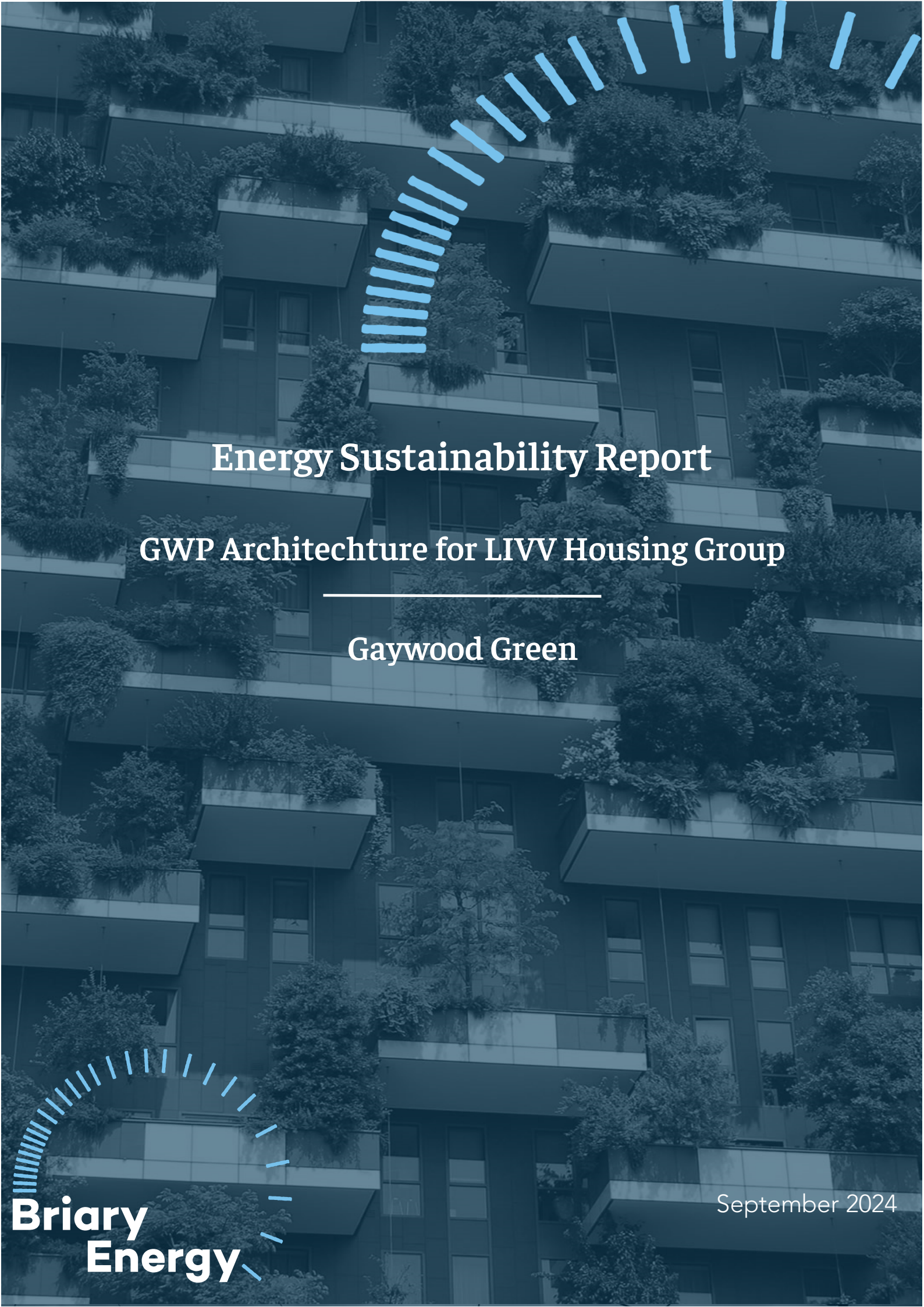




Energy Sustainability Report

GWP Architecture for LIVV Housing Group

Gaywood Green

Summary

Briary Energy have worked with GWP Architecture (on behalf of LIVV Housing Group) to develop a low carbon energy strategy which is fossil fuel free. As part of this, Three options were developed and assessed for one Detached house type, one Semi-Detached, and an apartment from each floor (totaling three apartments). with an Easterly orientation (reflecting a worse use case). All assessments have been carried out using SAP 10.2 methodology and targeting compliance the latest Part L 2021

The analysis shows that all options have a betterment over Part L 2021 in terms of carbon emissions ('Dwelling Emission Rate – 'DER') ranging from a 54.83% improvement (Option 1) to 67.02% (Option 3). All options provide a betterment of the council's policy on carbon reduction for new development CS22 AND CS23.

Option 1 has been identified as the preferred design option.

The proposed outline specifications is as follows:

- Improved fabric performance (vs. 2021 notional building)
- Use of sustainable construction materials where possible (to reduce embodied carbon)
- No fossil fuels used for energy to remain of the gas grid.
- Use of heat pumps
- Use of Solar PV for sustainable energy generation

Compliance with Knowsley Local Plan: Core Strategy January 2016

The council's current policy's pertaining to sustainable design are outlined in the Knowsley Local Plan: Core Strategy January 2016. The key policies relating to the development in terms of energy use are Policy CS22 criteria 1) and Policy CS23, criteria 1)

Policy CS22

Sustainable and Low Carbon Development

Sustainable Construction Principles

- 1) New development will be required to meet high standards of sustainable design and construction and minimise carbon emissions. This should be achieved by:
 - b) Avoiding the creation of adverse local climate conditions by using natural systems to avoid internal overheating and excessive heat generation;
 - e) Limiting energy use by incorporating high standards of insulation, heat retention, natural ventilation and passive solar techniques;

Policy CS23

Renewable and Low Carbon Infrastructure

- 1) The Council will support proposals that will produce and distribute decentralised, low carbon and renewable energy, provided that they do not cause significant harm (in terms of their number, scale, siting or cumulative impacts) to:
 - a) Natural resources, biodiversity, geodiversity, water and air quality and, landscape character;

As the above do not state any requirement for a set reduction in either carbon emissions, or energy reduction, the premise is that the development must be built to conform to the current building regulation targets, ensuring that all of the proposed options are compliant.

National Planning Policy Framework (NPPF)

The latest National Planning Policy Framework (NPPF) sets out the Government's planning policies for England and how these are expected to be applied. At the heart of the NPPF is a presumption in favour of planning of sustainable development. The NPPF has guidance for developments to ensure they plan for climate change.

Achieving sustainable development

7. The purpose of the planning system is to contribute to the achievement of sustainable development. At a very high level, the objective of sustainable development can be summarised as meeting the needs of the present without compromising the ability of future generations to meet their own needs.

Planning for climate change

158. Plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating from rising temperatures⁵⁶. Policies should support appropriate measures to ensure the future resilience of communities and infrastructure to climate change impacts, such as providing space for physical protection measures, or making provision for the possible future relocation of vulnerable development and infrastructure.

160. To help increase the use and supply of renewable and low carbon energy and heat, plans should:

- a) provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts);
- b) consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and
- c) identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for collocating potential heat customers and suppliers.

161. Local planning authorities should support community-led initiatives for renewable and low carbon energy, including developments outside areas identified in local plans or other strategic policies that are being taken forward through neighbourhood planning.

Paragraph 163 sets out what is expected from local authorities when considering strategies to mitigate and adapt to climate change:

163. When determining planning applications⁵⁷ for renewable and low carbon development, local planning authorities should:

- a) not require applicants to demonstrate the overall need for renewable or low carbon energy, and recognise that even small-scale projects provide a valuable contribution to significant cutting greenhouse gas emissions;
- b) approve the application if its impacts are (or can be made) acceptable⁵⁸. Once suitable areas for renewable and low carbon energy have been identified in plans, local planning authorities should expect subsequent applications for commercial scale projects outside these areas to demonstrate that the proposed location meets the criteria used in identifying suitable areas; and
- c) in the case of applications for the repowering and life-extension of existing renewable sites, give significant weight to the benefits of utilising an established site, and approve the proposal if its impacts are or can be made acceptable.

Fabric element proposed Values

Enhancing the thermal performance of the building is usually more cost effective than providing renewable energy, with more reliable CO₂ savings for the long-term life cycle of the building, without the cost of replacing mechanical or electrical components on a continual basis. Adding renewable technology will then maximise these carbon reductions, reducing the quantity required.

Element	Building Regulations	Proposed
Ground Floor	0.18 W/m ² k	0.11 W/m ² k
External Wall	0.26 W/m ² k	0.18 W/m ² k
Ins Joist	0.16 W/m ² k	0.09 W/m ² k
Ins Rafter	0.16 W/m ² k	0.13 W/m ² k
Windows	2.00 W/m ² k	1.30 W/m ² k
Doors	2.00 W/m ² k	1.20 W/m ² k
Air Permeability	8.00 m ³ /hm ² (@50 Pa)	3.00 m ³ /hm ² (@50 Pa)
Thermal Bridges	0.15 ≤ Y	Calculated Constructive Details

Energy Analysis

As requested, we assessed Blocks D, F, and one apartment block from each level for this exercise with an orientation of East.

This document is an analysis into 3 proposed specifications on a mix of house types, comparing the proposed energy and carbon reductions they will bring. Below we have included the details of the energy ratings and performance against the Building Regulations targets for each of the specifications. Then a further analysis into the space heating, water heating, pumps and fans and lighting energy demands that each option would bring.

Option 1(**Preferred option**): Electric Panel radiators, with a Domestic Hot Water Heat Pump. PV required to meet building regs. (PV required for types D, Ground and Top floor apartment to comply Primary Energy Rate)

Option 2: Electric Panel radiators, with a Domestic Hot Water Heat Pump, with additional PV(4kWp on block D and F, with 1kWp for each apartment.

Option 3: Full Air Source Heat Pump to provide heating and hot water.

The below table shows how each of the options will perform against Part L 2021 of Building Regulations.

Building Regulations Targets Block D

	DER	%Over TER	DPER	%Over TPER	DFEE	%Over DFEE	Total Co ² Kg	EPC Rating
Option 1 (0.8kWp PV)	5.88	49.61	60.95	0.1	43.44	0.56	650.33	74
Option 2	3.2	72.58	43.28	29.05	43.44	0.56	354.13	83
Option 3	4.32	63.51	45.27	26.93	43.44	0.56	478.3	80

All the data within the above table has been taken from the SAP 10.2 software calculations carried out for this dwelling.

Building Regulations Targets Block F

	DER	%Over TER	DPER	%Over TPER	DFEE	%Over DFEE	Total Co ² Kg	EPC Rating
Option 1	6	50.21	61.7	2.06	34.85	6.37	419.54	78
Option 2	0.77	93.61	27.22	56.79	34.85	6.37	53.8	92
Option 3	4.97	59.33	52.45	17.92	34.85	6.37	347.82	81

All the data within the above table has been taken from the SAP 10.2 software calculations carried out for this dwelling.

Building Regulations Targets Ground Floor Apartment

	DER	%Over TER	DPER	%Over TPER	DFEE	%Over DFEE	Total Co ² Kg	EPC Rating
Option 1	5.43	58.99	55.88	19.84	32.29	11.99	360.04	81
Option 2	3.75	71.68	42.16	39.53	32.29	11.99	248.55	86
Option 3	3.74	71.75	39.2	69.71	32.29	11.99	247.83	86

All the data within the above table has been taken from the SAP 10.2 software calculations carried out for this dwelling.

Building Regulations Targets Mid Floor Apartment

	DER	%Over TER	DPER	%Over TPER	DFEE	%Over DFEE	Total Co ² Kg	EPC Rating
Option 1	4.64	59.93	47.83	21.34	27.55	5.07	307.33	83
Option 2	3.24	72.02	36.29	40.31	27.55	5.07	215	88
Option 3	3.38	70.81	35.59	60.8	27.55	5.07	224.18	87

All the data within the above table has been taken from the SAP 10.2 software calculations carried out for this dwelling.

Building Regulations Targets Top Floor Apartment

	DER	%Over TER	DPER	%Over TPER	DFEE	%Over DFEE	Total Co ² Kg	EPC Rating
Option 1	5.76	55.42	59.27	12.87	34.75	1.12	381.67	79
Option 2	4.08	68.42	45.5	33.12	34.75	1.12	270.21	85
Option 3	3.91	69.74	40.97	68.03	34.75	1.12	259.22	85

All the data within the above table has been taken from the SAP 10.2 software calculations carried out for this dwelling.

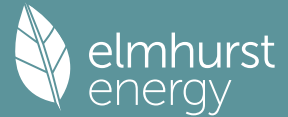
The following table outlines the energy demand in kWh/year from each of the specification options. It also provides the energy reductions provided from PV to the specifications which utilise this.

Energy Requirments	Main Heating Fuel Requirement	Water Heating Fuel Requirement	Pumps and Fans Requirement	Lighting Requirement	PV Redcution (If applied)	Total
Block D Option 1	3707.5	751.2	41.3	213.9	-545.9	4167.9
Block D Option 2	3707.5	751.2	41.3	213.9	-2905.1	1808.7
Block D Option 3	1370.4	1615.5	41.3	213.9		3241.1
Block F Option 1	1929.0	651.7	25.6	158.7		2765.1
Block F Option 2	1929.0	651.7	25.6	158.7	-2905.1	-140.1
Block F Option 3	733.9	1465.3	25.6	158.7		2383.6
Ground Floor Option 1	1558.9	636.0	21.6	155.5		2372.1
Ground Floor Option 2	1558.9	636.0	21.6	155.5	-863.6	1508.5
Ground Floor Option 3	624.3	880.5	21.6	155.5		1682.0
Mid Floor Option 1	1220.3	636.0	21.6	155.5		2033.5
Mid Floor Option 2	1220.3	636.0	21.6	155.5	-863.6	1169.8
Mid Floor Option 3	476.6	876.4	21.6	155.5		1530.2
Top Floor Option 1	1703.7	636.0	21.6	155.5		2516.8
Top Floor Option 2	1703.7	637.0	21.6	155.5	-863.6	1654.2
Top Floor Option 3	698.6	881.5	21.6	155.5		1757.3

As the Tables show, the heating and hot water demans between Option 1 and Option 2 are the same, Option 3 having a lower space heating, but higher hot water demand.

I have attached to this document the SAP reports where all the data figures within the tables have been derived from. Some assumptions in regards to the Psi Values have been made as at this stage the timber frame has not been finalised therefore they are not available.

Full SAP Calculation Printout



Property Reference	001 BLOCK D				Issued on Date	10/09/2024
Assessment Reference	001 BLOCK D ASHP	Prop Type Ref		001 BLOCK D		
Property	001 BLOCK D, 001 BLOCK D, 0					
SAP Rating	84 B	DER	3.56	TER	11.84	
Environmental	97 A	% DER < TER				69.93
CO ₂ Emissions (t/year)	0.36	DFEE	43.44	TFEE	43.68	
Compliance Check	See BREL	% DFEE < TFEE				0.56
% DPER < TPER	40.14	DPER	37.09	TPER	61.96	
Assessor Details	Mr. Scott Binstead				Assessor ID	U903-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)		Storey height (m)		Volume (m ³)	
Ground floor	45.0550 (1b)	x	2.4000 (2b)	=	108.1320 (1b) - (3b)	
First floor	45.0550 (1c)	x	2.6000 (2c)	=	117.1430 (1c) - (3c)	
Second floor	20.5690 (1d)	x	2.2000 (2d)	=	45.2518 (1d) - (3d)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	110.6790				(4)	
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	270.5268 (5)	

2. Ventilation rate

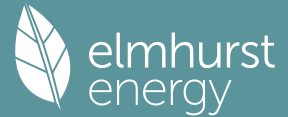
	m ³ per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (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) =	0.1500 (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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(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	
Solid Door			2.0370	1.0000	2.0400			(26)
Windows (Uw = 1.30)			34.0300	1.2357	42.0646			(27)
Flr - Ground			45.0550	0.1100	4.9560	75.0000	3379.1250	(28a)
Wl - 1	145.9220	30.4910	115.4310	0.1800	20.7776	60.0000	6925.8598	(29a)
Wl - Dormer	14.7880		9.2120	0.2600	2.3951	9.0000	82.9080	(29a)
Wl - Stud Ashlar	25.6520		25.6520	0.1200	3.0782	9.0000	230.8680	(29a)
Rf - Ins Rafter	8.5120		8.5120	0.1600	1.3619	9.0000	76.6080	(30)
Rf - Flat Roof	5.8400		5.8400	0.1600	0.9344	9.0000	52.5600	(30)
Rf - Ashlar behind Stud	24.4870		24.4870	0.1152	2.8209	9.0000	220.3830	(30)
Rf - Ins Joist Ashlar	9.2570		9.2570	0.1794	1.6611	9.0000	83.3130	(30)
Total net area of external elements Aum(A, m ²)			279.5260					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		82.0900			(33)
Stud			86.2224			9.0000	776.0016	(32c)
Stud			112.7204			9.0000	1014.4836	(32c)

Full SAP Calculation Printout



Stud	12.0912	9.0000	108.8208 (32c)
Internal Floor 1	65.6240	9.0000	590.6160 (32d)
Internal Ceiling 1	65.6240	9.0000	590.6160 (32e)

Heat capacity $C_m = \text{Sum}(A \times k)$ (28)...(30) + (32) + (32a)...(32e) = 14132.1628 (34)
Thermal mass parameter (TMP = C_m / TFA) in kJ/m²K 127.6860 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	17.1270	0.2240	3.8364
E2 Other lintels (including other steel lintels)	12.7320	0.0240	0.3056
E3 Sill	44.3120	0.0190	0.8419
E4 Jamb	27.8000	0.0450	1.2510
E5 Ground floor (normal)	55.6000	0.0000	0.0000
E6 Intermediate floor within a dwelling	1.9060	0.0340	0.0648
E13 Gable (insulation at rafter level)	28.8800	0.0370	1.0686
E16 Corner (normal)	3.1240	0.2400	0.7498
R1 Head of roof window	3.1240	0.2400	0.7498
R2 Sill of roof window	3.2220	0.0400	0.1289
R6 Flat ceiling	4.7260	0.1200	0.5671
R7 Flat ceiling (inverted)	10.4700	0.1600	1.6752
R9 Roof to wall (flat ceiling)			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			11.2390 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 93.3290 (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	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369 (38)
Heat transfer coeff	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659 (39)
Average = Sum(39)m / 12 =												137.9659
HLP	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465 (40)
HLP (average)												1.2465
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

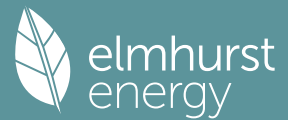
Assumed occupancy													2.8188 (42)
Hot water usage for mixer showers	71.4825	70.4083	68.8429	65.8478	63.6375	61.1726	59.7716	61.3251	63.0281	65.6746	68.7340	71.2086 (42a)	
Hot water usage for baths	30.8630	30.4047	29.7592	28.5691	27.6779	26.6898	26.1560	26.7970	27.4949	28.5522	29.7669	30.7587 (42b)	
Hot water usage for other uses	43.4977	41.9160	40.3343	38.7525	37.1708	35.5891	35.5891	37.1708	38.7525	40.3343	41.9160	43.4977 (42c)	
Average daily hot water use (litres/day)												134.0628 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	145.8433	142.7289	138.9364	133.1694	128.4862	123.4515	121.5167	125.2929	129.2755	134.5611	140.4169	145.4651 (44)	
Distribution loss (46)m = 0.15 x (45)m	230.9801	203.2441	213.5400	182.3023	172.9672	151.7980	146.9639	155.1388	159.4096	182.5982	200.0496	227.7631 (45)	
Water storage loss:										Total = Sum(45)m =		2226.7549	
Store volume	34.6470	30.4866	32.0310	27.3453	25.9451	22.7697	22.0446	23.2708	23.9114	27.3897	30.0074	34.1645 (46)	
a) If manufacturer declared loss factor is known (kWh/day):												250.0000 (47)	
Temperature factor from Table 2b												1.7500 (48)	
Enter (49) or (54) in (55)												0.5400 (49)	
Total storage loss												0.9450 (55)	
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950 (56)	
Primary loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950 (57)	
Combi loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)	
Total heat required for water heating calculated for each month	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)	
WWHRS	283.5375	250.7153	266.0974	233.1643	225.5246	202.6600	199.5213	207.6962	210.2716	235.1556	250.9116	280.3205 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)	
Electric shower(s)	283.5375	250.7153	266.0974	233.1643	225.5246	202.6600	199.5213	207.6962	210.2716	235.1556	250.9116	280.3205 (64)	
Total per year (kWh/year) = Sum(64)m =												2845.5759 (64)	
Heat gains from water heating, kWh/month	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	118.8468	105.5556	113.0480	101.3051	99.5575	91.1624	90.9114	93.6296	93.6933	102.7598	107.2061	117.7772 (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	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.2797	26.8941	21.8718	16.5583	12.3776	10.4497	11.2912	14.6768	19.6991	25.0125	29.1933	31.1212 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	406.7582	410.9790	400.3426	377.6988	349.1150	322.2504	304.3031	300.0823	310.7187	333.3625	361.9462	388.8109 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319 (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)	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536 (71)
Water heating gains (Table 5)	159.7403	157.0768	151.9462	140.7015	133.8139	126.6145	122.1928	125.8462	130.1296	138.1180	148.8974	158.3026 (72)
Total internal gains	707.8869	706.0587	685.2692	646.0674	606.4152	570.4232	548.8958	551.7139	571.6561	607.6018	651.1456	689.3435 (73)

6. Solar gains

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[Jan]	Area m2				Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
North	2.8690				10.6334	0.4700		0.0000		0.7700	11.0406 (74)
East	14.0080				19.6403	0.4700		0.0000		0.7700	99.5662 (76)
South	0.7000				46.7521	0.4700		0.0000		0.7700	11.8437 (78)
West	16.4530				19.6403	0.4700		0.0000		0.7700	116.9448 (80)

Solar gains	239.3953	464.0375	758.0733	1102.7945	1353.3924	1387.2883	1319.9266	1131.7789	880.1530	548.6048	297.6226	197.4862 (83)
Total gains	947.2822	1170.0962	1443.3425	1748.8618	1959.8076	1957.7115	1868.8224	1683.4928	1451.8091	1156.2066	948.7682	886.8296 (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	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534
alpha	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969
util living area	0.9537	0.9195	0.8497	0.7259	0.5727	0.4252	0.3163	0.3627	0.5733	0.8174	0.9297	0.9609 (86)
Living	18.8495	19.2414	19.8115	20.3859	20.7532	20.9224	20.9755	20.9632	20.8164	20.2480	19.4098	18.7496
Non living	17.4122	17.8997	18.5959	19.2680	19.6670	19.8303	19.8718	19.8649	19.7445	19.1367	18.1201	17.2869
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	19.8999	19.2414	19.8115	20.3859	20.7532	20.9224	20.9755	20.9632	20.8164	20.2480	19.4098	19.0644 (87)
Th 2	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829 (88)
util rest of house	0.9457	0.9063	0.8267	0.6880	0.5201	0.3587	0.2393	0.2800	0.5012	0.7801	0.9158	0.9540 (89)
MIT 2	18.8979	17.8997	18.5959	19.2680	19.6670	19.8303	19.8718	19.8649	19.7445	19.1367	18.1201	17.7547 (90)
Living area fraction									fLA = Living area /	(4) =		0.1536 (91)
MIT	19.0519	18.1058	18.7827	19.4398	19.8338	19.9981	20.0413	20.0336	19.9092	19.3074	18.3183	17.9559 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0519	18.1058	18.7827	19.4398	19.8338	19.9981	20.0413	20.0336	19.9092	19.3074	18.3183	17.9559 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9386	0.8793	0.7997	0.6714	0.5177	0.3657	0.2505	0.2915	0.5030	0.7574	0.8899	0.9380 (94)
Useful gains	889.0801	1028.8820	1154.1991	1174.1757	1014.5654	716.0233	468.0653	490.6918	730.2164	875.7528	844.2987	831.8584 (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	2035.2562	1821.9537	1694.5891	1454.1267	1122.1940	744.7540	474.7863	501.3192	801.4700	1201.3230	1547.7417	1897.8501 (97)
Space heating kWh	852.7550	532.9442	402.0502	201.5647	80.0757	0.0000	0.0000	0.0000	0.0000	242.2243	506.4790	793.0978 (98a)
Space heating requirement - total per year (kWh/year)												3611.1909
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	852.7550	532.9442	402.0502	201.5647	80.0757	0.0000	0.0000	0.0000	0.0000	242.2243	506.4790	793.0978 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3611.1909
Space heating per m2										(98c) / (4) =		32.6276 (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 %)

