existing wall	417.6900	62.2900	355.4000	0.1800	63.9720		(29a)
new wall	33.0200	21.5100	11.5100	0.1800	2.0718		(29a)
existing ceiling	199.5000		199.5000	0.1100	21.9450		(30)
new flat roof	6.9200		6.9200	0.1100	0.7612		(30)
new pitched roof	11.6700		11.6700	0.1100	1.2837		(30)

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Total net area of external elements Aum(A, m2) 885.1200 (31)
 Fabric heat loss, W/K = Sum (A x U) (26)...(30) + (32) = 213.7890 (33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 172.4372 (35)
 Thermal bridges (User defined value 0.050 * total exposed area) 44.2560 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 258.0450 (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	234.0833	233.0438	232.0249	227.2391	226.3437	222.1754	222.1754	221.4035	223.7810	226.3437	228.1551	230.0488 (38)
Average = Sum(39)m / 12 =	492.1283	491.0888	490.0699	485.2841	484.3887	480.2204	480.2204	479.4485	481.8259	484.3887	486.2001	488.0938 (39)
												485.2798
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1250	1.1226	1.1203	1.1094	1.1073	1.0978	1.0978	1.0960	1.1015	1.1073	1.1115	1.1158 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	3.3106 (42)											
Hot water usage for mixer showers	79.4224 (42a)											
Hot water usage for baths	34.2925 (42b)											
Hot water usage for other uses	48.5339 (42c)											
Average daily hot water use (litres/day)	149.5305 (43)											
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	162.6705	159.1965	154.9661	148.5338	143.3101	137.6944	135.5367	139.7489	144.1912	150.0867	156.6180	162.2488 (44)
Energy content (annual)	257.6304	226.6937	238.1771	203.3353	192.9230	169.3113	163.9199	173.0383	177.8021	203.6662	223.1311	254.0423 (45)
Distribution loss (46)m = 0.15 x (45)m	Total = Sum(45)m = 2483.6708											
Water storage loss:	38.6446	34.0041	35.7266	30.5003	28.9385	25.3967	24.5880	25.9557	26.6703	30.5499	33.4697	38.1064 (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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	308.5893	272.7211	289.1360	252.6504	243.8819	218.6264	214.8788	223.9972	227.1172	254.6251	272.4462	305.0012 (62)
WWHRS	-36.4482	-32.2351	-33.7548	-27.9503	-26.0487	-22.2900	-20.8933	-22.2180	-23.0621	-27.1877	-30.8004	-35.7733 (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	272.1410	240.4860	255.3812	224.7001	217.8332	196.3364	193.9854	201.7792	204.0551	227.4374	241.6458	269.2280 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m = 2745.0089 (64)											
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Heat gains from water heating, kWh/month	98.4018	86.8825	91.9336	79.9378	76.8866	68.6248	67.2431	70.2750	71.4480	80.4587	86.5199	97.2088 (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	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301	165.5301 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	287.9275	318.7769	287.9275	297.5251	287.9275	297.5251	287.9275	287.9275	297.5251	287.9275	297.5251	287.9275 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	561.9383	567.7694	553.0751	521.7926	482.3040	445.1904	420.3962	414.5650	429.2593	460.5418	500.0304	537.1440 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530	39.5530 (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)	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241	-132.4241 (71)
Water heating gains (Table 5)	132.2605	129.2894	123.5667	111.0247	103.3422	95.3122	90.3805	94.4556	99.2333	108.1435	120.1665	130.6570 (72)
Total internal gains	1057.7853	1091.4948	1040.2283	1006.0014	949.2328	910.6867	871.3632	869.6071	898.6768	932.2719	993.3810	1031.3876 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W

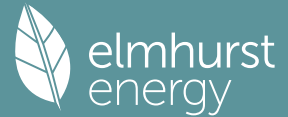
North					17.0900	10.6334		0.6300	0.7000	0.7700		55.5374 (74)
East					32.8200	19.6403		0.6300	0.7000	0.7700		196.9961 (76)
South					3.5900	46.7521		0.6300	0.7000	0.7700		51.2941 (78)
West					28.0900	19.6403		0.6300	0.7000	0.7700		168.6052 (80)

Solar gains	472.4328	905.3350	1465.1806	2128.4140	2621.4736	2694.1004	2560.2359	2186.9046	1698.4778	1065.5861	585.1754	391.2743 (83)
Total gains	1530.2181	1996.8298	2505.4089	3134.4154	3570.7065	3604.7872	3431.5991	3056.5117	2597.1546	1997.8580	1578.5564	1422.6619 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