274.3267 (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	852.7550	532.9442	402.0502	201.5647	80.0757	0.0000	0.0000	0.0000	0.0000	242.2243	506.4790	793.0978 (98)
Space heating efficiency (main heating system 1)	274.3267	274.3267	274.3267	274.3267	274.3267	0.0000	0.0000	0.0000	0.0000	274.3267	274.3267	274.3267 (210)
Space heating fuel (main heating system)	310.8538	194.2735	146.5589	73.4762	29.1899	0.0000	0.0000	0.0000	0.0000	88.2977	184.6262	289.1070 (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	283.5375	250.7153	266.0974	233.1643	225.5246	202.6600	199.5213	207.6962	210.2716	235.1556	250.9116	280.3205 (64)
Efficiency of water heater	278.8844	278.8844	278.8844	278.8844	278.8844	278.8844	278.8844	278.8844	278.8844	278.8844	278.8844	278.8844 (216)
Fuel for water heating, kWh/month	101.6685	89.8994	95.4150	83.6061	80.8667	72.6681	71.5427	74.4739	75.3974	84.3201	89.9698	100.5150 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	3.5062	3.1668	3.5062	3.3930	3.5062	3.3930	3.5062	3.5062	3.3930	3.5062	3.3930	3.5062 (231)
Lighting	26.5036	21.2622	19.1442	14.0259	10.8340	8.8515	9.8831	12.8465	16.6863	21.8933	24.7285	27.2402 (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)

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Electricity generated by hydro-electric generators (Appendix M) (negative quantity)														
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)														
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year														
Space heating fuel - main system 1													1316.3831	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													278.8844	
Water heating fuel used													1020.3426	(219)
Space cooling fuel													0.0000	(221)

Electricity for pumps and fans:														
(MEVDecentralised, Database: total watage = 4.6280, total flow = 37.0000, SFP = 0.1251)														
mechanical ventilation fans (SFP = 0.1251)													41.2821	(230a)
Total electricity for the above, kWh/year													41.2821	(231)
Electricity for lighting (calculated in Appendix L)													213.8993	(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													2591.9071	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1316.3831	16.4900	217.0716	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1020.3426	16.4900	168.2545	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	41.2821	16.4900	6.8074	(249)
Energy for lighting	213.8993	16.4900	35.2720	(250)
Additional standing charges			0.0000	(251)
Total energy cost			427.4055	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)		0.9884	(257)
SAP value	$[(255) \times (256)] / [(4) + 45.0] =$	83.9788	
SAP rating (Section 12)		84	(258)
SAP band		B	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1316.3831	0.1561	205.5481	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1020.3426	0.1410	143.8223	(264)
Space and water heating			349.3704	(265)
Pumps, fans and electric keep-hot	41.2821	0.1387	5.7263	(267)
Energy for lighting	213.8993	0.1443	30.8723	(268)
Total CO2, kg/year			385.9690	(272)
CO2 emissions per m2			3.4900	(273)
EI value			96.6778	
EI rating			97	(274)
EI band			A	

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

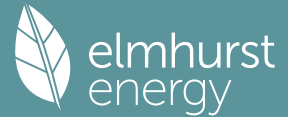
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	45.0550 (1b)	x 2.4000 (2b)	= 108.1320 (1b) - (3b)	
First floor	45.0550 (1c)	x 2.6000 (2c)	= 117.1430 (1c) - (3c)	
Second floor	20.5690 (1d)	x 2.2000 (2d)	= 45.2518 (1d) - (3d)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	110.6790			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 270.5268	(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)

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

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			3.0000 (17)
Infiltration rate			0.1500 (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) =		0.1500 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000	(22)
Adj infilt rate	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500	(22a)
	0.1575	0.1500	0.1500	0.1388	0.1388	0.1237	0.1275	0.1200	0.1237	0.1313	0.1313	0.1425	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(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	
Solid Door			2.0370	1.0000	2.0400			(26)
Windows (Uw = 1.30)			34.0300	1.2357	42.0646			(27)
Flr - Ground			45.0550	0.1100	4.9560	75.0000	3379.1250	(28a)
W1 - 1	145.9220	30.4910	115.4310	0.1800	20.7776	60.0000	6925.8598	(29a)
W1 - Dormer	14.7880	5.5760	9.2120	0.2600	2.3951	9.0000	82.9080	(29a)
W1 - Stud Ashlar	25.6520		25.6520	0.1200	3.0782	9.0000	230.8680	(29a)
Rf - Ins Rafter	8.5120		8.5120	0.1600	1.3619	9.0000	76.6080	(30)
Rf - Flat Roof	5.8400		5.8400	0.1600	0.9344	9.0000	52.5600	(30)
Rf - Ashlar behind Stud	24.4870		24.4870	0.1152	2.8209	9.0000	220.3830	(30)
Rf - Ins Joist Ashlar	9.2570		9.2570	0.1794	1.6611	9.0000	83.3130	(30)
Total net area of external elements Aum(A, m2)			279.5260					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	82.0900			(33)
Stud			86.2224			9.0000	776.0016	(32c)
Stud			112.7204			9.0000	1014.4836	(32c)
Stud			12.0912			9.0000	108.8208	(32c)
Internal Floor 1			65.6240			9.0000	590.6160	(32d)
Internal Ceiling 1			65.6240			9.0000	590.6160	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	14132.1628 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		127.6860 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	17.1270	0.2240	3.8364
E3 Sill	12.7320	0.0240	0.3056
E4 Jamb	44.3120	0.0190	0.8419
E5 Ground floor (normal)	27.8000	0.0450	1.2510
E6 Intermediate floor within a dwelling	55.6000	0.0000	0.0000
E13 Gable (insulation at rafter level)	1.9060	0.0340	0.0648
E16 Corner (normal)	28.8800	0.0370	1.0686
R1 Head of roof window	3.1240	0.2400	0.7498
R2 Sill of roof window	3.1240	0.2400	0.7498
R6 Flat ceiling	3.2220	0.0400	0.1289
R7 Flat ceiling (inverted)	4.7260	0.1200	0.5671
R9 Roof to wall (flat ceiling)	10.4700	0.1600	1.6752

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		11.2390 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	93.3290 (37)

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

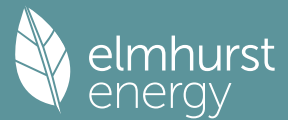
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	(38)
Average = Sum(39)m / 12 =	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	(39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8188 (42)
Hot water usage for mixer showers													
71.4825	70.4083	68.8429	65.8478	63.6375	61.1726	59.7716	61.3251	63.0281	65.6746	68.7340	71.2086		(42a)
Hot water usage for baths													
30.8630	30.4047	29.7592	28.5691	27.6779	26.6898	26.1560	26.7970	27.4949	28.5522	29.7669	30.7587		(42b)
Hot water usage for other uses													
43.4977	41.9160	40.3343	38.7525	37.1708	35.5891	35.5891	37.1708	38.7525	40.3343	41.9160	43.4977		(42c)
Average daily hot water use (litres/day)													134.0628 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
145.8433	142.7289	138.9364	133.1694	128.4862	123.4515	121.5167	125.2929	129.2755	134.5611	140.4169	145.4651		(44)
Energy conte	230.9801	203.2441	213.5400	182.3023	172.9672	151.7980	146.9639	155.1388	159.4096	182.5982	200.0496	227.7631	(45)
Energy content (annual)													Total = Sum(45)m = 2226.7549
Distribution loss (46)m = 0.15 x (45)m													
34.6470	30.4866	32.0310	27.3453	25.9451	22.7697	22.0446	23.2708	23.9114	27.3897	30.0074	34.1645		(46)
Water storage loss:													
Store volume													250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.7500 (48)

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Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9450 (55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950 (56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	283.5375	250.7153	266.0974	233.1643	225.5246	202.6600	199.5213	207.6962	210.2716	235.1556	250.9116	280.3205 (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	283.5375	250.7153	266.0974	233.1643	225.5246	202.6600	199.5213	207.6962	210.2716	235.1556	250.9116	280.3205 (64)
	Total per year (kWh/year) = Sum(64)m =											2845.5759 (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	118.8468	105.5556	113.0480	101.3051	99.5575	91.1624	90.9114	93.6296	93.6933	102.7598	107.2061	117.7772 (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	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.2797	26.8941	21.8718	16.5583	12.3776	10.4497	11.2912	14.6768	19.6991	25.0125	29.1933	31.1212	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	406.7582	410.9790	400.3426	377.6988	349.1150	322.2504	304.3031	300.0823	310.7187	333.3625	361.9462	388.8109	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	(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)	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	(71)
Water heating gains (Table 5)	159.7403	157.0768	151.9462	140.7015	133.8139	126.6145	122.1928	125.8462	130.1296	138.1180	148.8974	158.3026	(72)
Total internal gains	707.8869	706.0587	685.2692	646.0674	606.4152	570.4232	548.8958	551.7139	571.6561	607.6018	651.1456	689.3435	(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				2.8690	11.9814		0.4700		0.0000		0.7700		12.4402 (74)
East				14.0080	22.3313		0.4700		0.0000		0.7700		113.2085 (76)
South				0.7000	50.9848		0.4700		0.0000		0.7700		12.9160 (78)
West				16.4530	22.3313		0.4700		0.0000		0.7700		132.9683 (80)
Solar gains	271.5330	473.7502	763.8625	1142.9370	1364.3779	1495.7378	1408.0976	1236.2090	960.6369	597.9156	345.8945	221.7872	(83)
Total gains	979.4198	1179.8089	1449.1318	1789.0044	1970.7930	2066.1610	1956.9934	1787.9229	1532.2930	1205.5174	997.0402	911.1307	(84)

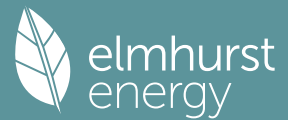
7. Mean internal temperature (heating season)

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	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	
alpha	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	
util living area	0.9440	0.9100	0.8303	0.6831	0.5087	0.3245	0.2165	0.2437	0.4809	0.7699	0.9098	0.9526	(86)
Living	19.0515	19.3862	19.9664	20.5251	20.8448	20.9702	20.9937	20.9911	20.9029	20.4338	19.6389	18.9645	
Non living	17.6672	18.0809	18.7843	19.4249	19.7588	19.8672	19.8814	19.8806	19.8205	19.3491	18.4044	17.5592	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0032	19.3862	19.9664	20.5251	20.8448	20.9702	20.9937	20.9911	20.9029	20.4338	19.6389	19.2492	(87)
Th 2	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	(88)
util rest of house	0.9341	0.8950	0.8036	0.6399	0.4499	0.2554	0.1394	0.1601	0.4009	0.7232	0.8916	0.9440	(89)
MIT 2	18.9996	18.0809	18.7843	19.4249	19.7588	19.8672	19.8814	19.8806	19.8205	19.3491	18.4044	17.9779	(90)
Living area fraction									fLA = Living area / (4) =			0.1536	(91)
MIT	19.1538	18.2814	18.9659	19.5939	19.9256	20.0367	20.0523	20.0512	19.9868	19.5158	18.5941	18.1732	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1538	18.2814	18.9659	19.5939	19.9256	20.0367	20.0523	20.0512	19.9868	19.5158	18.5941	18.1732	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	907.3589	1023.4325	1127.4684	1123.1053	891.2295	547.7462	295.8726	308.9726	626.3144	850.6201	861.9782	844.0867	(94)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(95)
Heat loss rate W	1938.9456	1749.6044	1595.6998	1337.4318	955.5025	556.9214	296.9420	310.5857	660.4095	1092.1074	1461.6193	1803.6617	(97)
Space heating kWh	767.5005	487.9875	348.3641	154.3151	47.8192	0.0000	0.0000	0.0000	0.0000	179.6665	431.7416	713.9238	(98a)
Space heating requirement - total per year (kWh/year)												3131.3183	
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	767.5005	487.9875	348.3641	154.3151	47.8192	0.0000	0.0000	0.0000	0.0000	179.6665	431.7416	713.9238	(98c)

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Space heating requirement after solar contribution - total per year (kWh/year)
Space heating per m2

3131.3183
(98c) / (4) = 28.2919 (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 %)												274.3267 (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	767.5005	487.9875	348.3641	154.3151	47.8192	0.0000	0.0000	0.0000	0.0000	179.6665	431.7416	713.9238 (98)
Space heating efficiency (main heating system 1)	274.3267	274.3267	274.3267	274.3267	274.3267	0.0000	0.0000	0.0000	0.0000	274.3267	274.3267	274.3267 (210)
Space heating fuel (main heating system)	279.7761	177.8855	126.9888	56.2523	17.4315	0.0000	0.0000	0.0000	0.0000	65.4936	157.3822	260.2458 (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	283.5375	250.7153	266.0974	233.1643	225.5246	202.6600	199.5213	207.6962	210.2716	235.1556	250.9116	280.3205 (64)
Efficiency of water heater (217)m	278.8844	278.8844	278.8844	278.8844	278.8844	278.8844	278.8844	278.8844	278.8844	278.8844	278.8844	278.8844 (216)
Fuel for water heating, kWh/month	101.6685	89.8994	95.4150	83.6061	80.8667	72.6681	71.5427	74.4739	75.3974	84.3201	89.9698	100.5150 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	3.5062	3.1668	3.5062	3.3930	3.5062	3.3930	3.5062	3.5062	3.3930	3.5062	3.3930	3.5062 (231)
Lighting	26.5036	21.2622	19.1442	14.0259	10.8340	8.8515	9.8831	12.8465	16.6863	21.8933	24.7285	27.2402 (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												1141.4557 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												278.8844
Water heating fuel used												1020.3426 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(MEV)Decentralised, Database: total watage = 4.6280, total flow = 37.0000, SFP = 0.1251)												
mechanical ventilation fans (SFP = 0.1251)												41.2821 (230a)
Total electricity for the above, kWh/year												41.2821 (231)
Electricity for lighting (calculated in Appendix L)												213.8993 (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												2416.9797 (238)

10a. Fuel costs - using BEDF prices (552)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1141.4557	26.0600	297.4634 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1020.3426	26.0600	265.9013 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Pumps, fans and electric keep-hot	41.2821	26.0600	10.7581 (249)
Energy for lighting	213.8993	26.0600	55.7422 (250)
Additional standing charges			0.0000 (251)
Total energy cost			629.8649 (255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1141.4557	0.1568	178.9314 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1020.3426	0.1410	143.8223 (264)
Space and water heating			322.7537 (265)
Pumps, fans and electric keep-hot	41.2821	0.1387	5.7263 (267)
Energy for lighting	213.8993	0.1443	30.8723 (268)
Total CO2, kg/year			359.3523 (272)

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

	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year	
Space heating - main system 1	1141.4557	1.5803	1803.8160	(275)
Total CO ₂ associated with community systems			0.0000	(473)
Water heating (other fuel)	1020.3426	1.5212	1552.1481	(278)
Space and water heating			3355.9641	(279)
Pumps, fans and electric keep-hot	41.2821	1.5128	62.4516	(281)
Energy for lighting	213.8993	1.5338	328.0859	(282)
Total Primary energy kWh/year			3746.5016	(286)

SAP 10 EPC IMPROVEMENTS

001 BLOCK D ASHP

Current energy efficiency rating: B 84
Current environmental impact rating: A 97

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

Recommended measures:	SAP change	Cost change	CO ₂ change
N Solar water heating	+ 1.0	-£ 49	-23 kg (6.4%)
U Solar photovoltaic panels	+ 7.2	-£ 289	-235 kg (69.8%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£49	0.21 kg/m ²	B 85 A 97
Solar photovoltaic panels	£289	2.12 kg/m ²	A 92 A 99
Total Savings	£338	2.33 kg/m ²	

Potential energy efficiency rating: A 92
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 552 TEST (30 Aug 2024)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£630	£581	£49
Space heating	£308	£329	-£21
Water heating	£266	£196	£70
Lighting	£56	£56	£0
Generated (PV)	-£0	-£289	£289
Total cost of fuels	£630	£292	£338
Total cost of uses	£630	£292	£338
Delivered energy	22 kWh/m ²	4 kWh/m ²	18 kWh/m ²
Carbon dioxide emissions	0.4 tonnes	0.1 tonnes	0.3 tonnes
CO ₂ emissions per m ²	3 kg/m ²	1 kg/m ²	2 kg/m ²
Primary energy	34 kWh/m ²	15 kWh/m ²	18 kWh/m ²

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

1. Overall dwelling characteristics

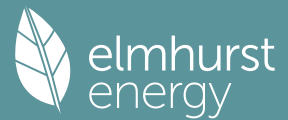
	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	45.0550 (1b)	x 2.4000 (2b)	= 108.1320 (1b) - (3b)
First floor	45.0550 (1c)	x 2.6000 (2c)	= 117.1430 (1c) - (3c)
Second floor	20.5690 (1d)	x 2.2000 (2d)	= 45.2518 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	110.6790		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	270.5268 (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)

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Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (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) =	0.1500 (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)
	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
Solid Door			2.0370	1.0000	2.0400		(26)
Windows (Uw = 1.30)			34.0300	1.2357	42.0646		(27)
Flr - Ground			45.0550	0.1100	4.9560	75.0000	3379.1250 (28a)
Wl - 1	145.9220	30.4910	115.4310	0.1800	20.7776	60.0000	6925.8598 (29a)
Wl - Dormer	14.7880	5.5760	9.2120	0.2600	2.3951	9.0000	82.9080 (29a)
Wl - Stud Ashlar	25.6520		25.6520	0.1200	3.0782	9.0000	230.8680 (29a)
Rf - Ins Rafter	8.5120		8.5120	0.1600	1.3619	9.0000	76.6080 (30)
Rf - Flat Roof	5.8400		5.8400	0.1600	0.9344	9.0000	52.5600 (30)
Rf - Ashlar behind Stud	24.4870		24.4870	0.1152	2.8209	9.0000	220.3830 (30)
Rf - Ins Joist Ashlar	9.2570		9.2570	0.1794	1.6611	9.0000	83.3130 (30)
Total net area of external elements Aum(A, m2)			279.5260				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	82.0900		(33)
Stud			86.2224			9.0000	776.0016 (32c)
Stud			112.7204			9.0000	1014.4836 (32c)
Stud			12.0912			9.0000	108.8208 (32c)
Internal Floor 1			65.6240			9.0000	590.6160 (32d)
Internal Ceiling 1			65.6240			9.0000	590.6160 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
List of Thermal Bridges
K1 Element
E2 Other lintels (including other steel lintels)
E3 Sill
E4 Jamb
E5 Ground floor (normal)
E6 Intermediate floor within a dwelling
E13 Gable (insulation at rafter level)
E16 Corner (normal)
R1 Head of roof window
R2 Sill of roof window
R6 Flat ceiling
R7 Flat ceiling (inverted)
R9 Roof to wall (flat ceiling)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Point Thermal bridges
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 14132.1628 (34)
127.6860 (35)

	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	17.1270	0.2240	3.8364
E3 Sill	12.7320	0.0240	0.3056
E4 Jamb	44.3120	0.0190	0.8419
E5 Ground floor (normal)	27.8000	0.0450	1.2510
E6 Intermediate floor within a dwelling	55.6000	0.0000	0.0000
E13 Gable (insulation at rafter level)	1.9060	0.0340	0.0648
E16 Corner (normal)	28.8800	0.0370	1.0686
R1 Head of roof window	3.1240	0.2400	0.7498
R2 Sill of roof window	3.1240	0.2400	0.7498
R6 Flat ceiling	3.2220	0.0400	0.1289
R7 Flat ceiling (inverted)	4.7260	0.1200	0.5671
R9 Roof to wall (flat ceiling)	10.4700	0.1600	1.6752
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			11.2390 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(36a) =	93.3290 (37)
		(33) + (36) + (36a) =	

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	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369 (38)
Average = Sum(39)m / 12 =	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8188 (42)
Hot water usage for mixer showers	71.4825	70.4083	68.8429	65.8478	63.6375	61.1726	59.7716	61.3251	63.0281	65.6746	68.7340	71.2086 (42a)
Hot water usage for baths	30.8630	30.4047	29.7592	28.5691	27.6779	26.6898	26.1560	26.7970	27.4949	28.5522	29.7669	30.7587 (42b)
Hot water usage for other uses	43.4977	41.9160	40.3343	38.7525	37.1708	35.5891	35.5891	37.1708	38.7525	40.3343	41.9160	43.4977 (42c)
Average daily hot water use (litres/day)												134.0628 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	145.8433	142.7289	138.9364	133.1694	128.4862	123.4515	121.5167	125.2929	129.2755	134.5611	140.4169	145.4651 (44)
Energy content (annual)	230.9801	203.2441	213.5400	182.3023	172.9672	151.7980	146.9639	155.1388	159.4096	182.5982	200.0496	227.7631 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 2226.7549
	34.6470	30.4866	32.0310	27.3453	25.9451	22.7697	22.0446	23.2708	23.9114	27.3897	30.0074	34.1645 (46)
Water storage loss:												
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9450 (55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950 (56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950 (57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)

8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9386	0.8793	0.8000	0.6730	0.5204	0.3681	0.2523	0.2936	0.5045	0.7579	0.8899	0.9380 (94)
Useful gains	889.0801	1028.8820	1153.4321	1171.8845	1012.6883	715.4141	467.9002	490.4313	729.4724	875.0983	844.2987	831.8584 (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	2035.2562	1821.9537	1694.3793	1453.5422	1121.7560	744.6210	474.7509	501.2630	801.2980	1201.1479	1547.7417	1897.8501 (97)

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Space heating kWh	852.7550	532.9442	402.4647	202.7936	81.1464	0.0000	0.0000	0.0000	0.0000	242.5809	506.4790	793.0978 (98a)
Space heating requirement - total per year (kWh/year)												3614.2616
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	852.7550	532.9442	402.4647	202.7936	81.1464	0.0000	0.0000	0.0000	0.0000	242.5809	506.4790	793.0978 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3614.2616
Space heating per m2										(98c) / (4) =		32.6554 (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 %)												274.3267 (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	852.7550	532.9442	402.4647	202.7936	81.1464	0.0000	0.0000	0.0000	0.0000	242.5809	506.4790	793.0978 (98)
Space heating efficiency (main heating system 1)	274.3267	274.3267	274.3267	274.3267	274.3267	0.0000	0.0000	0.0000	0.0000	274.3267	274.3267	274.3267 (210)
Space heating fuel (main heating system)	310.8538	194.2735	146.7100	73.9241	29.5802	0.0000	0.0000	0.0000	0.0000	88.4277	184.6262	289.1070 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	283.5375	234.5164	206.0380	145.5143	106.7427	92.3306	89.4742	110.9436	146.6752	205.0403	250.9116	280.3205 (64)
Efficiency of water heater	278.8844	278.8844	278.8844	278.8844	278.8844	278.8844	278.8844	278.8844	278.8844	278.8844	278.8844	278.8844 (216)
Fuel for water heating, kWh/month	101.6685	84.0909	73.8794	52.1773	38.2749	33.1071	32.0829	39.7812	52.5935	73.5216	89.9698	100.5150 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	10.3007	9.3038	10.3007	9.9684	10.3007	9.9684	10.3007	10.3007	9.9684	10.3007	9.9684	10.3007 (231)
Lighting	26.5036	21.2622	19.1442	14.0259	10.8340	8.8515	9.8831	12.8465	16.6863	21.8933	24.7285	27.2402 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-38.8456	-57.4669	-85.7163	-97.5928	-103.9088	-94.4466	-93.0983	-87.2861	-76.7918	-65.6635	-43.2073	-33.0463 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-11.2409	-26.1130	-56.6300	-93.1793	-131.7740	-137.2672	-135.5532	-112.4879	-79.6713	-41.1824	-16.2025	-8.8676 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1317.5025 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												278.8844
Water heating fuel used												771.6621 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(MEV)Decentralised, Database: total watage = 4.6280, total flow = 37.0000, SFP = 0.1251)												
mechanical ventilation fans (SFP = 0.1251)												41.2821 (230a)
pump for solar water heating												80.0000 (230g)
Total electricity for the above, kWh/year												121.2821 (231)
Electricity for lighting (calculated in Appendix L)												213.8993 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-1727.2394 (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												697.1066 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1317.5025	16.4900	217.2562 (240)	
Total CO2 associated with community systems			0.0000 (473)	
Water heating (other fuel)	771.6621	16.4900	127.2471 (247)	
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)	
Pumps, fans and electric keep-hot	41.2821	16.4900	6.8074 (249)	
Pump for solar water heating	80.0000	16.4900	13.1920 (249)	
Energy for lighting	213.8993	16.4900	35.2720 (250)	
Additional standing charges			0.0000 (251)	
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-877.0702	16.4900	-144.6289	
PV Unit electricity exported	-850.1692	5.5900	-47.5245	
Total			-192.1533 (252)	
Total energy cost			207.6213 (255)	