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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	42.5764	42.6665	42.7552	43.1768	43.2566	43.6321	43.6321	43.7024	43.4867	43.2566	43.0955	42.9283
alpha	3.8384	3.8444	3.8503	3.8785	3.8838	3.9088	3.9088	3.9135	3.8991	3.8838	3.8730	3.8619
util living area	0.9987	0.9962	0.9882	0.9571	0.8761	0.7285	0.5766	0.6514	0.8809	0.9832	0.9973	0.9990 (86)
MIT	18.8145	19.0660	19.4858	20.0583	20.5484	20.8529	20.9558	20.9295	20.6594	19.9917	19.3010	18.7807 (87)
Th 2	19.9805	19.9824	19.9843	19.9932	19.9949	20.0026	20.0026	20.0041	19.9996	19.9949	19.9915	19.9880 (88)
util rest of house	0.9984	0.9953	0.9850	0.9448	0.8393	0.6501	0.4621	0.5373	0.8302	0.9766	0.9964	0.9988 (89)
MIT 2	17.3862	17.7094	18.2468	18.9741	19.5650	19.8967	19.9822	19.9679	19.7102	18.9005	18.0170	17.3476 (90)
Living area fraction									FLA = Living area / (4) =			0.0807 (91)
MIT	17.5014	17.8189	18.3468	19.0616	19.6444	19.9739	20.0608	20.0454	19.7868	18.9885	18.1206	17.4632 (92)
Temperature adjustment												0.0000
adjusted MIT	17.5014	17.8189	18.3468	19.0616	19.6444	19.9739	20.0608	20.0454	19.7868	18.9885	18.1206	17.4632 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9970	0.9919	0.9773	0.9294	0.8239	0.6476	0.4692	0.5425	0.8166	0.9667	0.9938	0.9978 (94)
Useful gains	1525.6663	1980.6962	2448.4296	2913.1795	2941.8154	2334.3590	1610.0854	1658.0592	2120.8965	1931.3246	1568.7351	1419.4682 (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	6496.8050	6344.3124	5805.7411	4931.2420	3848.1629	2580.6347	1661.9335	1747.7958	2740.0394	4063.3147	5358.2187	6473.6769 (97)
Space heating kWh	3698.5272	2932.3501	2497.8398	1453.0050	674.3225	0.0000	0.0000	0.0000	0.0000	1586.2006	2728.4282	3760.3313 (98a)
Space heating requirement - total per year (kWh/year)												19331.0047
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	3698.5272	2932.3501	2497.8398	1453.0050	674.3225	0.0000	0.0000	0.0000	0.0000	1586.2006	2728.4282	3760.3313 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												19331.0047
Space heating per m2										(98c) / (4) =		44.1912 (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 %)												92.4000 (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	3698.5272	2932.3501	2497.8398	1453.0050	674.3225	0.0000	0.0000	0.0000	0.0000	1586.2006	2728.4282	3760.3313 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	4002.7351	3173.5390	2703.2898	1572.5163	729.7863	0.0000	0.0000	0.0000	0.0000	1716.6673	2952.8443	4069.6226 (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	272.1410	240.4860	255.3812	224.7001	217.8332	196.3364	193.9854	201.7792	204.0551	227.4374	241.6458	269.2280 (64)
Efficiency of water heater (217)m	88.2522	88.1842	88.0255	87.6429	86.6345	80.3000	80.3000	80.3000	80.3000	87.7218	88.1321	80.3000 (216)
Fuel for water heating, kWh/month	308.3674	272.7088	290.1217	256.3816	251.4393	244.5036	241.5759	251.2817	254.1159	259.2712	274.1861	305.0106 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	59.8257	47.9944	43.2136	31.6601	24.4552	19.9801	22.3089	28.9979	37.6654	49.4190	55.8187	61.4884 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-160.5198	-207.9447	-274.6775	-282.6260	-283.8156	-257.0837	-253.1019	-248.1961	-238.0260	-223.4455	-169.3940	-140.9533 (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	-156.2153	-317.9390	-613.6169	-896.7570	-1163.2234	-1161.3984	-1148.4112	-983.0499	-734.6752	-446.8601	-205.7820	-124.4453 (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												20921.0007 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												3208.9637 (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)												482.8273 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-10692.1580 (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)

Full SAP Calculation Printout



Total delivered energy for all uses

14006.6337 (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	20921.0007	0.2100	4393.4102 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3208.9637	0.2100	673.8824 (264)
Space and water heating			5067.2925 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	482.8273	0.1443	69.6869 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2739.7843	0.1365	-374.0647
PV Unit electricity exported	-7952.3737	0.1267	-1007.6288
Total			-1381.6935 (269)
Total CO2, kg/year			3767.2152 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.6100 (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	20921.0007	1.1300	23640.7308 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3208.9637	1.1300	3626.1290 (278)
Space and water heating			27266.8598 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	482.8273	1.5338	740.5766 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2739.7843	1.5047	-4122.5538
PV Unit electricity exported	-7952.3737	0.4651	-3698.9634
Total			-7821.5172 (283)
Total Primary energy kWh/year			20316.0200 (286)
Target Primary Energy Rate (TPER)			46.4400 (287)