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11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.4801 (257)
SAP value		92.2174
SAP rating (Section 12)		92 (258)
SAP band		A

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

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Space heating - main system 1	1317.5025	0.1561	205.7045 (261)
Total CO ₂ associated with community systems			0.0000 (373)
Water heating (other fuel)	771.6621	0.1454	112.2180 (264)
Space and water heating			317.9224 (265)
Pumps, fans and electric keep-hot	121.2821	0.1387	16.8233 (267)
Energy for lighting	213.8993	0.1443	30.8723 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-877.0702	0.1345	-117.9661
PV Unit electricity exported	-850.1692	0.1232	-104.7450
Total			-222.7110 (269)
Total CO ₂ , kg/year			142.9070 (272)
CO ₂ emissions per m ²			1.2900 (273)
EI value			98.7699
EI rating			99 (274)
EI band			A

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	45.0550 (1b)	x 2.4000 (2b)	= 108.1320 (1b) - (3b)
First floor	45.0550 (1c)	x 2.6000 (2c)	= 117.1430 (1c) - (3c)
Second floor	20.5690 (1d)	x 2.2000 (2d)	= 45.2518 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	110.6790		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	270.5268 (5)

2. Ventilation rate

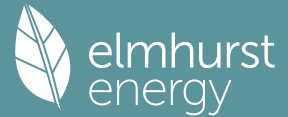
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (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) = 0.1500 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.1575	0.1500	0.1500	0.1388	0.1388	0.1237	0.1275	0.1200	0.1237	0.1313	0.1313	0.1425 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
Solid Door			2.0370	1.0000	2.0400		(26)
Windows (Uw = 1.30)			34.0300	1.2357	42.0646		(27)
Flr - Ground			45.0550	0.1100	4.9560	75.0000	3379.1250 (28a)
Wl - 1	145.9220	30.4910	115.4310	0.1800	20.7776	60.0000	6925.8598 (29a)

Full SAP Calculation Printout

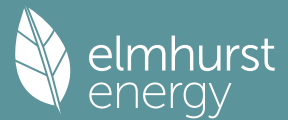


Dormer	14.7880	5.5760	9.2120	0.2600	2.3951	9.0000	82.9080	(29a)							
W1 - Stud Ashlar	25.6520		25.6520	0.1200	3.0782	9.0000	230.8680	(29a)							
Rf - Ins Rafter	8.5120		8.5120	0.1600	1.3619	9.0000	76.6080	(30)							
Rf - Flat Roof	5.8400		5.8400	0.1600	0.9344	9.0000	52.5600	(30)							
Rf - Ashlar behind Stud	24.4870		24.4870	0.1152	2.8209	9.0000	220.3830	(30)							
Rf - Ins Joist Ashlar	9.2570		9.2570	0.1794	1.6611	9.0000	83.3130	(30)							
Total net area of external elements Aum(A, m2)			279.5260					(31)							
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	82.0900				(33)							
Stud			86.2224			9.0000	776.0016	(32c)							
Stud			112.7204			9.0000	1014.4836	(32c)							
Stud			12.0912			9.0000	108.8208	(32c)							
Internal Floor 1			65.6240			9.0000	590.6160	(32d)							
Internal Ceiling 1			65.6240			9.0000	590.6160	(32e)							
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	14132.1628	(34)							
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							127.6860	(35)							
List of Thermal Bridges															
K1 Element						Length	Psi-value	Total							
E2 Other lintels (including other steel lintels)						17.1270	0.2240	3.8364							
E3 Sill						12.7320	0.0240	0.3056							
E4 Jamb						44.3120	0.0190	0.8419							
E5 Ground floor (normal)						27.8000	0.0450	1.2510							
E6 Intermediate floor within a dwelling						55.6000	0.0000	0.0000							
E13 Gable (insulation at rafter level)						1.9060	0.0340	0.0648							
E16 Corner (normal)						28.8800	0.0370	1.0686							
R1 Head of roof window						3.1240	0.2400	0.7498							
R2 Sill of roof window						3.1240	0.2400	0.7498							
R6 Flat ceiling						3.2220	0.0400	0.1289							
R7 Flat ceiling (inverted)						4.7260	0.1200	0.5671							
R9 Roof to wall (flat ceiling)						10.4700	0.1600	1.6752							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								11.2390	(36)						
Point Thermal bridges								(36a) =	0.0000						
Total fabric heat loss								(33) + (36) + (36a) =	93.3290	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)															
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(38)		
Heat transfer coeff	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	(39)		
Average = Sum(39)m / 12 =	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	(39)		
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(40)		
HLP (average)	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	(40)		
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	(40)		

4. Water heating energy requirements (kWh/year)															

Assumed occupancy													2.8188	(42)	
Hot water usage for mixer showers															
	71.4825	70.4083	68.8429	65.8478	63.6375	61.1726	59.7716	61.3251	63.0281	65.6746	68.7340	71.2086	71.2086	(42a)	
Hot water usage for baths															
	30.8630	30.4047	29.7592	28.5691	27.6779	26.6898	26.1560	26.7970	27.4949	28.5522	29.7669	30.7587	30.7587	(42b)	
Hot water usage for other uses															
	43.4977	41.9160	40.3343	38.7525	37.1708	35.5891	35.5891	37.1708	38.7525	40.3343	41.9160	43.4977	43.4977	(42c)	
Average daily hot water use (litres/day)													134.0628	(43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
	145.8433	142.7289	138.9364	133.1694	128.4862	123.4515	121.5167	125.2929	129.2755	134.5611	140.4169	145.4651	145.4651	(44)	
Energy conte	230.9801	203.2441	213.5400	182.3023	172.9672	151.7980	146.9639	155.1388	159.4096	182.5982	200.0496	227.7631	227.7631	(45)	
Energy content (annual)															
Distribution loss (46)m = 0.15 x (45)m															
	34.6470	30.4866	32.0310	27.3453	25.9451	22.7697	22.0446	23.2708	23.9114	27.3897	30.0074	34.1645	34.1645	(46)	
Water storage loss:															
Store volume													250.0000	(47)	
a) If manufacturer declared loss factor is known (kWh/day):													1.7500	(48)	
Temperature factor from Table 2b													0.5400	(49)	
Enter (49) or (54) in (55)													0.9450	(55)	
Total storage loss															
	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	(56)	
If cylinder contains dedicated solar storage															
	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	(57)	
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	23.2624	(59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)	
Total heat required for water heating calculated for each month															
	283.5375	250.7153	264.7017	226.4107	212.7303	190.0533	186.4943	195.5997	204.8687	233.7598	250.9116	280.3205	280.3205	(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)	
Aperture area of solar collector													3.0000	(H1)	
Zero-loss collector efficiency													0.8000	(H2)	
Collector linear heat loss coefficient													1.8000	(H3)	
Collector 2nd order heat loss coefficient													0.0000	(H4)	
Collector loop efficiency													0.9000	(H5)	
Incidence angle modifier													1.0000	(H6)	
Overshading factor													0.8000	(H8)	
Overall heat loss coefficient of system													6.5000	(H10)	
Heat loss coefficient of collector loop													3.9667	(H11)	
Dedicated solar storage volume													75.0000	(H12)	
Effective solar volume													75.0000	(H14)	
Reference volume													225.0000	(H15)	
Storage tank correction coefficient													1.3161	(H16)	
Heat delivered to hot water													686.0591	(H24)	
Heat delivered to space heating													0.0000	(H29)	
Solar input													686.0591		
Solar input	-0.0000	-17.5791	-59.7031	-85.3475	-108.0518	-107.5302	-105.4305	-95.4278	-67.0295	-35.7066	-4.2529	-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	283.5375	233.1362	204.9986	141.0631	104.6785	82.5231	81.0639	100.1719	137.8392	198.0532	246.6587	280.3205	280.3205	(64)	
													Total per year (kWh/year) = Sum(64)m =	2094.0444	(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															
	118.8468	105.5556	111.9314	95.9022	89.3221	81.0771	80.4899	83.9524	89.3710	101.6432	107.2061	117.7772	117.7772	(65)	

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.2797	26.8941	21.8718	16.5583	12.3776	10.4497	11.2912	14.6768	19.6991	25.0125	29.1933	31.1212 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	406.7582	410.9790	400.3426	377.6988	349.1150	322.2504	304.3031	300.0823	310.7187	333.3625	361.9462	388.8109 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319 (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)	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536 (71)
Water heating gains (Table 5)	159.7403	157.0768	150.4454	133.1975	120.0565	112.6070	108.1853	112.8393	124.1264	136.6172	148.8974	158.3026 (72)
Total internal gains	707.8869	706.0587	683.7684	638.5634	592.6578	556.4158	534.8883	538.7070	565.6529	606.1010	651.1456	689.3435 (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					2.8690	11.9814		0.4700	0.0000	0.7700		12.4402 (74)				
East					14.0080	22.3313		0.4700	0.0000	0.7700		113.2085 (76)				
South					0.7000	50.9848		0.4700	0.0000	0.7700		12.9160 (78)				
West					16.4530	22.3313		0.4700	0.0000	0.7700		132.9683 (80)				

Solar gains					271.5330	473.7502	763.8625	1142.9370	1364.3779	1495.7378	1408.0976	1236.2090	960.6369	597.9156	345.8945	221.7872 (83)
Total gains					979.4198	1179.8089	1447.6310	1781.5004	1957.0357	2052.1535	1942.9860	1774.9159	1526.2898	1204.0166	997.0402	911.1307 (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	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534
alpha	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969
util living area	0.9440	0.9100	0.8306	0.6848	0.5116	0.3265	0.2180	0.2454	0.4825	0.7703	0.9098	0.9526 (86)
Living	19.0515	19.3862	19.9652	20.5218	20.8425	20.9697	20.9936	20.9909	20.9021	20.4328	19.6389	18.9645
Non living	17.6672	18.0809	18.7829	19.4215	19.7569	19.8669	19.8814	19.8805	19.8199	19.3481	18.4044	17.5592
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.0032	19.3862	19.9652	20.5218	20.8425	20.9697	20.9936	20.9909	20.9021	20.4328	19.6389	19.2492 (87)
Th 2	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829 (88)
util rest of house	0.9341	0.8950	0.8040	0.6417	0.4525	0.2571	0.1404	0.1612	0.4023	0.7237	0.8916	0.9440 (89)
MIT 2	18.9996	18.0809	18.7829	19.4215	19.7569	19.8669	19.8814	19.8805	19.8199	19.3481	18.4044	17.9779 (90)
Living area fraction	19.1538	18.2814	18.9645	19.5906	19.9237	20.0363	20.0522	20.0511	19.9862	19.5148	18.5941	0.1536 (91)
MIT	19.1538	18.2814	18.9645	19.5906	19.9237	20.0363	20.0522	20.0511	19.9862	19.5148	18.5941	18.1732 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1538	18.2814	18.9645	19.5906	19.9237	20.0363	20.0522	20.0511	19.9862	19.5148	18.5941	18.1732 (93)

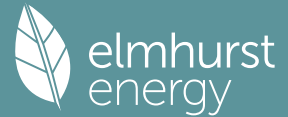
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9264	0.8675	0.7783	0.6294	0.4548	0.2668	0.1523	0.1741	0.4101	0.7060	0.8645	0.9264 (94)
Useful gains	907.3589	1023.4325	1126.7604	1121.2378	890.0174	547.5452	295.8454	308.9316	625.9371	850.0896	861.9782	844.0867 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	1938.9456	1749.6044	1595.5081	1336.9679	955.2287	556.8784	296.9359	310.5765	660.3258	1091.9696	1461.6193	1803.6617 (97)
Space heating kWh	767.5005	487.9875	348.7483	155.3256	48.5172	0.0000	0.0000	0.0000	0.0000	179.9587	431.7416	713.9238 (98a)
Space heating requirement - total per year (kWh/year)												3133.7032
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	767.5005	487.9875	348.7483	155.3256	48.5172	0.0000	0.0000	0.0000	0.0000	179.9587	431.7416	713.9238 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3133.7032
Space heating per m2										(98c) / (4) =		28.3134 (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 %)												274.3267 (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	767.5005	487.9875	348.7483	155.3256	48.5172	0.0000	0.0000	0.0000	0.0000	179.9587	431.7416	713.9238 (98)
Space heating efficiency (main heating system 1)	274.3267	274.3267	274.3267	274.3267	274.3267	0.0000	0.0000	0.0000	0.0000	274.3267	274.3267	274.3267 (210)
Space heating fuel (main heating system)	279.7761	177.8855	127.1288	56.6207	17.6859	0.0000	0.0000	0.0000	0.0000	65.6001	157.3822	260.2458 (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)

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Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	283.5375	233.1362	204.9986	141.0631	104.6785	82.5231	81.0639	100.1719	137.8392	198.0532	246.6587	280.3205	(64)
Efficiency of water heater	278.8844	278.8844	278.8844	278.8844	278.8844	278.8844	278.8844	278.8844	278.8844	278.8844	278.8844	278.8844	(216)
(217)m	278.8844	278.8844	278.8844	278.8844	278.8844	278.8844	278.8844	278.8844	278.8844	278.8844	278.8844	278.8844	(217)
Fuel for water heating, kWh/month	101.6685	83.5960	73.5067	50.5812	37.5347	29.5904	29.0672	35.9188	49.4252	71.0162	88.4448	100.5150	(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	10.3007	9.3038	10.3007	9.9684	10.3007	9.9684	10.3007	10.3007	9.9684	10.3007	9.9684	10.3007	(231)
Lighting	26.5036	21.2622	19.1442	14.0259	10.8340	8.8515	9.8831	12.8465	16.6863	21.8933	24.7285	27.2402	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-42.6407	-57.5972	-84.8167	-97.9624	-102.6113	-97.5921	-95.7127	-90.9740	-80.4188	-68.4498	-48.0589	-36.0152	(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	-13.5061	-26.7912	-57.3041	-98.4920	-133.9859	-151.4161	-147.3163	-126.0525	-88.9711	-46.7829	-20.1889	-10.5027	(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												1142.3251	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												278.8844	
Water heating fuel used												750.8647	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 4.6280, total flow = 37.0000, SFP = 0.1251)													
mechanical ventilation fans (SFP = 0.1251)													41.2821 (230a)
pump for solar water heating													80.0000 (230g)
Total electricity for the above, kWh/year													121.2821 (231)
Electricity for lighting (calculated in Appendix L)													213.8993 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-1824.1596 (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													404.2117 (238)

10a. Fuel costs - using BEDF prices (552)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1142.3251	26.0600	297.6899 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	750.8647	26.0600	195.6754 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Pumps, fans and electric keep-hot	41.2821	26.0600	10.7581 (249)
Pump for solar water heating	80.0000	26.0600	20.8480 (249)
Energy for lighting	213.8993	26.0600	55.7422 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-902.8499	26.0600	-235.2827
PV Unit electricity exported	-921.3098	5.8100	-53.5281
Total			-288.8108 (252)
Total energy cost			291.9028 (255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1142.3251	0.1567	179.0536 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	750.8647	0.1460	109.6089 (264)
Space and water heating			288.6625 (265)
Pumps, fans and electric keep-hot	121.2821	0.1387	16.8233 (267)
Energy for lighting	213.8993	0.1443	30.8723 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-902.8499	0.1345	-121.4682
PV Unit electricity exported	-921.3098	0.1228	-113.1691
Total			-234.6372 (269)
Total CO2, kg/year			101.7209 (272)

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

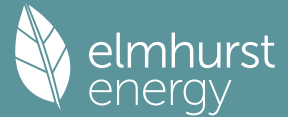
	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1142.3251	1.5802	1805.1378 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	750.8647	1.5400	1156.3296 (278)
Space and water heating			2961.4674 (279)
Pumps, fans and electric keep-hot	121.2821	1.5128	183.4756 (281)
Energy for lighting	213.8993	1.5338	328.0859 (282)

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Energy saving/generation technologies			
PV Unit electricity used in dwelling	-902.8499	1.4972	-1351.7718
PV Unit electricity exported	-921.3098	0.4507	-415.2021
Total			-1766.9739 (283)
Total Primary energy kWh/year			1706.0550 (286)

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Property Reference	001 BLOCK D				Issued on Date	10/09/2024
Assessment Reference	001 BLOCK D ELEC, DWHP, PV		Prop Type Ref	001 BLOCK D		
Property	001 BLOCK D, 001 BLOCK D, 0					
SAP Rating	83 B	DER	3.20	TER	11.67	
Environmental	97 A	% DER < TER				72.58
CO ₂ Emissions (t/year)	0.24	DFEE	43.44	TFEE	43.68	
Compliance Check	See BREL	% DFEE < TFEE				0.56
% DPER < TPER	29.05	DPER	43.28	TPER	61.01	
Assessor Details	Mr. Scott Binstead				Assessor ID	U903-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)		Storey height (m)		Volume (m ³)	
Ground floor	45.0550 (1b)	x	2.4000 (2b)	=	108.1320 (1b) -	(3b)
First floor	45.0550 (1c)	x	2.6000 (2c)	=	117.1430 (1c) -	(3c)
Second floor	20.5690 (1d)	x	2.2000 (2d)	=	45.2518 (1d) -	(3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	110.6790					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	270.5268	(5)

2. Ventilation rate

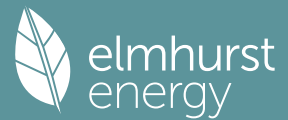
	m ³ per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (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) =	0.1500 (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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation													0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(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	
Solid Door			2.0370	1.0000	2.0400			(26)
Windows (Uw = 1.30)			34.0300	1.2357	42.0646			(27)
Flr - Ground			45.0550	0.1100	4.9560	75.0000	3379.1250	(28a)
Wl - 1	145.9220	30.4910	115.4310	0.1800	20.7776	60.0000	6925.8598	(29a)
Wl - Dormer	14.7880		9.2120	0.2600	2.3951	9.0000	82.9080	(29a)
Wl - Stud Ashlar	25.6520		25.6520	0.1200	3.0782	9.0000	230.8680	(29a)
Rf - Ins Rafter	8.5120		8.5120	0.1600	1.3619	9.0000	76.6080	(30)
Rf - Flat Roof	5.8400		5.8400	0.1600	0.9344	9.0000	52.5600	(30)
Rf - Ashlar behind Stud	24.4870		24.4870	0.1152	2.8209	9.0000	220.3830	(30)
Rf - Ins Joist Ashlar	9.2570		9.2570	0.1794	1.6611	9.0000	83.3130	(30)
Total net area of external elements Aum(A, m ²)			279.5260					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		82.0900			(33)
Stud			86.2224			9.0000	776.0016	(32c)
Stud			112.7204			9.0000	1014.4836	(32c)

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Stud	12.0912	9.0000	108.8208 (32c)
Internal Floor 1	65.6240	9.0000	590.6160 (32d)
Internal Ceiling 1	65.6240	9.0000	590.6160 (32e)

Heat capacity $C_m = \text{Sum}(A \times k)$ (28)...(30) + (32) + (32a)...(32e) = 14132.1628 (34)
 Thermal mass parameter (TMP = C_m / TFA) in kJ/m²K 127.6860 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	17.1270	0.2240	3.8364
E3 Sill	12.7320	0.0240	0.3056
E4 Jamb	44.3120	0.0190	0.8419
E5 Ground floor (normal)	27.8000	0.0450	1.2510
E6 Intermediate floor within a dwelling	55.6000	0.0000	0.0000
E13 Gable (insulation at rafter level)	1.9060	0.0340	0.0648
E16 Corner (normal)	28.8800	0.0370	1.0686
R1 Head of roof window	3.1240	0.2400	0.7498
R2 Sill of roof window	3.1240	0.2400	0.7498
R6 Flat ceiling	3.2220	0.0400	0.1289
R7 Flat ceiling (inverted)	4.7260	0.1200	0.5671
R9 Roof to wall (flat ceiling)	10.4700	0.1600	1.6752

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.2390 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 93.3290 (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	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369 (38)
Heat transfer coeff	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659 (39)
Average = Sum(39)m / 12 =												137.9659

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465 (40)
HLP (average)												1.2465
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

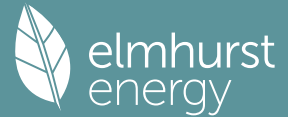
Assumed occupancy													2.8188 (42)
Hot water usage for mixer showers													
71.4825	70.4083	68.8429	65.8478	63.6375	61.1726	59.7716	61.3251	63.0281	65.6746	68.7340	71.2086	(42a)	
Hot water usage for baths													
30.8630	30.4047	29.7592	28.5691	27.6779	26.6898	26.1560	26.7970	27.4949	28.5522	29.7669	30.7587	(42b)	
Hot water usage for other uses													
43.4977	41.9160	40.3343	38.7525	37.1708	35.5891	35.5891	37.1708	38.7525	40.3343	41.9160	43.4977	(42c)	
Average daily hot water use (litres/day)												134.0628 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
145.8433	142.7289	138.9364	133.1694	128.4862	123.4515	121.5167	125.2929	129.2755	134.5611	140.4169	145.4651	(44)	
Energy conte	230.9801	203.2441	213.5400	182.3023	172.9672	151.7980	146.9639	155.1388	159.4096	182.5982	200.0496	227.7631 (45)	
Energy content (annual)										Total = Sum(45)m =	2226.7549		
Distribution loss (46)m = 0.15 x (45)m													
34.6470	30.4866	32.0310	27.3453	25.9451	22.7697	22.0446	23.2708	23.9114	27.3897	30.0074	34.1645	(46)	
Water storage loss:													
Store volume												201.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.6100 (48)	
Temperature factor from Table 2b												0.5400 (49)	
Enter (49) or (54) in (55)												0.8694 (55)	
Total storage loss													
26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)	
If cylinder contains dedicated solar storage													
26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(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													
257.9315	227.5873	240.4914	208.3843	199.9186	177.8800	173.9153	182.0902	185.4916	209.5496	226.1316	254.7145	(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													
257.9315	227.5873	240.4914	208.3843	199.9186	177.8800	173.9153	182.0902	185.4916	209.5496	226.1316	254.7145	(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													
76.8009	67.5787	71.0021	60.6155	57.5116	50.4728	48.8655	51.5836	53.0037	60.7139	66.5165	75.7312	(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	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.2797	26.8941	21.8718	16.5583	12.3776	10.4497	11.2912	14.6768	19.6991	25.0125	29.1933	31.1212 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	406.7582	410.9790	400.3426	377.6988	349.1150	322.2504	304.3031	300.0823	310.7187	333.3625	361.9462	388.8109 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319 (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)	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536 (71)
Water heating gains (Table 5)	103.2270	100.5635	95.4329	84.1882	77.3005	70.1012	65.6794	69.3329	73.6162	81.6047	92.3840	101.7893 (72)
Total internal gains	651.3735	649.5454	628.7559	589.5540	549.9018	513.9099	492.3825	495.2006	515.1428	551.0884	594.6323	632.8301 (73)

6. Solar gains

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[Jan]	Area m2				Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
North	2.8690				10.6334	0.4700		0.0000		0.7700	11.0406 (74)
East	14.0080				19.6403	0.4700		0.0000		0.7700	99.5662 (76)
South	0.7000				46.7521	0.4700		0.0000		0.7700	11.8437 (78)
West	16.4530				19.6403	0.4700		0.0000		0.7700	116.9448 (80)

Solar gains	239.3953	464.0375	758.0733	1102.7945	1353.3924	1387.2883	1319.9266	1131.7789	880.1530	548.6048	297.6226	197.4862 (83)
Total gains	890.7688	1113.5829	1386.8292	1692.3485	1903.2942	1901.1982	1812.3090	1626.9794	1395.2957	1099.6933	892.2549	830.3163 (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	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534
alpha	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969
util living area	0.9599	0.9276	0.8604	0.7383	0.5848	0.4360	0.3255	0.3741	0.5898	0.8325	0.9386	0.9666 (86)
MIT	18.7753	19.1755	19.7605	20.3552	20.7390	20.9171	20.9736	20.9601	20.8019	20.2026	19.3414	18.6735 (87)
Th 2	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829 (88)
util rest of house	0.9529	0.9156	0.8384	0.7010	0.5320	0.3683	0.2465	0.2892	0.5171	0.7970	0.9262	0.9606 (89)
MIT 2	17.3194	17.8190	18.5360	19.2349	19.6537	19.8265	19.8708	19.8633	19.7326	19.0865	18.0364	17.1915 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	17.5431	18.0274	18.7241	19.4070	19.8204	19.9941	20.0403	20.0318	19.8969	19.2580	18.2369	17.4192 (92)
Temperature adjustment	0.0000											
adjusted MIT	17.5431	18.0274	18.7241	19.4070	19.8204	19.9941	20.0403	20.0318	19.8969	19.2580	18.2369	17.4192 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9319	0.8892	0.8110	0.6834	0.5289	0.3753	0.2579	0.3009	0.5181	0.7733	0.9013	0.9415 (94)
Useful gains	830.1134	990.2266	1124.7329	1156.5140	1006.6509	713.4830	467.3729	489.5105	722.9063	850.3616	804.1789	781.7667 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1827.0983	1811.1336	1686.5096	1449.6069	1120.3431	744.1985	474.6376	501.0642	799.7744	1194.5025	1536.5142	1823.7934 (97)
Space heating kWh	741.7568	551.6495	417.9618	211.0269	84.5870	0.0000	0.0000	0.0000	0.0000	256.0408	527.2814	775.2678 (98a)
Space heating requirement - total per year (kWh/year)	3565.5720											
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	741.7568	551.6495	417.9618	211.0269	84.5870	0.0000	0.0000	0.0000	0.0000	256.0408	527.2814	775.2678 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	3565.5720											
Space heating per m2	(98c) / (4) = 32.2154 (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)											
Fraction of main heating from main system 2	0.0000 (203)											
Fraction of total heating from main system 1	1.0000 (204)											
Fraction of total heating from main system 2	0.0000 (205)											
Efficiency of main space heating system 1 (in %)	100.0000 (206)											
Efficiency of main space heating system 2 (in %)	0.0000 (207)											
Efficiency of secondary/supplementary heating system, %	0.0000 (208)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	741.7568	551.6495	417.9618	211.0269	84.5870	0.0000	0.0000	0.0000	0.0000	256.0408	527.2814	775.2678 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	741.7568	551.6495	417.9618	211.0269	84.5870	0.0000	0.0000	0.0000	0.0000	256.0408	527.2814	775.2678 (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)
Space heating fuel used, main 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)
Water heating												
Water heating requirement	257.9315	227.5873	240.4914	208.3843	199.9186	177.8800	173.9153	182.0902	185.4916	209.5496	226.1316	254.7145 (64)
Efficiency of water heater (217)m	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868 (216)
Fuel for water heating, kWh/month	76.1564	67.1970	71.0070	61.5271	59.0276	52.5205	51.3499	53.7636	54.7679	61.8712	66.7672	75.2065 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	3.5062	3.1668	3.5062	3.3930	3.5062	3.3930	3.5062	3.5062	3.3930	3.5062	3.3930	3.5062 (231)
Lighting	26.5036	21.2622	19.1442	14.0259	10.8340	8.8515	9.8831	12.8465	16.6863	21.8933	24.7285	27.2402 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-50.2520	-81.2806	-131.1127	-152.2551	-155.1300	-129.1563	-126.7680	-118.2161	-101.4593	-92.9240	-57.5816	-41.9768 (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	-13.0945	-34.3939	-90.1737	-175.9283	-275.1136	-303.3572	-296.0563	-235.1689	-152.7551	-61.7621	-19.5753	-9.6421 (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)												

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(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												3565.5720	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												338.6868	
Water heating fuel used												751.1618	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 4.6280, total flow = 37.0000, SFP = 0.1251)													
mechanical ventilation fans (SFP = 0.1251)												41.2821	(230a)
Total electricity for the above, kWh/year												41.2821	(231)
Electricity for lighting (calculated in Appendix L)												213.8993	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2905.1336	(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												1666.7817	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3565.5720	16.4900	587.9628	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	751.1618	16.4900	123.8666	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	41.2821	16.4900	6.8074	(249)
Energy for lighting	213.8993	16.4900	35.2720	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1238.1125	16.4900	-204.1647	
PV Unit electricity exported	-1667.0211	5.5900	-93.1865	
Total			-297.3512	(252)
Total energy cost			456.5576	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)		1.0558	(257)
SAP value		82.8860	
SAP rating (Section 12)		83	(258)
SAP band		B	

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

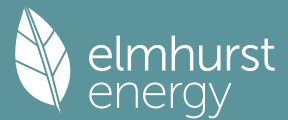
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3565.5720	0.1557	555.2705	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	751.1618	0.1412	106.0796	(264)
Space and water heating			661.3501	(265)
Pumps, fans and electric keep-hot	41.2821	0.1387	5.7263	(267)
Energy for lighting	213.8993	0.1443	30.8723	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1238.1125	0.1348	-166.8688	
PV Unit electricity exported	-1667.0211	0.1194	-199.0862	
Total			-365.9550	(269)
Total CO2, kg/year			331.9937	(272)
CO2 emissions per m2			3.0000	(273)
EI value			97.1424	
EI rating			97	(274)
EI band			A	

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	45.0550 (1b)	x	2.4000 (2b)	=	108.1320 (1b)	- (3b)
First floor	45.0550 (1c)	x	2.6000 (2c)	=	117.1430 (1c)	- (3c)
Second floor	20.5690 (1d)	x	2.2000 (2d)	=	45.2518 (1d)	- (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e) ... (1n)	110.6790					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e) ... (3n)	=	270.5268	(5)

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2. Ventilation rate

											m3 per hour		
Number of open chimneys												0 * 80 =	0.0000 (6a)
Number of open flues												0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire												0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler												0 * 20 =	0.0000 (6d)
Number of flues attached to other heater												0 * 35 =	0.0000 (6e)
Number of blocked chimneys												0 * 20 =	0.0000 (6f)
Number of intermittent extract fans												0 * 10 =	0.0000 (7a)
Number of passive vents												0 * 10 =	0.0000 (7b)
Number of flueless gas fires												0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											0.0000 / (5) =		0.0000 (8)
Pressure test													Yes
Pressure Test Method													Blower Door
Measured/design AP50													3.0000 (17)
Infiltration rate													0.1500 (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) =		0.1500 (21)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)	
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)	
Adj infilt rate	0.1575	0.1500	0.1500	0.1388	0.1388	0.1237	0.1275	0.1200	0.1237	0.1313	0.1313	0.1425 (22b)	
Mechanical extract ventilation - decentralised													
If mechanical ventilation													0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)	

3. Heat losses and heat loss parameter

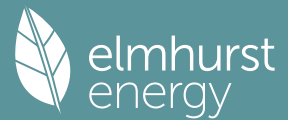
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Solid Door			2.0370	1.0000	2.0400			(26)
Windows (Uw = 1.30)			34.0300	1.2357	42.0646			(27)
Flr - Ground			45.0550	0.1100	4.9560	75.0000	3379.1250	(28a)
Wl - 1	145.9220	30.4910	115.4310	0.1800	20.7776	60.0000	6925.8598	(29a)
Wl - Dormer	14.7880	5.5760	9.2120	0.2600	2.3951	9.0000	82.9080	(29a)
Wl - Stud Ashlar	25.6520		25.6520	0.1200	3.0782	9.0000	230.8680	(29a)
Rf - Ins Rafter	8.5120		8.5120	0.1600	1.3619	9.0000	76.6080	(30)
Rf - Flat Roof	5.8400		5.8400	0.1600	0.9344	9.0000	52.5600	(30)
Rf - Ashlar behind Stud	24.4870		24.4870	0.1152	2.8209	9.0000	220.3830	(30)
Rf - Ins Joist Ashlar	9.2570		9.2570	0.1794	1.6611	9.0000	83.3130	(30)
Total net area of external elements Aum(A, m2)			279.5260					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	82.0900			(33)
Stud			86.2224			9.0000	776.0016	(32c)
Stud			112.7204			9.0000	1014.4836	(32c)
Stud			12.0912			9.0000	108.8208	(32c)
Internal Floor 1			65.6240			9.0000	590.6160	(32d)
Internal Ceiling 1			65.6240			9.0000	590.6160	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =	14132.1628		(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K						127.6860		(35)
List of Thermal Bridges								
K1 Element				Length	Psi-value	Total		
E2 Other lintels (including other steel lintels)				17.1270	0.2240	3.8364		
E3 Sill				12.7320	0.0240	0.3056		
E4 Jamb				44.3120	0.0190	0.8419		
E5 Ground floor (normal)				27.8000	0.0450	1.2510		
E6 Intermediate floor within a dwelling				55.6000	0.0000	0.0000		
E13 Gable (insulation at rafter level)				1.9060	0.0340	0.0648		
E16 Corner (normal)				28.8800	0.0370	1.0686		
R1 Head of roof window				3.1240	0.2400	0.7498		
R2 Sill of roof window				3.1240	0.2400	0.7498		
R6 Flat ceiling				3.2220	0.0400	0.1289		
R7 Flat ceiling (inverted)				4.7260	0.1200	0.5671		
R9 Roof to wall (flat ceiling)				10.4700	0.1600	1.6752		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.2390	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =	93.3290		(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	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369 (38)
Average = Sum(39)m / 12 =	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8188 (42)
Hot water usage for mixer showers												
	71.4825	70.4083	68.8429	65.8478	63.6375	61.1726	59.7716	61.3251	63.0281	65.6746	68.7340	71.2086 (42a)
Hot water usage for baths												
	30.8630	30.4047	29.7592	28.5691	27.6779	26.6898	26.1560	26.7970	27.4949	28.5522	29.7669	30.7587 (42b)
Hot water usage for other uses												
	43.4977	41.9160	40.3343	38.7525	37.1708	35.5891	35.5891	37.1708	38.7525	40.3343	41.9160	43.4977 (42c)
Average daily hot water use (litres/day)												134.0628 (43)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	145.8433	142.7289	138.9364	133.1694	128.4862	123.4515	121.5167	125.2929	129.2755	134.5611	140.4169	145.4651	(44)
Energy conte	230.9801	203.2441	213.5400	182.3023	172.9672	151.7980	146.9639	155.1388	159.4096	182.5982	200.0496	227.7631	(45)
Energy content (annual)	Total = Sum(45)m =												2226.7549
Distribution loss	34.6470	30.4866	32.0310	27.3453	25.9451	22.7697	22.0446	23.2708	23.9114	27.3897	30.0074	34.1645	(46)
Water storage loss:													
Store volume													201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6100 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8694 (55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(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	257.9315	227.5873	240.4914	208.3843	199.9186	177.8800	173.9153	182.0902	185.4916	209.5496	226.1316	254.7145	(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	257.9315	227.5873	240.4914	208.3843	199.9186	177.8800	173.9153	182.0902	185.4916	209.5496	226.1316	254.7145	(64)
Total per year (kWh/year) = Sum(64)m =												2544.0859	(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	76.8009	67.5787	71.0021	60.6155	57.5116	50.4728	48.8655	51.5836	53.0037	60.7139	66.5165	75.7312	(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	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.2797	26.8941	21.8718	16.5583	12.3776	10.4497	11.2912	14.6768	19.6991	25.0125	29.1933	31.1212	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	406.7582	410.9790	400.3426	377.6988	349.1150	322.2504	304.3031	300.0823	310.7187	333.3625	361.9462	388.8109	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	(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)	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	(71)
Water heating gains (Table 5)	103.2270	100.5635	95.4329	84.1882	77.3005	70.1012	65.6794	69.3329	73.6162	81.6047	92.3840	101.7893	(72)
Total internal gains	651.3735	649.5454	628.7559	589.5540	549.9018	513.9099	492.3825	495.2006	515.1428	551.0884	594.6323	632.8301	(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				2.8690	11.9814		0.4700		0.0000		0.7700		12.4402 (74)
East				14.0080	22.3313		0.4700		0.0000		0.7700		113.2085 (76)
South				0.7000	50.9848		0.4700		0.0000		0.7700		12.9160 (78)
West				16.4530	22.3313		0.4700		0.0000		0.7700		132.9683 (80)
Solar gains	271.5330	473.7502	763.8625	1142.9370	1364.3779	1495.7378	1408.0976	1236.2090	960.6369	597.9156	345.8945	221.7872	(83)
Total gains	922.9065	1123.2955	1392.6184	1732.4910	1914.2797	2009.6477	1900.4801	1731.4095	1475.7797	1149.0041	940.5268	854.6174	(84)

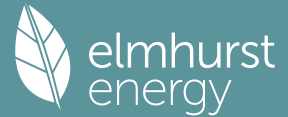
7. Mean internal temperature (heating season)

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	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	
alpha	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	
util living area	0.9512	0.9189	0.8418	0.6959	0.5205	0.3329	0.2227	0.2513	0.4958	0.7865	0.9203	0.9592 (86)	
MIT	18.9797	19.3225	19.9190	20.4999	20.8351	20.9681	20.9932	20.9903	20.8948	20.3963	19.5751	18.8905 (87)	
Th 2	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829 (88)	
util rest of house	0.9423	0.9050	0.8163	0.6531	0.4610	0.2623	0.1435	0.1652	0.4144	0.7414	0.9037	0.9516 (89)	
MIT 2	17.5781	18.0034	18.7295	19.3987	19.7506	19.8660	19.8813	19.8803	19.8148	19.3097	18.3275	17.4669 (90)	
Living area fraction	17.7934	18.2060	18.9123	19.5679	19.9172	20.0354	20.0521	20.0509	fLA = Living area / (4) =				0.1536 (91)
MIT	17.7934	18.2060	18.9123	19.5679	19.9172	20.0354	20.0521	20.0509	19.9808	19.4767	18.5192	17.6856 (92)	
Temperature adjustment												0.0000	
adjusted MIT	17.7934	18.2060	18.9123	19.5679	19.9172	20.0354	20.0521	20.0509	19.9808	19.4767	18.5192	17.6856 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9194	0.8780	0.7900	0.6399	0.4629	0.2721	0.1556	0.1783	0.4219	0.7223	0.8772	0.9305	(94)
Useful gains	848.5236	986.2294	1100.2169	1108.6758	886.1036	546.9066	295.7586	308.7864	622.5907	829.9471	825.0054	795.1992	(95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Heat loss rate W	1751.2591	1739.2032	1588.2998	1333.8357	954.3425	556.7417	296.9163	310.5441	659.5816	1086.7125	1451.2914	1736.3901	(97)
Space heating kWh	671.6352	505.9983	363.1337	162.1151	50.7698	0.0000	0.0000	0.0000	0.0000	191.0335	450.9259	700.2460	(98a)

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Space heating requirement - total per year (kWh/year)												3095.8575
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	671.6352	505.9983	363.1337	162.1151	50.7698	0.0000	0.0000	0.0000	191.0335	450.9259	700.2460	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3095.8575
Space heating per m2												(98c) / (4) = 27.9715 (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)
Fraction of main heating from main system 2												0.0000 (203)
Fraction of total heating from main system 1												1.0000 (204)
Fraction of total heating from main system 2												0.0000 (205)
Efficiency of main space heating system 1 (in %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	671.6352	505.9983	363.1337	162.1151	50.7698	0.0000	0.0000	0.0000	0.0000	191.0335	450.9259	700.2460 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	671.6352	505.9983	363.1337	162.1151	50.7698	0.0000	0.0000	0.0000	0.0000	191.0335	450.9259	700.2460 (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)
Space heating fuel used, main system 2												0.0000 (213)
Water heating												
Water heating requirement	257.9315	227.5873	240.4914	208.3843	199.9186	177.8800	173.9153	182.0902	185.4916	209.5496	226.1316	254.7145 (64)
Efficiency of water heater	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868 (216)
Fuel for water heating, kWh/month	76.1564	67.1970	71.0070	61.5271	59.0276	52.5205	51.3499	53.7636	54.7679	61.8712	66.7672	75.2065 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	3.5062	3.1668	3.5062	3.3930	3.5062	3.3930	3.5062	3.3930	3.5062	3.3930	3.5062	3.5062 (231)
Lighting	26.5036	21.2622	19.1442	14.0259	10.8340	8.8515	9.8831	12.8465	16.6863	21.8933	24.7285	27.2402 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-56.1780	-82.5787	-130.2543	-150.7354	-149.5693	-133.0609	-130.1401	-123.1171	-106.6458	-96.5722	-64.9712	-46.6218 (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	-16.4063	-36.7021	-94.7673	-191.9850	-286.8182	-335.7571	-323.4945	-265.5723	-173.2038	-73.6689	-25.6147	-11.9400 (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												3095.8575 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												338.6868
Water heating fuel used												751.1618 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:												
(MEV)Decentralised, Database: total watage = 4.6280, total flow = 37.0000, SFP = 0.1251)												
mechanical ventilation fans (SFP = 0.1251)												41.2821 (230a)
Total electricity for the above, kWh/year												41.2821 (231)
Electricity for lighting (calculated in Appendix L)												213.8993 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-3106.3749 (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												995.8259 (238)

10a. Fuel costs - using BEDF prices (552)

	Fuel	Fuel price	Fuel cost
	kWh/year	p/kWh	£/year
Space heating - main system 1	3095.8575	26.0600	806.7805 (240)
Space heating - main system 2	0.0000	26.0600	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	751.1618	26.0600	195.7528 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Pumps, fans and electric keep-hot	41.2821	26.0600	10.7581 (249)
Energy for lighting	213.8993	26.0600	55.7422 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1270.4447	26.0600	-331.0779
PV Unit electricity exported	-1835.9302	5.8100	-106.6675
Total			-437.7454 (252)
Total energy cost			631.2881 (255)

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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	3095.8575	0.1564	484.0903 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	751.1618	0.1412	106.0796 (264)
Space and water heating			590.1699 (265)
Pumps, fans and electric keep-hot	41.2821	0.1387	5.7263 (267)
Energy for lighting	213.8993	0.1443	30.8723 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1270.4447	0.1349	-171.3534
PV Unit electricity exported	-1835.9302	0.1193	-219.0963
Total			-390.4497 (269)
Total CO2, kg/year			236.3188 (272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	3095.8575	1.5789	4887.9909 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	751.1618	1.5222	1143.4176 (278)
Space and water heating			6031.4085 (279)
Pumps, fans and electric keep-hot	41.2821	1.5128	62.4516 (281)
Energy for lighting	213.8993	1.5338	328.0859 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1270.4447	1.4985	-1903.8020
PV Unit electricity exported	-1835.9302	0.4376	-803.4569
Total			-2707.2589 (283)
Total Primary energy kWh/year			3714.6871 (286)

SAP 10 EPC IMPROVEMENTS

001 BLOCK D ELEC, DWHP, PV

Current energy efficiency rating: B 83
Current environmental impact rating: A 97

N Solar water heating SAP increase too small
U Solar photovoltaic panels Already installed
V2 Wind turbine Not applicable

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

Measures omitted - SAP change or cost saving too small:
N Solar water heating + 0.5 -£ 25 -14 kg (5.9%)

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

Potential energy efficiency rating: B 83
Potential environmental impact rating: A 97

Fuel prices for cost data on this page from database revision number 552 TEST (30 Aug 2024)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):			
	Current £1069	Potential £1069	Saving £0
Electricity			
Space heating	£818	£818	£0
Water heating	£196	£196	£0
Lighting	£56	£56	£0
Generated (PV)	-£438	-£438	£0
Total cost of fuels	£631	£631	£0
Total cost of uses	£632	£632	£0
Delivered energy	9 kWh/m²	9 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m²	2 kg/m²	2 kg/m²	0 kg/m²
Primary energy	34 kWh/m²	34 kWh/m²	0 kWh/m²

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

1. Overall dwelling characteristics

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	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	45.0550 (1b)	x 2.4000 (2b)	= 108.1320 (1b) - (3b)
First floor	45.0550 (1c)	x 2.6000 (2c)	= 117.1430 (1c) - (3c)
Second floor	20.5690 (1d)	x 2.2000 (2d)	= 45.2518 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	110.6790		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 270.5268 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (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) = 0.1500 (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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
Solid Door			2.0370	1.0000	2.0400		(26)
Windows (Uw = 1.30)			34.0300	1.2357	42.0646		(27)
Flr - Ground			45.0550	0.1100	4.9560	75.0000	3379.1250 (28a)
W1 - 1	145.9220	30.4910	115.4310	0.1800	20.7776	60.0000	6925.8598 (29a)
W1 - Dormer	14.7880	5.5760	9.2120	0.2600	2.3951	9.0000	82.9080 (29a)
W1 - Stud Ashlar	25.6520		25.6520	0.1200	3.0782	9.0000	230.8680 (29a)
Rf - Ins Rafter	8.5120		8.5120	0.1600	1.3619	9.0000	76.6080 (30)
Rf - Flat Roof	5.8400		5.8400	0.1600	0.9344	9.0000	52.5600 (30)
Rf - Ashlar behind Stud	24.4870		24.4870	0.1152	2.8209	9.0000	220.3830 (30)
Rf - Ins Joist Ashlar	9.2570		9.2570	0.1794	1.6611	9.0000	83.3130 (30)
Total net area of external elements Aum(A, m ²)			279.5260				(31)
Fabric heat loss, W/K = Sum (A x k)				(26)...(30) + (32) =	82.0900		(33)
Stud			86.2224			9.0000	776.0016 (32c)
Stud			112.7204			9.0000	1014.4836 (32c)
Stud			12.0912			9.0000	108.8208 (32c)
Internal Floor 1			65.6240			9.0000	590.6160 (32d)
Internal Ceiling 1			65.6240			9.0000	590.6160 (32e)

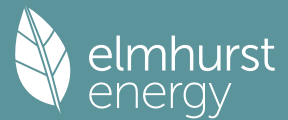
Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	14132.1628 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		127.6860 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	17.1270	0.2240	3.8364
E3 Sill	12.7320	0.0240	0.3056
E4 Jamb	44.3120	0.0190	0.8419
E5 Ground floor (normal)	27.8000	0.0450	1.2510
E6 Intermediate floor within a dwelling	55.6000	0.0000	0.0000
E13 Gable (insulation at rafter level)	1.9060	0.0340	0.0648
E16 Corner (normal)	28.8800	0.0370	1.0686
R1 Head of roof window	3.1240	0.2400	0.7498
R2 Sill of roof window	3.1240	0.2400	0.7498
R6 Flat ceiling	3.2220	0.0400	0.1289
R7 Flat ceiling (inverted)	4.7260	0.1200	0.5671
R9 Roof to wall (flat ceiling)	10.4700	0.1600	1.6752
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			11.2390 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	93.3290 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369 (38)
Heat transfer coeff	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659 (39)
Average = Sum(39)m / 12 =												137.9659
HLP	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465 (40)
HLP (average)												1.2465
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8188 (42)
Hot water usage for mixer showers												
71.4825	70.4083	68.8429	65.8478	63.6375	61.1726	59.7716	61.3251	63.0281	65.6746	68.7340	71.2086	(42a)
Hot water usage for baths												
30.8630	30.4047	29.7592	28.5691	27.6779	26.6898	26.1560	26.7970	27.4949	28.5522	29.7669	30.7587	(42b)
Hot water usage for other uses												
43.4977	41.9160	40.3343	38.7525	37.1708	35.5891	35.5891	37.1708	38.7525	40.3343	41.9160	43.4977	(42c)
Average daily hot water use (litres/day)												134.0628 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	145.8433	142.7289	138.9364	133.1694	128.4862	123.4515	121.5167	125.2929	129.2755	134.5611	140.4169	145.4651 (44)
Energy content	230.9801	203.2441	213.5400	182.3023	172.9672	151.7980	146.9639	155.1388	159.4096	182.5982	200.0496	227.7631 (45)
Energy content (annual)												Total = Sum(45)m = 2226.7549
Distribution loss (46)m = 0.15 x (45)m												
34.6470	30.4866	32.0310	27.3453	25.9451	22.7697	22.0446	23.2708	23.9114	27.3897	30.0074	34.1645	(46)
Water storage loss:												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8694 (55)
Total storage loss												
26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage												
26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (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												
257.9315	227.5873	240.4914	208.3843	199.9186	177.8800	173.9153	182.0902	185.4916	209.5496	226.1316	254.7145	(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	257.9315	227.5873	240.4914	208.3843	199.9186	177.8800	173.9153	182.0902	185.4916	209.5496	226.1316	254.7145 (64)
												Total per year (kWh/year) = Sum(64)m = 2544.0859 (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	76.8009	67.5787	71.0021	60.6155	57.5116	50.4728	48.8655	51.5836	53.0037	60.7139	66.5165	75.7312 (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	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.2797	26.8941	21.8718	16.5583	12.3776	10.4497	11.2912	14.6768	19.6991	25.0125	29.1933	31.1212 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	406.7582	410.9790	400.3426	377.6988	349.1150	322.2504	304.3031	300.0823	310.7187	333.3625	361.9462	388.8109 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319 (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)	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536 (71)
Water heating gains (Table 5)	103.2270	100.5635	95.4329	84.1882	77.3005	70.1012	65.6794	69.3329	73.6162	81.6047	92.3840	101.7893 (72)
Total internal gains	651.3735	649.5454	628.7559	589.5540	549.9018	513.9099	492.3825	495.2006	515.1428	551.0884	594.6323	632.8301 (73)

6. Solar gains

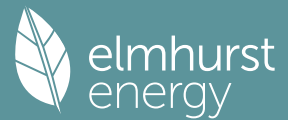
[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				2.8690	10.6334	0.4700	0.0000	0.7700	11.0406 (74)			
East				14.0080	19.6403	0.4700	0.0000	0.7700	99.5662 (76)			
South				0.7000	46.7521	0.4700	0.0000	0.7700	11.8437 (78)			
West				16.4530	19.6403	0.4700	0.0000	0.7700	116.9448 (80)			
Solar gains	239.3953	464.0375	758.0733	1102.7945	1353.3924	1387.2883	1319.9266	1131.7789	880.1530	548.6048	297.6226	197.4862 (83)
Total gains	890.7688	1113.5829	1386.8292	1692.3485	1903.2942	1901.1982	1812.3090	1626.9794	1395.2957	1099.6933	892.2549	830.3163 (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	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534
alpha	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969
util living area	0.9599	0.9276	0.8604	0.7383	0.5848	0.4360	0.3255	0.3741	0.5898	0.8325	0.9386	0.9666 (86)
MIT	18.7753	19.1755	19.7605	20.3552	20.7390	20.9171	20.9736	20.9601	20.8019	20.2026	19.3414	18.6735 (87)
Th 2	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829 (88)
util rest of house	0.9529	0.9156	0.8384	0.7010	0.5320	0.3683	0.2465	0.2892	0.5171	0.7970	0.9262	0.9606 (89)
MIT 2	17.3194	17.8190	18.5360	19.2349	19.6537	19.8265	19.8708	19.8633	19.7326	19.0865	18.0364	17.1915 (90)
Living area fraction	17.5431	18.0274	18.7241	19.4070	19.8204	19.9941	20.0403	20.0318	19.8969	19.2580	18.2369	17.4192 (91)
MIT	17.5431	18.0274	18.7241	19.4070	19.8204	19.9941	20.0403	20.0318	19.8969	19.2580	18.2369	17.4192 (92)
Temperature adjustment	17.5431	18.0274	18.7241	19.4070	19.8204	19.9941	20.0403	20.0318	19.8969	19.2580	18.2369	17.4192 (93)
adjusted MIT	17.5431	18.0274	18.7241	19.4070	19.8204	19.9941	20.0403	20.0318	19.8969	19.2580	18.2369	17.4192 (93)

8. Space heating requirement

Full SAP Calculation Printout



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9319	0.8892	0.8110	0.6834	0.5289	0.3753	0.2579	0.3009	0.5181	0.7733	0.9013	0.9415	(94)
Useful gains	830.1134	990.2266	1124.7329	1156.5140	1006.6509	713.4830	467.3729	489.5105	722.9063	850.3616	804.1789	781.7667	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1827.0983	1811.1336	1686.5096	1449.6069	1120.3431	744.1985	474.6376	501.0642	799.7744	1194.5025	1536.5142	1823.7934	(97)
Space heating kWh	741.7568	551.6495	417.9618	211.0269	84.5870	0.0000	0.0000	0.0000	0.0000	256.0408	527.2814	775.2678	(98a)
Space heating requirement - total per year (kWh/year)												3565.5720	
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	741.7568	551.6495	417.9618	211.0269	84.5870	0.0000	0.0000	0.0000	0.0000	256.0408	527.2814	775.2678	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3565.5720	
Space heating per m2										(98c) / (4) =		32.2154	(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)
Fraction of main heating from main system 2													0.0000	(203)
Fraction of total heating from main system 1													1.0000	(204)
Fraction of total heating from main system 2													0.0000	(205)
Efficiency of main space heating system 1 (in %)													100.0000	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement	741.7568	551.6495	417.9618	211.0269	84.5870	0.0000	0.0000	0.0000	0.0000	256.0408	527.2814	775.2678	(98)	
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)	
Space heating fuel (main heating system)	741.7568	551.6495	417.9618	211.0269	84.5870	0.0000	0.0000	0.0000	0.0000	256.0408	527.2814	775.2678	(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)	
Space heating fuel used, main system 2													0.0000	(213)
Water heating requirement	257.9315	227.5873	240.4914	208.3843	199.9186	177.8800	173.9153	182.0902	185.4916	209.5496	226.1316	254.7145	(64)	
Efficiency of water heater (217)m	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	(216)	
Fuel for water heating, kWh/month	76.1564	67.1970	71.0070	61.5271	59.0276	52.5205	51.3499	53.7636	54.7679	61.8712	66.7672	75.2065	(219)	
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)	
Pumps and Fa	3.5062	3.1668	3.5062	3.3930	3.5062	3.3930	3.5062	3.5062	3.3930	3.5062	3.3930	3.5062	(231)	
Lighting	26.5036	21.2622	19.1442	14.0259	10.8340	8.8515	9.8831	12.8465	16.6863	21.8933	24.7285	27.2402	(232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-50.2520	-81.2806	-131.1127	-152.2551	-155.1300	-129.1563	-126.7680	-118.2161	-101.4593	-92.9240	-57.5816	-41.9768	(233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)	
Electricity generated by PVs (Appendix M) (negative quantity)	-13.0945	-34.3939	-90.1737	-175.9283	-275.1136	-303.3572	-296.0563	-235.1689	-152.7551	-61.7621	-19.5753	-9.6421	(233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)	
Annual totals kWh/year														
Space heating fuel - main system 1													3565.5720	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													338.6868	
Water heating fuel used													751.1618	(219)
Space cooling fuel													0.0000	(221)
Electricity for pumps and fans:														
(MEV)Decentralised, Database: total watage = 4.6280, total flow = 37.0000, SFP = 0.1251)														
mechanical ventilation fans (SFP = 0.1251)													41.2821	(230a)
Total electricity for the above, kWh/year													41.2821	(231)
Electricity for lighting (calculated in Appendix L)													213.8993	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-2905.1336	(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													1666.7817	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3565.5720	16.4900	587.9628	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	751.1618	16.4900	123.8666	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	41.2821	16.4900	6.8074	(249)

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Energy for lighting	213.8993	16.4900	35.2720 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1238.1125	16.4900	-204.1647
PV Unit electricity exported	-1667.0211	5.5900	-93.1865
Total			-297.3512 (252)
Total energy cost			456.5576 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.0558 (257)
SAP value		82.8860
SAP rating (Section 12)		83 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3565.5720	0.1557	555.2705 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	751.1618	0.1412	106.0796 (264)
Space and water heating			661.3501 (265)
Pumps, fans and electric keep-hot	41.2821	0.1387	5.7263 (267)
Energy for lighting	213.8993	0.1443	30.8723 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1238.1125	0.1348	-166.8688
PV Unit electricity exported	-1667.0211	0.1194	-199.0862
Total			-365.9550 (269)
Total CO2, kg/year			331.9937 (272)
CO2 emissions per m2			3.0000 (273)
EI value			97.1424
EI rating			97 (274)
EI band			A

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

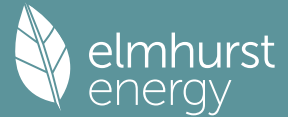
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	45.0550 (1b)	x 2.4000 (2b)	= 108.1320 (1b) - (3b)
First floor	45.0550 (1c)	x 2.6000 (2c)	= 117.1430 (1c) - (3c)
Second floor	20.5690 (1d)	x 2.2000 (2d)	= 45.2518 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	110.6790		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	270.5268 (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)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (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) =	0.1500 (21)
Wind speed	Jan 4.2000 Feb 4.0000 Mar 4.0000 Apr 3.7000 May 3.7000 Jun 3.3000 Jul 3.4000 Aug 3.2000 Sep 3.3000 Oct 3.5000 Nov 3.5000 Dec 3.8000 (22)	
Wind factor	1.0500 1.0000 1.0000 0.9250 0.9250 0.8250 0.8500 0.8000 0.8250 0.8750 0.8750 0.9500 (22a)	
Adj infilt rate	0.1575 0.1500 0.1500 0.1388 0.1388 0.1237 0.1275 0.1200 0.1237 0.1313 0.1313 0.1425 (22b)	
Mechanical extract ventilation - decentralised		
If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
Effective ac	0.5000 0.5000 0.5000 0.5000 0.5000 0.5000 0.5000 0.5000 0.5000 0.5000 0.5000 0.5000 (25)	

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Solid Door			2.0370	1.0000	2.0400			(26)
Windows (Uw = 1.30)			34.0300	1.2357	42.0646			(27)
Flr - Ground			45.0550	0.1100	4.9560	75.0000	3379.1250	(28a)
Wl - 1	145.9220	30.4910	115.4310	0.1800	20.7776	60.0000	6925.8598	(29a)
Wl - Dormer	14.7880	5.5760	9.2120	0.2600	2.3951	9.0000	82.9080	(29a)
Wl - Stud Ashlar	25.6520		25.6520	0.1200	3.0782	9.0000	230.8680	(29a)
Rf - Ins Rafter	8.5120		8.5120	0.1600	1.3619	9.0000	76.6080	(30)
Rf - Flat Roof	5.8400		5.8400	0.1600	0.9344	9.0000	52.5600	(30)
Rf - Ashlar behind Stud	24.4870		24.4870	0.1152	2.8209	9.0000	220.3830	(30)
Rf - Ins Joist Ashlar	9.2570		9.2570	0.1794	1.6611	9.0000	83.3130	(30)
Total net area of external elements Aum(A, m2)			279.5260					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	82.0900		(33)
Stud			86.2224			9.0000	776.0016	(32c)
Stud			112.7204			9.0000	1014.4836	(32c)
Stud			12.0912			9.0000	108.8208	(32c)
Internal Floor 1			65.6240			9.0000	590.6160	(32d)
Internal Ceiling 1			65.6240			9.0000	590.6160	(32e)

Heat capacity Cm = Sum(A x k)

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

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	17.1270	0.2240	3.8364	
E3 Sill	12.7320	0.0240	0.3056	
E4 Jamb	44.3120	0.0190	0.8419	
E5 Ground floor (normal)	27.8000	0.0450	1.2510	
E6 Intermediate floor within a dwelling	55.6000	0.0000	0.0000	
E13 Gable (insulation at rafter level)	1.9060	0.0340	0.0648	
E16 Corner (normal)	28.8800	0.0370	1.0686	
R1 Head of roof window	3.1240	0.2400	0.7498	
R2 Sill of roof window	3.1240	0.2400	0.7498	
R6 Flat ceiling	3.2220	0.0400	0.1289	
R7 Flat ceiling (inverted)	4.7260	0.1200	0.5671	
R9 Roof to wall (flat ceiling)	10.4700	0.1600	1.6752	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				11.2390 (36)
Point Thermal bridges				(36a) = 0.0000
Total fabric heat loss				(33) + (36) + (36a) = 93.3290 (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	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	(38)
Average = Sum(39)m / 12 =	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	(39)
HLP	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	(40)
HLP (average)													1.2465
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

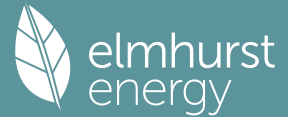
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8188 (42)
Hot water usage for mixer showers	71.4825	70.4083	68.8429	65.8478	63.6375	61.1726	59.7716	61.3251	63.0281	65.6746	68.7340	71.2086	(42a)
Hot water usage for baths	30.8630	30.4047	29.7592	28.5691	27.6779	26.6898	26.1560	26.7970	27.4949	28.5522	29.7669	30.7587	(42b)
Hot water usage for other uses	43.4977	41.9160	40.3343	38.7525	37.1708	35.5891	35.5891	37.1708	38.7525	40.3343	41.9160	43.4977	(42c)
Average daily hot water use (litres/day)													134.0628 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	145.8433	142.7289	138.9364	133.1694	128.4862	123.4515	121.5167	125.2929	129.2755	134.5611	140.4169	145.4651	(44)
Energy conte	230.9801	203.2441	213.5400	182.3023	172.9672	151.7980	146.9639	155.1388	159.4096	182.5982	200.0496	227.7631	(45)
Energy content (annual)										Total = Sum(45)m =		2226.7549	
Distribution loss (46)m = 0.15 x (45)m													
	34.6470	30.4866	32.0310	27.3453	25.9451	22.7697	22.0446	23.2708	23.9114	27.3897	30.0074	34.1645	(46)
Water storage loss:													
Store volume													201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6100 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8694 (55)
Total storage loss													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(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													
	257.9315	227.5873	240.4914	208.3843	199.9186	177.8800	173.9153	182.0902	185.4916	209.5496	226.1316	254.7145	(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													
	257.9315	227.5873	240.4914	208.3843	199.9186	177.8800	173.9153	182.0902	185.4916	209.5496	226.1316	254.7145	(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													
	76.8009	67.5787	71.0021	60.6155	57.5116	50.4728	48.8655	51.5836	53.0037	60.7139	66.5165	75.7312	(65)

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

Metabolic gains (Table 5), Watts

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.2797	26.8941	21.8718	16.5583	12.3776	10.4497	11.2912	14.6768	19.6991	25.0125	29.1933	31.1212	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	406.7582	410.9790	400.3426	377.6988	349.1150	322.2504	304.3031	300.0823	310.7187	333.3625	361.9462	388.8109	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	(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)	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	(71)
Water heating gains (Table 5)	103.2270	100.5635	95.4329	84.1882	77.3005	70.1012	65.6794	69.3329	73.6162	81.6047	92.3840	101.7893	(72)
Total internal gains	651.3735	649.5454	628.7559	589.5540	549.9018	513.9099	492.3825	495.2006	515.1428	551.0884	594.6323	632.8301	(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					2.8690	11.9814		0.4700	0.0000	0.7700		12.4402 (74)	
East					14.0080	22.3313		0.4700	0.0000	0.7700		113.2085 (76)	
South					0.7000	50.9848		0.4700	0.0000	0.7700		12.9160 (78)	
West					16.4530	22.3313		0.4700	0.0000	0.7700		132.9683 (80)	

Solar gains	271.5330	473.7502	763.8625	1142.9370	1364.3779	1495.7378	1408.0976	1236.2090	960.6369	597.9156	345.8945	221.7872	(83)
Total gains	922.9065	1123.2955	1392.6184	1732.4910	1914.2797	2009.6477	1900.4801	1731.4095	1475.7797	1149.0041	940.5268	854.6174	(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	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534
alpha	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969
util living area	0.9512	0.9189	0.8418	0.6959	0.5205	0.3329	0.2227	0.2513	0.4958	0.7865	0.9203	0.9592 (86)
MIT	18.9797	19.3225	19.9190	20.4999	20.8351	20.9681	20.9932	20.9903	20.8948	20.3963	19.5751	18.8905 (87)
Th 2	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829 (88)
util rest of house	0.9423	0.9050	0.8163	0.6531	0.4610	0.2623	0.1435	0.1652	0.4144	0.7414	0.9037	0.9516 (89)
MIT 2	17.5781	18.0034	18.7295	19.3987	19.7506	19.8660	19.8813	19.8803	19.8148	19.3097	18.3275	17.4669 (90)
Living area fraction	17.7934	18.2060	18.9123	19.5679	19.9172	20.0354	20.0521	20.0509	19.9808	19.4767	18.5192	17.6856 (92)
MIT	17.7934	18.2060	18.9123	19.5679	19.9172	20.0354	20.0521	20.0509	19.9808	19.4767	18.5192	17.6856 (93)
Temperature adjustment												0.0000
adjusted MIT	17.7934	18.2060	18.9123	19.5679	19.9172	20.0354	20.0521	20.0509	19.9808	19.4767	18.5192	17.6856 (93)

8. Space heating requirement

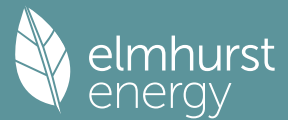
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9194	0.8780	0.7900	0.6399	0.4629	0.2721	0.1556	0.1783	0.4219	0.7223	0.8772	0.9305	(94)
Useful gains	848.5236	986.2294	1100.2169	1108.6758	886.1036	546.9066	295.7586	308.7864	622.5907	829.9471	825.0054	795.1992	(95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Heat loss rate W	1751.2591	1739.2032	1588.2998	1333.8357	954.3425	556.7417	296.9163	310.5441	659.5816	1086.7125	1451.2914	1736.3901	(97)
Space heating kWh	671.6352	505.9983	363.1337	162.1151	50.7698	0.0000	0.0000	0.0000	0.0000	191.0335	450.9259	700.2460	(98a)
Space heating requirement - total per year (kWh/year)												3095.8575	
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	671.6352	505.9983	363.1337	162.1151	50.7698	0.0000	0.0000	0.0000	0.0000	191.0335	450.9259	700.2460	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3095.8575	
Space heating per m2											(98c) / (4) =	27.9715	(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)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	671.6352	505.9983	363.1337	162.1151	50.7698	0.0000	0.0000	0.0000	0.0000	191.0335	450.9259	700.2460	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	671.6352	505.9983	363.1337	162.1151	50.7698	0.0000	0.0000	0.0000	0.0000	191.0335	450.9259	700.2460	(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)
Space heating fuel used, main system 2													0.0000 (213)

Water heating
Water heating requirement

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Efficiency of water heater (217)m	257.9315	227.5873	240.4914	208.3843	199.9186	177.8800	173.9153	182.0902	185.4916	209.5496	226.1316	254.7145 (64)
Fuel for water heating, kWh/month	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868 (216)
Space cooling fuel requirement (221)m	76.1564	67.1970	71.0070	61.5271	59.0276	52.5205	51.3499	53.7636	54.7679	61.8712	66.7672	75.2065 (219)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Lighting	3.5062	3.1668	3.5062	3.3930	3.5062	3.3930	3.5062	3.5062	3.5062	3.5062	3.3930	3.5062 (231)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	26.5036	21.2622	19.1442	14.0259	10.8340	8.8515	9.8831	12.8465	16.6863	21.8933	24.7285	27.2402 (232)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	-56.1780	-82.5787	-130.2543	-150.7354	-149.5693	-133.0609	-130.1401	-123.1171	-106.6458	-96.5722	-64.9712	-46.6218 (233a)
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 (234a)
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 (235a)
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 (235c)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	-16.4063	-36.7021	-94.7673	-191.9850	-286.8182	-335.7571	-323.4945	-265.5723	-173.2038	-73.6689	-25.6147	-11.9400 (233b)
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 (234b)
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 (235b)
Annual totals kWh/year	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)
Space heating fuel - main system 1												3095.8575 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												338.6868
Water heating fuel used												751.1618 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(MEV)Decentralised, Database: total watage = 4.6280, total flow = 37.0000, SFP = 0.1251)												
mechanical ventilation fans (SFP = 0.1251)												41.2821 (230a)
Total electricity for the above, kWh/year												41.2821 (231)
Electricity for lighting (calculated in Appendix L)												213.8993 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-3106.3749 (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												995.8259 (238)

10a. Fuel costs - using BEDF prices (552)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3095.8575	26.0600	806.7805 (240)
Space heating - main system 2	0.0000	26.0600	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	751.1618	26.0600	195.7528 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Pumps, fans and electric keep-hot	41.2821	26.0600	10.7581 (249)
Energy for lighting	213.8993	26.0600	55.7422 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1270.4447	26.0600	-331.0779
PV Unit electricity exported	-1835.9302	5.8100	-106.6675
Total			-437.7454 (252)
Total energy cost			631.2881 (255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3095.8575	0.1564	484.0903 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	751.1618	0.1412	106.0796 (264)
Space and water heating			590.1699 (265)
Pumps, fans and electric keep-hot	41.2821	0.1387	5.7263 (267)
Energy for lighting	213.8993	0.1443	30.8723 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1270.4447	0.1349	-171.3534
PV Unit electricity exported	-1835.9302	0.1193	-219.0963
Total			-390.4497 (269)
Total CO2, kg/year			236.3188 (272)

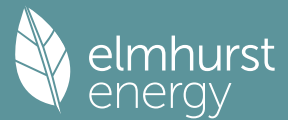
13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	3095.8575	1.5789	4887.9909 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	751.1618	1.5222	1143.4176 (278)
Space and water heating			6031.4085 (279)
Pumps, fans and electric keep-hot	41.2821	1.5128	62.4516 (281)
Energy for lighting	213.8993	1.5338	328.0859 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1270.4447	1.4985	-1903.8020
PV Unit electricity exported	-1835.9302	0.4376	-803.4569
Total			-2707.2589 (283)

Total Primary energy kWh/year

3714.6871 (286)

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Property Reference	001 BLOCK D				Issued on Date	10/09/2024
Assessment Reference	001 BLOCK D ELEC, DWHP		Prop Type Ref	001 BLOCK D		
Property	001 BLOCK D, 001 BLOCK D, 0					
SAP Rating	74 C	DER	5.88	TER	11.67	
Environmental	95 A	% DER < TER				49.61
CO ₂ Emissions (t/year)	0.55	DFEE	43.44	TFEE	43.68	
Compliance Check	See BREL	% DFEE < TFEE				0.56
% DPER < TPER	0.10	DPER	60.95	TPER	61.01	
Assessor Details	Mr. Scott Binstead				Assessor ID	U903-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)		Storey height (m)		Volume (m ³)	
Ground floor	45.0550 (1b)	x	2.4000 (2b)	=	108.1320 (1b)	- (3b)
First floor	45.0550 (1c)	x	2.6000 (2c)	=	117.1430 (1c)	- (3c)
Second floor	20.5690 (1d)	x	2.2000 (2d)	=	45.2518 (1d)	- (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	110.6790					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	270.5268	(5)

2. Ventilation rate

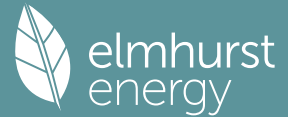
	m ³ per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (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) =	0.1500 (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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(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	
Solid Door			2.0370	1.0000	2.0400			(26)
Windows (Uw = 1.30)			34.0300	1.2357	42.0646			(27)
Flr - Ground			45.0550	0.1100	4.9560	75.0000	3379.1250	(28a)
Wl - 1	145.9220	30.4910	115.4310	0.1800	20.7776	60.0000	6925.8598	(29a)
Wl - Dormer	14.7880		9.2120	0.2600	2.3951	9.0000	82.9080	(29a)
Wl - Stud Ashlar	25.6520		25.6520	0.1200	3.0782	9.0000	230.8680	(29a)
Rf - Ins Rafter	8.5120		8.5120	0.1600	1.3619	9.0000	76.6080	(30)
Rf - Flat Roof	5.8400		5.8400	0.1600	0.9344	9.0000	52.5600	(30)
Rf - Ashlar behind Stud	24.4870		24.4870	0.1152	2.8209	9.0000	220.3830	(30)
Rf - Ins Joist Ashlar	9.2570		9.2570	0.1794	1.6611	9.0000	83.3130	(30)
Total net area of external elements Aum(A, m ²)			279.5260					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		82.0900			(33)
Stud			86.2224			9.0000	776.0016	(32c)
Stud			112.7204			9.0000	1014.4836	(32c)

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Stud	12.0912	9.0000	108.8208 (32c)
Internal Floor 1	65.6240	9.0000	590.6160 (32d)
Internal Ceiling 1	65.6240	9.0000	590.6160 (32e)

Heat capacity $C_m = \text{Sum}(A \times k)$ (28)...(30) + (32) + (32a)...(32e) = 14132.1628 (34)
Thermal mass parameter (TMP = C_m / TFA) in kJ/m²K 127.6860 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	17.1270	0.2240	3.8364
E2 Other lintels (including other steel lintels)	12.7320	0.0240	0.3056
E3 Sill	44.3120	0.0190	0.8419
E4 Jamb	27.8000	0.0450	1.2510
E5 Ground floor (normal)	55.6000	0.0000	0.0000
E6 Intermediate floor within a dwelling	1.9060	0.0340	0.0648
E13 Gable (insulation at rafter level)	28.8800	0.0370	1.0686
E16 Corner (normal)	3.1240	0.2400	0.7498
R1 Head of roof window	3.1240	0.2400	0.7498
R2 Sill of roof window	3.2220	0.0400	0.1289
R6 Flat ceiling	4.7260	0.1200	0.5671
R7 Flat ceiling (inverted)	10.4700	0.1600	1.6752
R9 Roof to wall (flat ceiling)			

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.2390 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 93.3290 (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	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369 (38)
Heat transfer coeff	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659 (39)
Average = Sum(39)m / 12 =												137.9659

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465 (40)
HLP (average)												1.2465
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8188 (42)
Hot water usage for mixer showers												
71.4825	70.4083	68.8429	65.8478	63.6375	61.1726	59.7716	61.3251	63.0281	65.6746	68.7340	71.2086	(42a)
Hot water usage for baths												
30.8630	30.4047	29.7592	28.5691	27.6779	26.6898	26.1560	26.7970	27.4949	28.5522	29.7669	30.7587	(42b)
Hot water usage for other uses												
43.4977	41.9160	40.3343	38.7525	37.1708	35.5891	35.5891	37.1708	38.7525	40.3343	41.9160	43.4977	(42c)
Average daily hot water use (litres/day)												134.0628 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	145.8433	142.7289	138.9364	133.1694	128.4862	123.4515	121.5167	125.2929	129.2755	134.5611	140.4169	145.4651 (44)
Energy conte	230.9801	203.2441	213.5400	182.3023	172.9672	151.7980	146.9639	155.1388	159.4096	182.5982	200.0496	227.7631 (45)
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m												
34.6470	30.4866	32.0310	27.3453	25.9451	22.7697	22.0446	23.2708	23.9114	27.3897	30.0074	34.1645	(46)

Water storage loss: 201.0000 (47)
Store volume 1.6100 (48)

a) If manufacturer declared loss factor is known (kWh/day):
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)

Total storage loss												
26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage												
26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month												
257.9315	227.5873	240.4914	208.3843	199.9186	177.8800	173.9153	182.0902	185.4916	209.5496	226.1316	254.7145	(62)
WWHRS	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	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
257.9315	227.5873	240.4914	208.3843	199.9186	177.8800	173.9153	182.0902	185.4916	209.5496	226.1316	254.7145	(64)

Electric shower(s) Total per year (kWh/year) = Sum(64)m = 2544.0859 (64)

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 Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

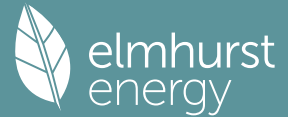
76.8009	67.5787	71.0021	60.6155	57.5116	50.4728	48.8655	51.5836	53.0037	60.7139	66.5165	75.7312	(65)
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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
30.2797	26.8941	21.8718	16.5583	12.3776	10.4497	11.2912	14.6768	19.6991	25.0125	29.1933	31.1212	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
406.7582	410.9790	400.3426	377.6988	349.1150	322.2504	304.3031	300.0823	310.7187	333.3625	361.9462	388.8109	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	(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)												
-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	(71)
Water heating gains (Table 5)												
103.2270	100.5635	95.4329	84.1882	77.3005	70.1012	65.6794	69.3329	73.6162	81.6047	92.3840	101.7893	(72)
Total internal gains												
651.3735	649.5454	628.7559	589.5540	549.9018	513.9099	492.3825	495.2006	515.1428	551.0884	594.6323	632.8301	(73)

6. Solar gains

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[Jan]	Area m2				Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d		Gains W
North	2.8690				10.6334	0.4700		0.0000		0.7700		11.0406 (74)
East	14.0080				19.6403	0.4700		0.0000		0.7700		99.5662 (76)
South	0.7000				46.7521	0.4700		0.0000		0.7700		11.8437 (78)
West	16.4530				19.6403	0.4700		0.0000		0.7700		116.9448 (80)
Solar gains	239.3953	464.0375	758.0733	1102.7945	1353.3924	1387.2883	1319.9266	1131.7789	880.1530	548.6048	297.6226	197.4862 (83)
Total gains	890.7688	1113.5829	1386.8292	1692.3485	1903.2942	1901.1982	1812.3090	1626.9794	1395.2957	1099.6933	892.2549	830.3163 (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	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534
alpha	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969
util living area	0.9599	0.9276	0.8604	0.7383	0.5848	0.4360	0.3255	0.3741	0.5898	0.8325	0.9386	0.9666 (86)
MIT	18.7753	19.1755	19.7605	20.3552	20.7390	20.9171	20.9736	20.9601	20.8019	20.2026	19.3414	18.6735 (87)
Th 2	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829 (88)
util rest of house	0.9529	0.9156	0.8384	0.7010	0.5320	0.3683	0.2465	0.2892	0.5171	0.7970	0.9262	0.9606 (89)
MIT 2	17.3194	17.8190	18.5360	19.2349	19.6537	19.8265	19.8708	19.8633	19.7326	19.0865	18.0364	17.1915 (90)
Living area fraction	fLA = Living area / (4) = 0.1536 (91)											
MIT	17.5431	18.0274	18.7241	19.4070	19.8204	19.9941	20.0403	20.0318	19.8969	19.2580	18.2369	17.4192 (92)
Temperature adjustment	0.0000											
adjusted MIT	17.5431	18.0274	18.7241	19.4070	19.8204	19.9941	20.0403	20.0318	19.8969	19.2580	18.2369	17.4192 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9319	0.8892	0.8110	0.6834	0.5289	0.3753	0.2579	0.3009	0.5181	0.7733	0.9013	0.9415 (94)
Useful gains	830.1134	990.2266	1124.7329	1156.5140	1006.6509	713.4830	467.3729	489.5105	722.9063	850.3616	804.1789	781.7667 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1827.0983	1811.1336	1686.5096	1449.6069	1120.3431	744.1985	474.6376	501.0642	799.7744	1194.5025	1536.5142	1823.7934 (97)
Space heating kWh	741.7568	551.6495	417.9618	211.0269	84.5870	0.0000	0.0000	0.0000	0.0000	256.0408	527.2814	775.2678 (98a)
Space heating requirement - total per year (kWh/year)	3565.5720											
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	741.7568	551.6495	417.9618	211.0269	84.5870	0.0000	0.0000	0.0000	0.0000	256.0408	527.2814	775.2678 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	3565.5720											
Space heating per m2	(98c) / (4) = 32.2154 (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)
Fraction of main heating from main system 2												0.0000 (203)
Fraction of total heating from main system 1												1.0000 (204)
Fraction of total heating from main system 2												0.0000 (205)
Efficiency of main space heating system 1 (in %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	741.7568	551.6495	417.9618	211.0269	84.5870	0.0000	0.0000	0.0000	0.0000	256.0408	527.2814	775.2678 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	741.7568	551.6495	417.9618	211.0269	84.5870	0.0000	0.0000	0.0000	0.0000	256.0408	527.2814	775.2678 (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)
Space heating fuel used, main 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)
Water heating												
Water heating requirement	257.9315	227.5873	240.4914	208.3843	199.9186	177.8800	173.9153	182.0902	185.4916	209.5496	226.1316	254.7145 (64)
Efficiency of water heater (217)m	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868 (216)
Fuel for water heating, kWh/month	76.1564	67.1970	71.0070	61.5271	59.0276	52.5205	51.3499	53.7636	54.7679	61.8712	66.7672	75.2065 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	3.5062	3.1668	3.5062	3.3930	3.5062	3.3930	3.5062	3.5062	3.3930	3.5062	3.3930	3.5062 (231)
Lighting	26.5036	21.2622	19.1442	14.0259	10.8340	8.8515	9.8831	12.8465	16.6863	21.8933	24.7285	27.2402 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-11.1668	-19.1611	-33.6341	-44.4253	-51.9679	-48.1090	-47.1632	-41.4998	-32.4777	-23.8347	-13.2083	-9.2243 (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	-1.1795	-3.1498	-8.4497	-17.1612	-28.0737	-32.0718	-31.3395	-24.5537	-15.5960	-5.8413	-1.7840	-0.8666 (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)												

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(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												3565.5720	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												338.6868	
Water heating fuel used												751.1618	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 4.6280, total flow = 37.0000, SFP = 0.1251)													
mechanical ventilation fans (SFP = 0.1251)												41.2821	(230a)
Total electricity for the above, kWh/year												41.2821	(231)
Electricity for lighting (calculated in Appendix L)												213.8993	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-545.9391	(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												4025.9762	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3565.5720	16.4900	587.9628	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	751.1618	16.4900	123.8666	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	41.2821	16.4900	6.8074	(249)
Energy for lighting	213.8993	16.4900	35.2720	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-375.8723	16.4900	-61.9813	
PV Unit electricity exported	-170.0668	5.5900	-9.5067	
Total			-71.4881	(252)
Total energy cost			682.4208	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.5781	(257)
SAP value		74.4196	
SAP rating (Section 12)		74	(258)
SAP band		C	

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

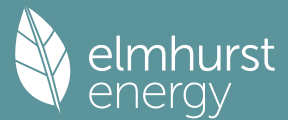
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3565.5720	0.1557	555.2705	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	751.1618	0.1412	106.0796	(264)
Space and water heating			661.3501	(265)
Pumps, fans and electric keep-hot	41.2821	0.1387	5.7263	(267)
Energy for lighting	213.8993	0.1443	30.8723	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-375.8723	0.1320	-49.6026	
PV Unit electricity exported	-170.0668	0.1183	-20.1157	
Total			-69.7183	(269)
Total CO2, kg/year			628.2304	(272)
CO2 emissions per m2			5.6800	(273)
EI value			94.5925	
EI rating			95	(274)
EI band			A	

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	45.0550 (1b)	x	2.4000 (2b)	=	108.1320 (1b)	- (3b)
First floor	45.0550 (1c)	x	2.6000 (2c)	=	117.1430 (1c)	- (3c)
Second floor	20.5690 (1d)	x	2.2000 (2d)	=	45.2518 (1d)	- (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e) ... (1n)	110.6790					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e) ... (3n)	=	270.5268	(5)

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2. Ventilation rate

											m3 per hour		
Number of open chimneys												0 * 80 =	0.0000 (6a)
Number of open flues												0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire												0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler												0 * 20 =	0.0000 (6d)
Number of flues attached to other heater												0 * 35 =	0.0000 (6e)
Number of blocked chimneys												0 * 20 =	0.0000 (6f)
Number of intermittent extract fans												0 * 10 =	0.0000 (7a)
Number of passive vents												0 * 10 =	0.0000 (7b)
Number of flueless gas fires												0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											0.0000	/ (5) =	0.0000 (8)
Pressure test											Yes		
Pressure Test Method											Blower Door		
Measured/design AP50											3.0000 (17)		
Infiltration rate											0.1500 (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) = 0.1500 (21)		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)	
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)	
Adj infilt rate	0.1575	0.1500	0.1500	0.1388	0.1388	0.1237	0.1275	0.1200	0.1237	0.1313	0.1313	0.1425 (22b)	
Mechanical extract ventilation - decentralised													
If mechanical ventilation													0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)	

3. Heat losses and heat loss parameter

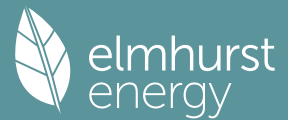
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Solid Door			2.0370	1.0000	2.0400			(26)
Windows (Uw = 1.30)			34.0300	1.2357	42.0646			(27)
Flr - Ground			45.0550	0.1100	4.9560	75.0000	3379.1250	(28a)
W1 - 1	145.9220	30.4910	115.4310	0.1800	20.7776	60.0000	6925.8598	(29a)
W1 - Dormer	14.7880	5.5760	9.2120	0.2600	2.3951	9.0000	82.9080	(29a)
W1 - Stud Ashlar	25.6520		25.6520	0.1200	3.0782	9.0000	230.8680	(29a)
Rf - Ins Rafter	8.5120		8.5120	0.1600	1.3619	9.0000	76.6080	(30)
Rf - Flat Roof	5.8400		5.8400	0.1600	0.9344	9.0000	52.5600	(30)
Rf - Ashlar behind Stud	24.4870		24.4870	0.1152	2.8209	9.0000	220.3830	(30)
Rf - Ins Joist Ashlar	9.2570		9.2570	0.1794	1.6611	9.0000	83.3130	(30)
Total net area of external elements Aum(A, m2)			279.5260					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	82.0900			(33)
Stud			86.2224			9.0000	776.0016	(32c)
Stud			112.7204			9.0000	1014.4836	(32c)
Stud			12.0912			9.0000	108.8208	(32c)
Internal Floor 1			65.6240			9.0000	590.6160	(32d)
Internal Ceiling 1			65.6240			9.0000	590.6160	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		14132.1628	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							127.6860	(35)
List of Thermal Bridges								
K1 Element				Length	Psi-value		Total	
E2 Other lintels (including other steel lintels)				17.1270	0.2240		3.8364	
E3 Sill				12.7320	0.0240		0.3056	
E4 Jamb				44.3120	0.0190		0.8419	
E5 Ground floor (normal)				27.8000	0.0450		1.2510	
E6 Intermediate floor within a dwelling				55.6000	0.0000		0.0000	
E13 Gable (insulation at rafter level)				1.9060	0.0340		0.0648	
E16 Corner (normal)				28.8800	0.0370		1.0686	
R1 Head of roof window				3.1240	0.2400		0.7498	
R2 Sill of roof window				3.1240	0.2400		0.7498	
R6 Flat ceiling				3.2220	0.0400		0.1289	
R7 Flat ceiling (inverted)				4.7260	0.1200		0.5671	
R9 Roof to wall (flat ceiling)				10.4700	0.1600		1.6752	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.2390	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		93.3290	(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
	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369 (38)
Heat transfer coeff	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659 (39)
Average = Sum(39)m / 12 =												137.9659
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8188 (42)
Hot water usage for mixer showers												
	71.4825	70.4083	68.8429	65.8478	63.6375	61.1726	59.7716	61.3251	63.0281	65.6746	68.7340	71.2086 (42a)
Hot water usage for baths												
	30.8630	30.4047	29.7592	28.5691	27.6779	26.6898	26.1560	26.7970	27.4949	28.5522	29.7669	30.7587 (42b)
Hot water usage for other uses												
	43.4977	41.9160	40.3343	38.7525	37.1708	35.5891	35.5891	37.1708	38.7525	40.3343	41.9160	43.4977 (42c)
Average daily hot water use (litres/day)												134.0628 (43)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	145.8433	142.7289	138.9364	133.1694	128.4862	123.4515	121.5167	125.2929	129.2755	134.5611	140.4169	145.4651	(44)
Energy conte	230.9801	203.2441	213.5400	182.3023	172.9672	151.7980	146.9639	155.1388	159.4096	182.5982	200.0496	227.7631	(45)
Energy content (annual)	Total = Sum(45)m =												2226.7549
Distribution loss	34.6470	30.4866	32.0310	27.3453	25.9451	22.7697	22.0446	23.2708	23.9114	27.3897	30.0074	34.1645	(46)
Water storage loss:													
Store volume													201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6100 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8694 (55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(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	257.9315	227.5873	240.4914	208.3843	199.9186	177.8800	173.9153	182.0902	185.4916	209.5496	226.1316	254.7145	(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	257.9315	227.5873	240.4914	208.3843	199.9186	177.8800	173.9153	182.0902	185.4916	209.5496	226.1316	254.7145	(64)
Total per year (kWh/year) = Sum(64)m =												2544.0859	(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	76.8009	67.5787	71.0021	60.6155	57.5116	50.4728	48.8655	51.5836	53.0037	60.7139	66.5165	75.7312	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	(66)
(66)m	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.2797	26.8941	21.8718	16.5583	12.3776	10.4497	11.2912	14.6768	19.6991	25.0125	29.1933	31.1212	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	406.7582	410.9790	400.3426	377.6988	349.1150	322.2504	304.3031	300.0823	310.7187	333.3625	361.9462	388.8109	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	(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)	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	(71)
Water heating gains (Table 5)	103.2270	100.5635	95.4329	84.1882	77.3005	70.1012	65.6794	69.3329	73.6162	81.6047	92.3840	101.7893	(72)
Total internal gains	651.3735	649.5454	628.7559	589.5540	549.9018	513.9099	492.3825	495.2006	515.1428	551.0884	594.6323	632.8301	(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				2.8690	11.9814		0.4700	0.0000		0.7700		12.4402 (74)
East				14.0080	22.3313		0.4700	0.0000		0.7700		113.2085 (76)
South				0.7000	50.9848		0.4700	0.0000		0.7700		12.9160 (78)
West				16.4530	22.3313		0.4700	0.0000		0.7700		132.9683 (80)
Solar gains	271.5330	473.7502	763.8625	1142.9370	1364.3779	1495.7378	1408.0976	1236.2090	960.6369	597.9156	345.8945	221.7872 (83)
Total gains	922.9065	1123.2955	1392.6184	1732.4910	1914.2797	2009.6477	1900.4801	1731.4095	1475.7797	1149.0041	940.5268	854.6174 (84)

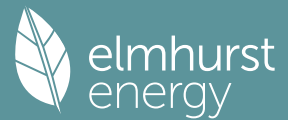
7. Mean internal temperature (heating season)

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	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534
alpha	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969
util living area	0.9512	0.9189	0.8418	0.6959	0.5205	0.3329	0.2227	0.2513	0.4958	0.7865	0.9203	0.9592 (86)
MIT	18.9797	19.3225	19.9190	20.4999	20.8351	20.9681	20.9932	20.9903	20.8948	20.3963	19.5751	18.8905 (87)
Th 2	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829 (88)
util rest of house	0.9423	0.9050	0.8163	0.6531	0.4610	0.2623	0.1435	0.1652	0.4144	0.7414	0.9037	0.9516 (89)
MIT 2	17.5781	18.0034	18.7295	19.3987	19.7506	19.8660	19.8813	19.8803	19.8148	19.3097	18.3275	17.4669 (90)
Living area fraction	17.7934	18.2060	18.9123	19.5679	19.9172	20.0354	20.0521	20.0509	19.9808	19.4767	18.5192	17.6856 (91)
MIT	17.7934	18.2060	18.9123	19.5679	19.9172	20.0354	20.0521	20.0509	19.9808	19.4767	18.5192	17.6856 (92)
Temperature adjustment	17.7934	18.2060	18.9123	19.5679	19.9172	20.0354	20.0521	20.0509	19.9808	19.4767	18.5192	17.6856 (93)
adjusted MIT	17.7934	18.2060	18.9123	19.5679	19.9172	20.0354	20.0521	20.0509	19.9808	19.4767	18.5192	17.6856 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9194	0.8780	0.7900	0.6399	0.4629	0.2721	0.1556	0.1783	0.4219	0.7223	0.8772	0.9305	(94)
Useful gains	848.5236	986.2294	1100.2169	1108.6758	886.1036	546.9066	295.7586	308.7864	622.5907	829.9471	825.0054	795.1992	(95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Heat loss rate W	1751.2591	1739.2032	1588.2998	1333.8357	954.3425	556.7417	296.9163	310.5441	659.5816	1086.7125	1451.2914	1736.3901	(97)
Space heating kWh	671.6352	505.9983	363.1337	162.1151	50.7698	0.0000	0.0000	0.0000	0.0000	191.0335	450.9259	700.2460	(98a)

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Space heating requirement - total per year (kWh/year)												3095.8575
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	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	671.6352	505.9983	363.1337	162.1151	50.7698	0.0000	0.0000	0.0000	0.0000	191.0335	450.9259	700.2460 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3095.8575
Space heating per m2												(98c) / (4) = 27.9715 (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)
Fraction of main heating from main system 2												0.0000 (203)
Fraction of total heating from main system 1												1.0000 (204)
Fraction of total heating from main system 2												0.0000 (205)
Efficiency of main space heating system 1 (in %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	671.6352	505.9983	363.1337	162.1151	50.7698	0.0000	0.0000	0.0000	0.0000	191.0335	450.9259	700.2460 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	671.6352	505.9983	363.1337	162.1151	50.7698	0.0000	0.0000	0.0000	0.0000	191.0335	450.9259	700.2460 (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)
Space heating fuel used, main system 2												0.0000 (213)
Water heating												
Water heating requirement	257.9315	227.5873	240.4914	208.3843	199.9186	177.8800	173.9153	182.0902	185.4916	209.5496	226.1316	254.7145 (64)
Efficiency of water heater	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868 (216)
Fuel for water heating, kWh/month	76.1564	67.1970	71.0070	61.5271	59.0276	52.5205	51.3499	53.7636	54.7679	61.8712	66.7672	75.2065 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	3.5062	3.1668	3.5062	3.3930	3.5062	3.3930	3.5062	3.5062	3.3930	3.5062	3.3930	3.5062 (231)
Lighting	26.5036	21.2622	19.1442	14.0259	10.8340	8.8515	9.8831	12.8465	16.6863	21.8933	24.7285	27.2402 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-12.6292	-19.5874	-33.7932	-45.2786	-51.5271	-50.9864	-49.6106	-44.5392	-34.9935	-25.5381	-15.2073	-10.3444 (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	-1.4820	-3.3619	-8.9019	-18.9095	-29.5269	-35.8013	-34.4857	-27.9811	-17.8120	-7.0423	-2.3501	-1.0753 (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												3095.8575 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												338.6868
Water heating fuel used												751.1618 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:												
(MEV)Decentralised, Database: total watage = 4.6280, total flow = 37.0000, SFP = 0.1251)												
mechanical ventilation fans (SFP = 0.1251)												41.2821 (230a)
Total electricity for the above, kWh/year												41.2821 (231)
Electricity for lighting (calculated in Appendix L)												213.8993 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-582.7651 (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												3519.4357 (238)

10a. Fuel costs - using BEDF prices (552)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3095.8575	26.0600	806.7805 (240)
Space heating - main system 2	0.0000	26.0600	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	751.1618	26.0600	195.7528 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Pumps, fans and electric keep-hot	41.2821	26.0600	10.7581 (249)
Energy for lighting	213.8993	26.0600	55.7422 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-394.0350	26.0600	-102.6855
PV Unit electricity exported	-188.7301	5.8100	-10.9652
Total			-113.6507 (252)
Total energy cost			955.3828 (255)

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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	3095.8575	0.1564	484.0903 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	751.1618	0.1412	106.0796 (264)
Space and water heating			590.1699 (265)
Pumps, fans and electric keep-hot	41.2821	0.1387	5.7263 (267)
Energy for lighting	213.8993	0.1443	30.8723 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-394.0350	0.1319	-51.9777
PV Unit electricity exported	-188.7301	0.1182	-22.2992
Total			-74.2769 (269)
Total CO2, kg/year			552.4916 (272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	3095.8575	1.5789	4887.9909 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	751.1618	1.5222	1143.4176 (278)
Space and water heating			6031.4085 (279)
Pumps, fans and electric keep-hot	41.2821	1.5128	62.4516 (281)
Energy for lighting	213.8993	1.5338	328.0859 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-394.0350	1.4874	-586.0759
PV Unit electricity exported	-188.7301	0.4332	-81.7516
Total			-667.8275 (283)
Total Primary energy kWh/year			5754.1185 (286)

SAP 10 EPC IMPROVEMENTS

001 BLOCK D ELEC, DWHP

Current energy efficiency rating: C 74
Current environmental impact rating: A 95

N Solar water heating SAP increase too small
U Solar photovoltaic panels Already installed
V2 Wind turbine Not applicable

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

Measures omitted - SAP change or cost saving too small:
N Solar water heating + 0.6 -£ 30 -14 kg (2.6%)

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

Potential energy efficiency rating: C 74
Potential environmental impact rating: A 95

Fuel prices for cost data on this page from database revision number 552 TEST (30 Aug 2024)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):			
	Current £1069	Potential £1069	Saving £0
Electricity			
Space heating	£818	£818	£0
Water heating	£196	£196	£0
Lighting	£56	£56	£0
Generated (PV)	-£114	-£114	£0
Total cost of fuels	£955	£955	£0
Total cost of uses	£956	£956	£0
Delivered energy	32 kWh/m²	32 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.6 tonnes	0.6 tonnes	0.0 tonnes
CO2 emissions per m²	5 kg/m²	5 kg/m²	0 kg/m²
Primary energy	52 kWh/m²	52 kWh/m²	0 kWh/m²

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

1. Overall dwelling characteristics

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	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	45.0550 (1b)	x 2.4000 (2b)	= 108.1320 (1b) - (3b)
First floor	45.0550 (1c)	x 2.6000 (2c)	= 117.1430 (1c) - (3c)
Second floor	20.5690 (1d)	x 2.2000 (2d)	= 45.2518 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	110.6790		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 270.5268 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (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) = 0.1500 (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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
Solid Door			2.0370	1.0000	2.0400		(26)
Windows (Uw = 1.30)			34.0300	1.2357	42.0646		(27)
Flr - Ground			45.0550	0.1100	4.9560	75.0000	3379.1250 (28a)
W1 - 1	145.9220	30.4910	115.4310	0.1800	20.7776	60.0000	6925.8598 (29a)
W1 - Dormer	14.7880	5.5760	9.2120	0.2600	2.3951	9.0000	82.9080 (29a)
W1 - Stud Ashlar	25.6520		25.6520	0.1200	3.0782	9.0000	230.8680 (29a)
Rf - Ins Rafter	8.5120		8.5120	0.1600	1.3619	9.0000	76.6080 (30)
Rf - Flat Roof	5.8400		5.8400	0.1600	0.9344	9.0000	52.5600 (30)
Rf - Ashlar behind Stud	24.4870		24.4870	0.1152	2.8209	9.0000	220.3830 (30)
Rf - Ins Joist Ashlar	9.2570		9.2570	0.1794	1.6611	9.0000	83.3130 (30)
Total net area of external elements Aum(A, m ²)			279.5260				(31)
Fabric heat loss, W/K = Sum (A x k)				(26)...(30) + (32) =	82.0900		(33)
Stud			86.2224			9.0000	776.0016 (32c)
Stud			112.7204			9.0000	1014.4836 (32c)
Stud			12.0912			9.0000	108.8208 (32c)
Internal Floor 1			65.6240			9.0000	590.6160 (32d)
Internal Ceiling 1			65.6240			9.0000	590.6160 (32e)

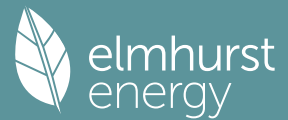
Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	14132.1628 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		127.6860 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	17.1270	0.2240	3.8364
E3 Sill	12.7320	0.0240	0.3056
E4 Jamb	44.3120	0.0190	0.8419
E5 Ground floor (normal)	27.8000	0.0450	1.2510
E6 Intermediate floor within a dwelling	55.6000	0.0000	0.0000
E13 Gable (insulation at rafter level)	1.9060	0.0340	0.0648
E16 Corner (normal)	28.8800	0.0370	1.0686
R1 Head of roof window	3.1240	0.2400	0.7498
R2 Sill of roof window	3.1240	0.2400	0.7498
R6 Flat ceiling	3.2220	0.0400	0.1289
R7 Flat ceiling (inverted)	4.7260	0.1200	0.5671
R9 Roof to wall (flat ceiling)	10.4700	0.1600	1.6752
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			11.2390 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	93.3290 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369 (38)
Heat transfer coeff	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659 (39)
Average = Sum(39)m / 12 =												137.9659
HLP	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465 (40)
HLP (average)												1.2465
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8188 (42)
Hot water usage for mixer showers												
71.4825	70.4083	68.8429	65.8478	63.6375	61.1726	59.7716	61.3251	63.0281	65.6746	68.7340	71.2086 (42a)	
Hot water usage for baths												
30.8630	30.4047	29.7592	28.5691	27.6779	26.6898	26.1560	26.7970	27.4949	28.5522	29.7669	30.7587 (42b)	
Hot water usage for other uses												
43.4977	41.9160	40.3343	38.7525	37.1708	35.5891	35.5891	37.1708	38.7525	40.3343	41.9160	43.4977 (42c)	
Average daily hot water use (litres/day)												134.0628 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
145.8433	142.7289	138.9364	133.1694	128.4862	123.4515	121.5167	125.2929	129.2755	134.5611	140.4169	145.4651 (44)	
Energy content	230.9801	203.2441	213.5400	182.3023	172.9672	151.7980	146.9639	155.1388	159.4096	182.5982	200.0496	227.7631 (45)
Energy content (annual)											Total = Sum(45)m =	2226.7549
Distribution loss (46)m = 0.15 x (45)m												
34.6470	30.4866	32.0310	27.3453	25.9451	22.7697	22.0446	23.2708	23.9114	27.3897	30.0074	34.1645 (46)	
Water storage loss:												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8694 (55)
Total storage loss												
26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)	
If cylinder contains dedicated solar storage												
26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)	
Total heat required for water heating calculated for each month												
257.9315	227.5873	240.4914	208.3843	199.9186	177.8800	173.9153	182.0902	185.4916	209.5496	226.1316	254.7145 (62)	
WWHRS	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 (63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)	
Output from w/h	257.9315	227.5873	240.4914	208.3843	199.9186	177.8800	173.9153	182.0902	185.4916	209.5496	226.1316	254.7145 (64)
											Total per year (kWh/year) = Sum(64)m =	2544.0859 (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 (64a)	
											Total Energy used by instantaneous electric shower (s) (kWh/year) = Sum(64a)m =	0.0000 (64a)
Heat gains from water heating, kWh/month	76.8009	67.5787	71.0021	60.6155	57.5116	50.4728	48.8655	51.5836	53.0037	60.7139	66.5165	75.7312 (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	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.2797	26.8941	21.8718	16.5583	12.3776	10.4497	11.2912	14.6768	19.6991	25.0125	29.1933	31.1212 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	406.7582	410.9790	400.3426	377.6988	349.1150	322.2504	304.3031	300.0823	310.7187	333.3625	361.9462	388.8109 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319 (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)	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536 (71)
Water heating gains (Table 5)	103.2270	100.5635	95.4329	84.1882	77.3005	70.1012	65.6794	69.3329	73.6162	81.6047	92.3840	101.7893 (72)
Total internal gains	651.3735	649.5454	628.7559	589.5540	549.9018	513.9099	492.3825	495.2006	515.1428	551.0884	594.6323	632.8301 (73)

6. Solar gains

[Jan]												
			Area		Solar flux		g		FF		Access	Gains
			m2		Table 6a		Specific data		Specific data		factor	W
					W/m2		or Table 6b		or Table 6c		Table 6d	
North			2.8690		10.6334		0.4700		0.0000		0.7700	11.0406 (74)
East			14.0080		19.6403		0.4700		0.0000		0.7700	99.5662 (76)
South			0.7000		46.7521		0.4700		0.0000		0.7700	11.8437 (78)
West			16.4530		19.6403		0.4700		0.0000		0.7700	116.9448 (80)
Solar gains	239.3953	464.0375	758.0733	1102.7945	1353.3924	1387.2883	1319.9266	1131.7789	880.1530	548.6048	297.6226	197.4862 (83)
Total gains	890.7688	1113.5829	1386.8292	1692.3485	1903.2942	1901.1982	1812.3090	1626.9794	1395.2957	1099.6933	892.2549	830.3163 (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	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534
alpha	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969
util living area	0.9599	0.9276	0.8604	0.7383	0.5848	0.4360	0.3255	0.3741	0.5898	0.8325	0.9386	0.9666 (86)
MIT	18.7753	19.1755	19.7605	20.3552	20.7390	20.9171	20.9736	20.9601	20.8019	20.2026	19.3414	18.6735 (87)
Th 2	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829 (88)
util rest of house	0.9529	0.9156	0.8384	0.7010	0.5320	0.3683	0.2465	0.2892	0.5171	0.7970	0.9262	0.9606 (89)
MIT 2	17.3194	17.8190	18.5360	19.2349	19.6537	19.8265	19.8708	19.8633	19.7326	19.0865	18.0364	17.1915 (90)
Living area fraction	17.5431	18.0274	18.7241	19.4070	19.8204	19.9941	20.0403	20.0318	19.8969	19.2580	18.2369	17.4192 (92)
MIT	17.5431	18.0274	18.7241	19.4070	19.8204	19.9941	20.0403	20.0318	19.8969	19.2580	18.2369	17.4192 (92)
Temperature adjustment	17.5431	18.0274	18.7241	19.4070	19.8204	19.9941	20.0403	20.0318	19.8969	19.2580	18.2369	17.4192 (93)
adjusted MIT	17.5431	18.0274	18.7241	19.4070	19.8204	19.9941	20.0403	20.0318	19.8969	19.2580	18.2369	17.4192 (93)

8. Space heating requirement

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9319	0.8892	0.8110	0.6834	0.5289	0.3753	0.2579	0.3009	0.5181	0.7733	0.9013	0.9415	(94)
Useful gains	830.1134	990.2266	1124.7329	1156.5140	1006.6509	713.4830	467.3729	489.5105	722.9063	850.3616	804.1789	781.7667	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1827.0983	1811.1336	1686.5096	1449.6069	1120.3431	744.1985	474.6376	501.0642	799.7744	1194.5025	1536.5142	1823.7934	(97)
Space heating kWh	741.7568	551.6495	417.9618	211.0269	84.5870	0.0000	0.0000	0.0000	0.0000	256.0408	527.2814	775.2678	(98a)
Space heating requirement - total per year (kWh/year)												3565.5720	
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	741.7568	551.6495	417.9618	211.0269	84.5870	0.0000	0.0000	0.0000	0.0000	256.0408	527.2814	775.2678	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3565.5720	
Space heating per m2										(98c) / (4) =		32.2154	(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)
Fraction of main heating from main system 2													0.0000	(203)
Fraction of total heating from main system 1													1.0000	(204)
Fraction of total heating from main system 2													0.0000	(205)
Efficiency of main space heating system 1 (in %)													100.0000	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement	741.7568	551.6495	417.9618	211.0269	84.5870	0.0000	0.0000	0.0000	0.0000	256.0408	527.2814	775.2678	(98)	
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)	
Space heating fuel (main heating system)	741.7568	551.6495	417.9618	211.0269	84.5870	0.0000	0.0000	0.0000	0.0000	256.0408	527.2814	775.2678	(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)	
Space heating fuel used, main system 2													0.0000	(213)
Water heating requirement	257.9315	227.5873	240.4914	208.3843	199.9186	177.8800	173.9153	182.0902	185.4916	209.5496	226.1316	254.7145	(64)	
Efficiency of water heater (217)m	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	(216)	
Fuel for water heating, kWh/month	76.1564	67.1970	71.0070	61.5271	59.0276	52.5205	51.3499	53.7636	54.7679	61.8712	66.7672	75.2065	(219)	
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)	
Pumps and Fa	3.5062	3.1668	3.5062	3.3930	3.5062	3.3930	3.5062	3.5062	3.3930	3.5062	3.3930	3.5062	(231)	
Lighting	26.5036	21.2622	19.1442	14.0259	10.8340	8.8515	9.8831	12.8465	16.6863	21.8933	24.7285	27.2402	(232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-11.1668	-19.1611	-33.6341	-44.4253	-51.9679	-48.1090	-47.1632	-41.4998	-32.4777	-23.8347	-13.2083	-9.2243	(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	-1.1795	-3.1498	-8.4497	-17.1612	-28.0737	-32.0718	-31.3395	-24.5537	-15.5960	-5.8413	-1.7840	-0.8666	(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													3565.5720	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													338.6868	
Water heating fuel used													751.1618	(219)
Space cooling fuel													0.0000	(221)
Electricity for pumps and fans:														
(MEV)Decentralised, Database: total watage = 4.6280, total flow = 37.0000, SFP = 0.1251)														
mechanical ventilation fans (SFP = 0.1251)													41.2821	(230a)
Total electricity for the above, kWh/year													41.2821	(231)
Electricity for lighting (calculated in Appendix L)													213.8993	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-545.9391	(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													4025.9762	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3565.5720	16.4900	587.9628	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	751.1618	16.4900	123.8666	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	41.2821	16.4900	6.8074	(249)

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Energy for lighting	213.8993	16.4900	35.2720 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-375.8723	16.4900	-61.9813
PV Unit electricity exported	-170.0668	5.5900	-9.5067
Total			-71.4881 (252)
Total energy cost			682.4208 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.5781 (257)
SAP value		74.4196
SAP rating (Section 12)		74 (258)
SAP band		C

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3565.5720	0.1557	555.2705 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	751.1618	0.1412	106.0796 (264)
Space and water heating			661.3501 (265)
Pumps, fans and electric keep-hot	41.2821	0.1387	5.7263 (267)
Energy for lighting	213.8993	0.1443	30.8723 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-375.8723	0.1320	-49.6026
PV Unit electricity exported	-170.0668	0.1183	-20.1157
Total			-69.7183 (269)
Total CO2, kg/year			628.2304 (272)
CO2 emissions per m2			5.6800 (273)
EI value			94.5925
EI rating			95 (274)
EI band			A

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

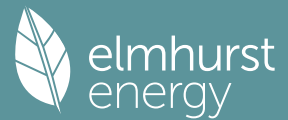
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	45.0550 (1b)	x 2.4000 (2b)	= 108.1320 (1b) - (3b)
First floor	45.0550 (1c)	x 2.6000 (2c)	= 117.1430 (1c) - (3c)
Second floor	20.5690 (1d)	x 2.2000 (2d)	= 45.2518 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	110.6790		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	270.5268 (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)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (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) =	0.1500 (21)
Wind speed	Jan 4.2000 Feb 4.0000 Mar 4.0000 Apr 3.7000 May 3.7000 Jun 3.3000 Jul 3.4000 Aug 3.2000 Sep 3.3000 Oct 3.5000 Nov 3.5000 Dec 3.8000 (22)	
Wind factor	1.0500 1.0000 1.0000 0.9250 0.9250 0.8250 0.8500 0.8000 0.8250 0.8750 0.8750 0.9500 (22a)	
Adj infilt rate	0.1575 0.1500 0.1500 0.1388 0.1388 0.1237 0.1275 0.1200 0.1237 0.1313 0.1313 0.1425 (22b)	
Mechanical extract ventilation - decentralised		
If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
Effective ac	0.5000 0.5000 0.5000 0.5000 0.5000 0.5000 0.5000 0.5000 0.5000 0.5000 0.5000 0.5000 (25)	

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Solid Door			2.0370	1.0000	2.0400			(26)
Windows (Uw = 1.30)			34.0300	1.2357	42.0646			(27)
Flr - Ground			45.0550	0.1100	4.9560	75.0000	3379.1250	(28a)
W1 - 1	145.9220	30.4910	115.4310	0.1800	20.7776	60.0000	6925.8598	(29a)
W1 - Dormer	14.7880	5.5760	9.2120	0.2600	2.3951	9.0000	82.9080	(29a)
W1 - Stud Ashlar	25.6520		25.6520	0.1200	3.0782	9.0000	230.8680	(29a)
Rf - Ins Rafter	8.5120		8.5120	0.1600	1.3619	9.0000	76.6080	(30)
Rf - Flat Roof	5.8400		5.8400	0.1600	0.9344	9.0000	52.5600	(30)
Rf - Ashlar behind Stud	24.4870		24.4870	0.1152	2.8209	9.0000	220.3830	(30)
Rf - Ins Joist Ashlar	9.2570		9.2570	0.1794	1.6611	9.0000	83.3130	(30)
Total net area of external elements Aum(A, m2)			279.5260					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	82.0900		(33)
Stud			86.2224			9.0000	776.0016	(32c)
Stud			112.7204			9.0000	1014.4836	(32c)
Stud			12.0912			9.0000	108.8208	(32c)
Internal Floor 1			65.6240			9.0000	590.6160	(32d)
Internal Ceiling 1			65.6240			9.0000	590.6160	(32e)

Heat capacity Cm = Sum(A x k)

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

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	17.1270	0.2240	3.8364	
E3 Sill	12.7320	0.0240	0.3056	
E4 Jamb	44.3120	0.0190	0.8419	
E5 Ground floor (normal)	27.8000	0.0450	1.2510	
E6 Intermediate floor within a dwelling	55.6000	0.0000	0.0000	
E13 Gable (insulation at rafter level)	1.9060	0.0340	0.0648	
E16 Corner (normal)	28.8800	0.0370	1.0686	
R1 Head of roof window	3.1240	0.2400	0.7498	
R2 Sill of roof window	3.1240	0.2400	0.7498	
R6 Flat ceiling	3.2220	0.0400	0.1289	
R7 Flat ceiling (inverted)	4.7260	0.1200	0.5671	
R9 Roof to wall (flat ceiling)	10.4700	0.1600	1.6752	

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

Point Thermal bridges

Total fabric heat loss

(36a) = 11.2390 (36)
(33) + (36) + (36a) = 93.3290 (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	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	44.6369	(38)
Average = Sum(39)m / 12 =	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	137.9659	(39)
HLP	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	1.2465	(40)
HLP (average)													
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

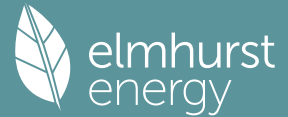
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8188 (42)
Hot water usage for mixer showers													
71.4825	70.4083	68.8429	65.8478	63.6375	61.1726	59.7716	61.3251	63.0281	65.6746	68.7340	71.2086		(42a)
Hot water usage for baths													
30.8630	30.4047	29.7592	28.5691	27.6779	26.6898	26.1560	26.7970	27.4949	28.5522	29.7669	30.7587		(42b)
Hot water usage for other uses													
43.4977	41.9160	40.3343	38.7525	37.1708	35.5891	35.5891	37.1708	38.7525	40.3343	41.9160	43.4977		(42c)
Average daily hot water use (litres/day)													134.0628 (43)
Daily hot water use													
145.8433	142.7289	138.9364	133.1694	128.4862	123.4515	121.5167	125.2929	129.2755	134.5611	140.4169	145.4651		(44)
Energy conte	230.9801	203.2441	213.5400	182.3023	172.9672	151.7980	146.9639	155.1388	159.4096	182.5982	200.0496	227.7631	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
34.6470	30.4866	32.0310	27.3453	25.9451	22.7697	22.0446	23.2708	23.9114	27.3897	30.0074	34.1645		(46)
Water storage loss:													
Store volume													201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6100 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8694 (55)
Total storage loss													
26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514		(56)
If cylinder contains dedicated solar storage													
26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514		(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(61)
Total heat required for water heating calculated for each month													
257.9315	227.5873	240.4914	208.3843	199.9186	177.8800	173.9153	182.0902	185.4916	209.5496	226.1316	254.7145		(62)
WWHRS	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		(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(63d)
Output from w/h													
257.9315	227.5873	240.4914	208.3843	199.9186	177.8800	173.9153	182.0902	185.4916	209.5496	226.1316	254.7145		(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													
76.8009	67.5787	71.0021	60.6155	57.5116	50.4728	48.8655	51.5836	53.0037	60.7139	66.5165	75.7312		(65)

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

Metabolic gains (Table 5), Watts

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	169.1304	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.2797	26.8941	21.8718	16.5583	12.3776	10.4497	11.2912	14.6768	19.6991	25.0125	29.1933	31.1212	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	406.7582	410.9790	400.3426	377.6988	349.1150	322.2504	304.3031	300.0823	310.7187	333.3625	361.9462	388.8109	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	54.7319	(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)	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	-112.7536	(71)
Water heating gains (Table 5)	103.2270	100.5635	95.4329	84.1882	77.3005	70.1012	65.6794	69.3329	73.6162	81.6047	92.3840	101.7893	(72)
Total internal gains	651.3735	649.5454	628.7559	589.5540	549.9018	513.9099	492.3825	495.2006	515.1428	551.0884	594.6323	632.8301	(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					2.8690	11.9814		0.4700	0.0000		0.7700		12.4402 (74)	
East					14.0080	22.3313		0.4700	0.0000		0.7700		113.2085 (76)	
South					0.7000	50.9848		0.4700	0.0000		0.7700		12.9160 (78)	
West					16.4530	22.3313		0.4700	0.0000		0.7700		132.9683 (80)	

Solar gains	271.5330	473.7502	763.8625	1142.9370	1364.3779	1495.7378	1408.0976	1236.2090	960.6369	597.9156	345.8945	221.7872	(83)	
Total gains	922.9065	1123.2955	1392.6184	1732.4910	1914.2797	2009.6477	1900.4801	1731.4095	1475.7797	1149.0041	940.5268	854.6174	(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	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534	28.4534
alpha	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969	2.8969
util living area	0.9512	0.9189	0.8418	0.6959	0.5205	0.3329	0.2227	0.2513	0.4958	0.7865	0.9203	0.9592 (86)
MIT	18.9797	19.3225	19.9190	20.4999	20.8351	20.9681	20.9932	20.9903	20.8948	20.3963	19.5751	18.8905 (87)
Th 2	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829	19.8829 (88)
util rest of house	0.9423	0.9050	0.8163	0.6531	0.4610	0.2623	0.1435	0.1652	0.4144	0.7414	0.9037	0.9516 (89)
MIT 2	17.5781	18.0034	18.7295	19.3987	19.7506	19.8660	19.8813	19.8803	19.8148	19.3097	18.3275	17.4669 (90)
Living area fraction	17.7934	18.2060	18.9123	19.5679	19.9172	20.0354	20.0521	20.0509	19.9808	19.4767	18.5192	17.6856 (92)
MIT	17.7934	18.2060	18.9123	19.5679	19.9172	20.0354	20.0521	20.0509	19.9808	19.4767	18.5192	17.6856 (93)
Temperature adjustment												0.0000
adjusted MIT	17.7934	18.2060	18.9123	19.5679	19.9172	20.0354	20.0521	20.0509	19.9808	19.4767	18.5192	17.6856 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9194	0.8780	0.7900	0.6399	0.4629	0.2721	0.1556	0.1783	0.4219	0.7223	0.8772	0.9305	(94)
Useful gains	848.5236	986.2294	1100.2169	1108.6758	886.1036	546.9066	295.7586	308.7864	622.5907	829.9471	825.0054	795.1992	(95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Heat loss rate W	1751.2591	1739.2032	1588.2998	1333.8357	954.3425	556.7417	296.9163	310.5441	659.5816	1086.7125	1451.2914	1736.3901	(97)
Space heating kWh	671.6352	505.9983	363.1337	162.1151	50.7698	0.0000	0.0000	0.0000	0.0000	191.0335	450.9259	700.2460	(98a)
Space heating requirement - total per year (kWh/year)												3095.8575	
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	671.6352	505.9983	363.1337	162.1151	50.7698	0.0000	0.0000	0.0000	0.0000	191.0335	450.9259	700.2460	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3095.8575	
Space heating per m2											(98c) / (4) =	27.9715	(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)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	671.6352	505.9983	363.1337	162.1151	50.7698	0.0000	0.0000	0.0000	0.0000	191.0335	450.9259	700.2460 (98)	
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)	
Space heating fuel (main heating system)	671.6352	505.9983	363.1337	162.1151	50.7698	0.0000	0.0000	0.0000	0.0000	191.0335	450.9259	700.2460 (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)	
Space heating fuel used, main system 2												0.0000 (213)	

Water heating
Water heating requirement

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Efficiency of water heater (217)m	257.9315	227.5873	240.4914	208.3843	199.9186	177.8800	173.9153	182.0902	185.4916	209.5496	226.1316	254.7145 (64)
Fuel for water heating, kWh/month	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868	338.6868 (216)
Space cooling fuel requirement (221)m	76.1564	67.1970	71.0070	61.5271	59.0276	52.5205	51.3499	53.7636	54.7679	61.8712	66.7672	75.2065 (219)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Lighting	3.5062	3.1668	3.5062	3.3930	3.5062	3.3930	3.5062	3.5062	3.5062	3.5062	3.3930	3.5062 (231)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	26.5036	21.2622	19.1442	14.0259	10.8340	8.8515	9.8831	12.8465	16.6863	21.8933	24.7285	27.2402 (232)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	-12.6292	-19.5874	-33.7932	-45.2786	-51.5271	-50.9864	-49.6106	-44.5392	-34.9935	-25.5381	-15.2073	-10.3444 (233a)
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 (234a)
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 (235a)
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 (235c)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	-1.4820	-3.3619	-8.9019	-18.9095	-29.5269	-35.8013	-34.4857	-27.9811	-17.8120	-7.0423	-2.3501	-1.0753 (233b)
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 (234b)
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 (235b)
Annual totals kWh/year	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)
Space heating fuel - main system 1												3095.8575 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												338.6868
Water heating fuel used												751.1618 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(MEVDecentralised, Database: total watage = 4.6280, total flow = 37.0000, SFP = 0.1251)												
mechanical ventilation fans (SFP = 0.1251)												41.2821 (230a)
Total electricity for the above, kWh/year												41.2821 (231)
Electricity for lighting (calculated in Appendix L)												213.8993 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-582.7651 (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												3519.4357 (238)

10a. Fuel costs - using BEDF prices (552)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3095.8575	26.0600	806.7805 (240)
Space heating - main system 2	0.0000	26.0600	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	751.1618	26.0600	195.7528 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Pumps, fans and electric keep-hot	41.2821	26.0600	10.7581 (249)
Energy for lighting	213.8993	26.0600	55.7422 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-394.0350	26.0600	-102.6855
PV Unit electricity exported	-188.7301	5.8100	-10.9652
Total			-113.6507 (252)
Total energy cost			955.3828 (255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3095.8575	0.1564	484.0903 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	751.1618	0.1412	106.0796 (264)
Space and water heating			590.1699 (265)
Pumps, fans and electric keep-hot	41.2821	0.1387	5.7263 (267)
Energy for lighting	213.8993	0.1443	30.8723 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-394.0350	0.1319	-51.9777
PV Unit electricity exported	-188.7301	0.1182	-22.2992
Total			-74.2769 (269)
Total CO2, kg/year			552.4916 (272)

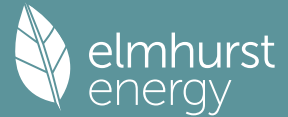
13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	3095.8575	1.5789	4887.9909 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	751.1618	1.5222	1143.4176 (278)
Space and water heating			6031.4085 (279)
Pumps, fans and electric keep-hot	41.2821	1.5128	62.4516 (281)
Energy for lighting	213.8993	1.5338	328.0859 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-394.0350	1.4874	-586.0759
PV Unit electricity exported	-188.7301	0.4332	-81.7516
Total			-667.8275 (283)

Total Primary energy kWh/year

5754.1185 (286)

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Property Reference	002 block F				Issued on Date	10/09/2024
Assessment Reference	002 block F ASHP	Prop Type Ref	002 block F			
Property	002 block F, 002 block F, 0					
SAP Rating	85 B	DER	3.88	TER	12.22	
Environmental	97 A	% DER < TER				68.25
CO ₂ Emissions (t/year)	0.25	DFEE	34.85	TFEE	37.22	
Compliance Check	See BREL	% DFEE < TFEE				6.37
% DPER < TPER	36.28	DPER	40.71	TPER	63.90	
Assessor Details	Mr. Scott Binstead				Assessor ID	U903-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	34.9880 (1b)	x 2.4000 (2b)	= 83.9712 (1b) - (3b)
First floor	34.9880 (1c)	x 2.6000 (2c)	= 90.9688 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.9760		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 174.9400 (5)

2. Ventilation rate

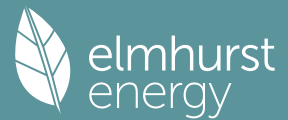
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1388 (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	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
Solid Door			1.9550	1.0000	1.9600		(26)
Windows (Uw = 1.30)			12.2350	1.2357	15.1255		(27)
Flr - Ground			34.9880	0.1100	3.8487	75.0000	2624.1000 (28a)
Wl - 1	83.8050	14.1900	69.6150	0.1800	12.5307	60.0000	4176.9000 (29a)
Rf - Ins Joist	34.9880		34.9880	0.0900	3.1489	9.0000	314.8920 (30)
Total net area of external elements Aum(A, m ²)			153.7910				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.6138		(33)
Party Wall			39.3650	0.0000	0.0000	110.0000	4330.1502 (32)
Stud			70.8384			9.0000	637.5456 (32c)
Stud			72.5868			9.0000	653.2812 (32c)
Internal Floor 1			34.9880			9.0000	314.8920 (32d)
Internal Ceiling 1			34.9880			9.0000	314.8920 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13366.6530 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							191.0177 (35)

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List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.8530	0.2210	1.9565
E3 Sill	6.3160	0.0240	0.1516
E4 Jamb	24.8880	0.0190	0.4729
E5 Ground floor (normal)	14.2240	0.0450	0.6401
E6 Intermediate floor within a dwelling	16.7610	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	2.5370	0.0360	0.0913
E10 Eaves (insulation at ceiling level)	16.7610	0.0510	0.8548
E16 Corner (normal)	10.0000	0.0370	0.3700
E18 Party wall between dwellings	10.0000	0.0310	0.3100
P1 Party wall - Ground floor	7.8730	0.0430	0.3385
P2 Party wall - Intermediate floor within a dwelling	7.8730	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	7.8730	0.4800	3.7790
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.9648 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	45.5785 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651 (38)
Heat transfer coeff	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436 (39)
Average = Sum(39)m / 12 =												74.4436
HLP	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638 (40)
HLP (average)												1.0638
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2455 (42)
Hot water usage for mixer showers	61.8700	60.9402	59.5853	56.9930	55.0800	52.9465	51.7339	53.0785	54.5525	56.8431	59.4911	61.6330 (42a)
Hot water usage for baths	26.7294	26.3324	25.7734	24.7426	23.9709	23.1151	22.6528	23.2079	23.8123	24.7280	25.7800	26.6390 (42b)
Hot water usage for other uses	37.6266	36.2584	34.8901	33.5219	32.1536	30.7854	30.7854	32.1536	33.5219	34.8901	36.2584	37.6266 (42c)
Average daily hot water use (litres/day)												116.0304 (43)
Daily hot water use	126.2259	123.5310	120.2488	115.2575	111.2044	106.8470	105.1721	108.4400	111.8866	116.4613	121.5295	125.8985 (44)
Energy conte	199.9110	175.9064	184.8180	157.7818	149.7026	131.3808	127.1965	134.2714	137.9674	158.0369	173.1410	197.1267 (45)
Energy content (annual)										Total = Sum(45)m =		1927.2405
Distribution loss (46)m = 0.15 x (45)m	29.9867	26.3860	27.7227	23.6673	22.4554	19.7071	19.0795	20.1407	20.6951	23.7055	25.9712	29.5690 (46)
Water storage loss:												210.0000 (47)
Store volume												1.4400 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7776 (55)
Enter (49) or (54) in (55)												
Total storage loss	24.1056	21.7728	24.1056	23.3280	24.1056	23.3280	24.1056	24.1056	23.3280	24.1056	23.3280	24.1056 (56)
If cylinder contains dedicated solar storage	24.1056	21.7728	24.1056	23.3280	24.1056	23.3280	24.1056	24.1056	23.3280	24.1056	23.3280	24.1056 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	247.2790	218.6904	232.1860	203.6218	197.0706	177.2208	174.5645	181.6394	183.8074	205.4049	218.9810	244.4947 (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	247.2790	218.6904	232.1860	203.6218	197.0706	177.2208	174.5645	181.6394	183.8074	205.4049	218.9810	244.4947 (64)
								Total per year (kWh/year) = Sum(64)m =				2484.9605 (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	104.3648	92.7161	99.3464	89.1345	87.6705	80.3561	80.1872	82.5396	82.5462	90.4417	94.2414	103.4390 (65)

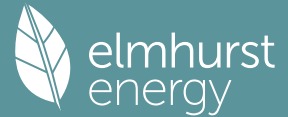
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.4693	19.9570	16.2301	12.2873	9.1849	7.7543	8.3787	10.8910	14.6179	18.5608	21.6632	23.0938 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	294.3896	297.4445	289.7463	273.3580	252.6706	233.2274	220.2382	217.1833	224.8815	241.2698	261.9572	281.4004 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188 (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)	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217 (71)
Water heating gains (Table 5)	140.2753	137.9704	133.5301	123.7978	117.8367	111.6057	107.7785	110.9404	114.6475	121.5614	130.8908	139.0309 (72)
Total internal gains	552.7638	551.0015	535.1362	505.0727	475.3218	448.2171	432.0251	434.6444	449.7764	477.0216	510.1408	539.1547 (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	0.6510	10.6334	0.4700	0.0000	0.7700	2.5052 (74)
East	5.0880	19.6403	0.4700	0.0000	0.7700	36.1645 (76)

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West			6.4960			19.6403			0.4700			0.0000			0.7700			46.1723 (80)		
Solar gains		84.8421	165.8560	273.3920	399.9284	491.7157	504.1832	479.6560	410.8630	318.2857	196.8202	105.7549	69.7983 (83)							
Total gains		637.6059	716.8574	808.5282	905.0011	967.0375	952.4002	911.6811	845.5074	768.0622	673.8418	615.8957	608.9530 (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	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761
alpha	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251
util living area	0.9721	0.9535	0.9084	0.8103	0.6583	0.4874	0.3565	0.4001	0.6247	0.8639	0.9542	0.9767 (86)
Living	19.8029	20.0110	20.3377	20.6785	20.8929	20.9766	20.9952	20.9921	20.9350	20.6312	20.1415	19.7405
Non living	18.6624	18.9215	19.3205	19.7164	19.9419	20.0162	20.0286	20.0272	19.9860	19.6762	19.0889	18.5842
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.3876	20.0110	20.3377	20.6785	20.8929	20.9766	20.9952	20.9921	20.9350	20.6312	20.1415	19.9167 (87)
Th 2	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305 (88)
util rest of house	0.9658	0.9434	0.8894	0.7747	0.6041	0.4184	0.2793	0.3181	0.5513	0.8285	0.9425	0.9713 (89)
MIT 2	19.4851	18.9215	19.3205	19.7164	19.9419	20.0162	20.0286	20.0272	19.9860	19.6762	19.0889	18.8448 (90)
Living area fraction												
MIT	19.6548	19.1264	19.5118	19.8974	20.1208	20.1969	20.2104	20.2087	20.1645	19.8558	19.2869	19.0464 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6548	19.1264	19.5118	19.8974	20.1208	20.1969	20.2104	20.2087	20.1645	19.8558	19.2869	19.0464 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9629	0.9317	0.8776	0.7694	0.6094	0.4305	0.2938	0.3334	0.5619	0.8212	0.9311	0.9644 (94)
Useful gains	613.9728	667.9008	709.5276	696.3116	589.3212	410.0080	267.8090	281.8568	431.5988	553.3265	573.4627	587.2862 (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	1143.0699	1059.0665	968.6494	818.6864	626.8751	416.6510	268.7730	283.5325	451.4617	689.0376	907.2369	1105.2228 (97)
Space heating kWh	393.6482	262.8633	192.7866	88.1098	27.9401	0.0000	0.0000	0.0000	0.0000	100.9690	240.3174	385.3449 (98a)
Space heating requirement - total per year (kWh/year)												1691.9794
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	393.6482	262.8633	192.7866	88.1098	27.9401	0.0000	0.0000	0.0000	0.0000	100.9690	240.3174	385.3449 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1691.9794
Space heating per m2										(98c) / (4) =		24.1794 (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 %)												249.4589 (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	393.6482	262.8633	192.7866	88.1098	27.9401	0.0000	0.0000	0.0000	0.0000	100.9690	240.3174	385.3449 (98)
Space heating efficiency (main heating system 1)	249.4589	249.4589	249.4589	249.4589	249.4589	0.0000	0.0000	0.0000	0.0000	249.4589	249.4589	249.4589 (210)
Space heating fuel (main heating system)	157.8008	105.3734	77.2819	35.3204	11.2003	0.0000	0.0000	0.0000	0.0000	40.4752	96.3355	154.4723 (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	247.2790	218.6904	232.1860	203.6218	197.0706	177.2208	174.5645	181.6394	183.8074	205.4049	218.9810	244.4947 (64)
Efficiency of water heater (217)m	268.5210	268.5210	268.5210	268.5210	268.5210	268.5210	268.5210	268.5210	268.5210	268.5210	268.5210	268.5210 (216)
Fuel for water heating, kWh/month	92.0893	81.4426	86.4684	75.8309	73.3911	65.9989	65.0096	67.6444	68.4518	76.4949	81.5508	91.0523 (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	2.1777	1.9670	2.1777	2.1075	2.1777	2.1075	2.1777	2.1777	2.1075	2.1777	2.1075	2.1777 (231)
Lighting	19.6672	15.7778	14.2061	10.4080	8.0395	6.5683	7.3339	9.5328	12.3822	16.2461	18.3500	20.2138 (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												678.2597 (211)
Space heating fuel - main system 2												0.0000 (213)

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Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	268.5210
Water heating fuel used	925.4249 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans: (MEVDecentralised, Database: total watage = 3.4840, total flow = 29.0000, SFP = 0.1201)	
mechanical ventilation fans (SFP = 0.1201)	25.6407 (230a)
Total electricity for the above, kWh/year	25.6407 (231)
Electricity for lighting (calculated in Appendix L)	158.7258 (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	1788.0511 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	678.2597	16.4900	111.8450 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	925.4249	16.4900	152.6026 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	25.6407	16.4900	4.2281 (249)
Energy for lighting	158.7258	16.4900	26.1739 (250)
Additional standing charges			0.0000 (251)
Total energy cost			294.8496 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] = 0.9232 (257)
SAP value	85.0349
SAP rating (Section 12)	85 (258)
SAP band	B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	678.2597	0.1565	106.1649 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	925.4249	0.1409	130.4247 (264)
Space and water heating			236.5896 (265)
Pumps, fans and electric keep-hot	25.6407	0.1387	3.5567 (267)
Energy for lighting	158.7258	0.1443	22.9090 (268)
Total CO2, kg/year			263.0553 (272)
CO2 emissions per m2			3.7600 (273)
EI value			96.9342
EI rating			97 (274)
EI band			A

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

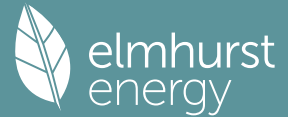
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	34.9880 (1b)	x 2.4000 (2b)	= 83.9712 (1b) - (3b)
First floor	34.9880 (1c)	x 2.6000 (2c)	= 90.9688 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.9760		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	174.9400 (5)

2. Ventilation rate

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

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Pressure test												Yes
Pressure Test Method												Blower Door
Measured/design AP50												3.0000 (17)
Infiltration rate												0.1500 (18)
Number of sides sheltered												1 (19)
Shelter factor												(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) = 0.1388 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Adj infilt rate	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
	0.1457	0.1388	0.1388	0.1283	0.1283	0.1145	0.1179	0.1110	0.1145	0.1214	0.1214	0.1318 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
Solid Door			1.9550	1.0000	1.9600		
Windows (Uw = 1.30)			12.2350	1.2357	15.1255		
Flr - Ground			34.9880	0.1100	3.8487	75.0000	2624.1000 (28a)
Wl - 1	83.8050	14.1900	69.6150	0.1800	12.5307	60.0000	4176.9000 (29a)
Rf - Ins Joist	34.9880		34.9880	0.0900	3.1489	9.0000	314.8920 (30)
Total net area of external elements Aum (A, m2)			153.7910				
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.6138		
Party Wall			39.3650	0.0000	0.0000	110.0000	4330.1502 (32)
Stud			70.8384			9.0000	637.5456 (32c)
Stud			72.5868			9.0000	653.2812 (32c)
Internal Floor 1			34.9880			9.0000	314.8920 (32d)
Internal Ceiling 1			34.9880			9.0000	314.8920 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13366.6530 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 191.0177 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.8530	0.2210	1.9565
E3 Sill	6.3160	0.0240	0.1516
E4 Jamb	24.8880	0.0190	0.4729
E5 Ground floor (normal)	14.2240	0.0450	0.6401
E6 Intermediate floor within a dwelling	16.7610	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	2.5370	0.0360	0.0913
E10 Eaves (insulation at ceiling level)	16.7610	0.0510	0.8548
E16 Corner (normal)	10.0000	0.0370	0.3700
E18 Party wall between dwellings	10.0000	0.0310	0.3100
P1 Party wall - Ground floor	7.8730	0.0430	0.3385
P2 Party wall - Intermediate floor within a dwelling	7.8730	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	7.8730	0.4800	3.7790
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.9648 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 45.5785 (37)

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

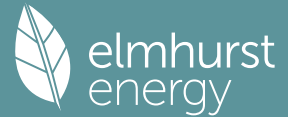
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651 (38)
Average = Sum(39)m / 12 =	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2455 (42)
Hot water usage for mixer showers												
Hot water usage for baths	61.8700	60.9402	59.5853	56.9930	55.0800	52.9465	51.7339	53.0785	54.5525	56.8431	59.4911	61.6330 (42a)
Hot water usage for other uses	26.7294	26.3324	25.7734	24.7426	23.9709	23.1151	22.6528	23.2079	23.8123	24.7280	25.7800	26.6390 (42b)
Average daily hot water use (litres/day)	37.6266	36.2584	34.8901	33.5219	32.1536	30.7854	30.7854	32.1536	33.5219	34.8901	36.2584	37.6266 (42c)
												116.0304 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	126.2259	123.5310	120.2488	115.2575	111.2044	106.8470	105.1721	108.4400	111.8866	116.4613	121.5295	125.8985 (44)
Energy content (annual)	199.9110	175.9064	184.8180	157.7818	149.7026	131.3808	127.1965	134.2714	137.9674	158.0369	173.1410	197.1267 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	29.9867	26.3860	27.7227	23.6673	22.4554	19.7071	19.0795	20.1407	20.6951	23.7055	25.9712	29.5690 (46)
Store volume												210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.4400 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7776 (55)
Total storage loss	24.1056	21.7728	24.1056	23.3280	24.1056	23.3280	24.1056	24.1056	23.3280	24.1056	23.3280	24.1056 (56)
If cylinder contains dedicated solar storage												
Primary loss	24.1056	21.7728	24.1056	23.3280	24.1056	23.3280	24.1056	24.1056	23.3280	24.1056	23.3280	24.1056 (57)
Combi loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	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)
WWHRS	247.2790	218.6904	232.1860	203.6218	197.0706	177.2208	174.5645	181.6394	183.8074	205.4049	218.9810	244.4947 (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)
	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)

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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	247.2790	218.6904	232.1860	203.6218	197.0706	177.2208	174.5645	181.6394	183.8074	205.4049	218.9810	244.4947 (64)
	Total per year (kWh/year) = Sum(64)m =											2484.9605 (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	104.3648	92.7161	99.3464	89.1345	87.6705	80.3561	80.1872	82.5396	82.5462	90.4417	94.2414	103.4390 (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	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.4693	19.9570	16.2301	12.2873	9.1849	7.7543	8.3787	10.8910	14.6179	18.5608	21.6632	23.0938	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	294.3896	297.4445	289.7463	273.3580	252.6706	233.2274	220.2382	217.1833	224.8815	241.2698	261.9572	281.4004	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	(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)	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	(71)
Water heating gains (Table 5)	140.2753	137.9704	133.5301	123.7978	117.8367	111.6057	107.7785	110.9404	114.6475	121.5614	130.8908	139.0309	(72)
Total internal gains	552.7638	551.0015	535.1362	505.0727	475.3218	448.2171	432.0251	434.6444	449.7764	477.0216	510.1408	539.1547	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
North	0.6510	11.9814	0.4700	0.0000	0.7700	2.8228 (74)
East	5.0880	22.3313	0.4700	0.0000	0.7700	41.1197 (76)
West	6.4960	22.3313	0.4700	0.0000	0.7700	52.4987 (80)

Solar gains	96.4412	169.6326	275.8059	414.7141	495.7922	543.6206	511.7459	448.9396	347.7088	214.8499	123.1627	78.5650 (83)
Total gains	649.2051	720.6340	810.9421	919.7869	971.1140	991.8376	943.7710	883.5840	797.4852	691.8715	633.3035	617.7197 (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	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	
alpha	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	
util living area	0.9650	0.9455	0.8901	0.7663	0.5824	0.3719	0.2441	0.2689	0.5232	0.8168	0.9383	0.9704	(86)
Living	19.9301	20.1070	20.4419	20.7667	20.9424	20.9935	20.9992	20.9988	20.9722	20.7414	20.2828	19.8782	
Non living	18.8225	19.0411	19.4460	19.8132	19.9879	20.0275	20.0303	20.0302	20.0147	19.7978	19.2630	18.7581	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.4527	20.1070	20.4419	20.7667	20.9424	20.9935	20.9992	20.9988	20.9722	20.7414	20.2828	20.0351	(87)
Th 2	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	(88)
util rest of house	0.9569	0.9335	0.8670	0.7241	0.5211	0.3013	0.1680	0.1878	0.4429	0.7706	0.9223	0.9634	(89)
MIT 2	19.5489	19.0411	19.4460	19.8132	19.9879	20.0275	20.0303	20.0302	20.0147	19.7978	19.2630	18.9874	(90)
Living area fraction	fLA = Living area / (4) =												0.1881 (91)
MIT	19.7189	19.2416	19.6334	19.9926	20.1674	20.2092	20.2126	20.2124	20.1948	19.9753	19.4548	19.1845	(92)
Temperature adjustment													0.0000
adjusted MIT	19.7189	19.2416	19.6334	19.9926	20.1674	20.2092	20.2126	20.2124	20.1948	19.9753	19.4548	19.1845	(93)

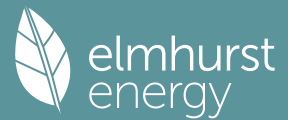
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9539	0.9215	0.8561	0.7223	0.5301	0.3144	0.1823	0.2031	0.4569	0.7677	0.9106	0.9557	(94)
Ext temp.	619.2500	664.0677	694.2429	664.3419	514.7585	311.8790	172.0665	179.4437	364.3847	531.1428	576.6821	590.3393	(95)
Heat loss rate W	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Space heating kWh	1088.2832	1015.5316	910.6955	751.3276	533.5668	313.3505	172.1562	179.5892	371.8318	623.4880	852.7355	1048.4994	(97)
Space heating requirement - total per year (kWh/year)	348.9607	236.1838	161.0407	62.6297	13.9934	0.0000	0.0000	0.0000	0.0000	68.7048	198.7584	340.8711	(98a)
Solar heating kWh													1431.1426
Solar heating contribution - total per year (kWh/year)	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)
Space heating kWh	348.9607	236.1838	161.0407	62.6297	13.9934	0.0000	0.0000	0.0000	0.0000	68.7048	198.7584	340.8711	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)													1431.1426
Space heating per m2													(98c) / (4) =

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 %)	249.4589	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	348.9607	236.1838	161.0407	62.6297	13.9934	0.0000	0.0000	0.0000	0.0000	68.7048	198.7584	340.8711	(98)
Space heating efficiency (main heating system 1)	249.4589	249.4589	249.4589	249.4589	249.4589	0.0000	0.0000	0.0000	0.0000	249.4589	249.4589	249.4589	(210)
Space heating fuel (main heating system)	139.8870	94.6784	64.5560	25.1062	5.6095	0.0000	0.0000	0.0000	0.0000	27.5415	79.6758	136.6442	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	247.2790	218.6904	232.1860	203.6218	197.0706	177.2208	174.5645	181.6394	183.8074	205.4049	218.9810	244.4947	(64)
Efficiency of water heater (217)m	268.5210	268.5210	268.5210	268.5210	268.5210	268.5210	268.5210	268.5210	268.5210	268.5210	268.5210	268.5210	(216)
Fuel for water heating, kWh/month	92.0893	81.4426	86.4684	75.8309	73.3911	65.9989	65.0096	67.6444	68.4518	76.4949	81.5508	91.0523	(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	2.1777	1.9670	2.1777	2.1075	2.1777	2.1075	2.1777	2.1777	2.1075	2.1777	2.1075	2.1777	(231)
Lighting	19.6672	15.7778	14.2061	10.4080	8.0395	6.5683	7.3339	9.5328	12.3822	16.2461	18.3500	20.2138	(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												573.6987	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												268.5210	
Water heating fuel used												925.4249	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.4840, total flow = 29.0000, SFP = 0.1201)													
mechanical ventilation fans (SFP = 0.1201)												25.6407	(230a)
Total electricity for the above, kWh/year												25.6407	(231)
Electricity for lighting (calculated in Appendix L)												158.7258	(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												1683.4901	(238)

10a. Fuel costs - using BEDF prices (552)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	573.6987	26.0600	149.5059	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	925.4249	26.0600	241.1657	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	25.6407	26.0600	6.6820	(249)
Energy for lighting	158.7258	26.0600	41.3639	(250)
Additional standing charges			0.0000	(251)
Total energy cost			438.7175	(255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	573.6987	0.1572	90.2075	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	925.4249	0.1409	130.4247	(264)
Space and water heating			220.6322	(265)
Pumps, fans and electric keep-hot	25.6407	0.1387	3.5567	(267)
Energy for lighting	158.7258	0.1443	22.9090	(268)
Total CO2, kg/year			247.0980	(272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	573.6987	1.5821	907.6341	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	925.4249	1.5211	1407.6898	(278)
Space and water heating			2315.3239	(279)
Pumps, fans and electric keep-hot	25.6407	1.5128	38.7892	(281)
Energy for lighting	158.7258	1.5338	243.4590	(282)
Total Primary energy kWh/year			2597.5720	(286)

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SAP 10 EPC IMPROVEMENTS

002 block F ASHP

Current energy efficiency rating: B 85
Current environmental impact rating: A 97

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

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.4	-£ 50	-23 kg (9.4%)
U Solar photovoltaic panels	+ 9.2	-£ 269	-234 kg (104.7%)

Recommended measures	Typical annual savings	Energy efficiency impact	Environmental impact
Solar water heating	£50	0.33 kg/m²	B 86 A 97
Solar photovoltaic panels	£269	3.35 kg/m²	A 96 A 100
Total Savings	£318	3.68 kg/m²	

Potential energy efficiency rating: A 96
Potential environmental impact rating: A 100

Fuel prices for cost data on this page from database revision number 552 TEST (30 Aug 2024)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£439	£389	£50
Space heating	£156	£177	-£21
Water heating	£241	£171	£71
Lighting	£41	£41	£0
Generated (PV)	-£0	-£269	£269
Total cost of fuels	£439	£120	£319
Total cost of uses	£438	£120	£319
Delivered energy	24 kWh/m²	-5 kWh/m²	29 kWh/m²
Carbon dioxide emissions	0.2 tonnes	-0.0 tonnes	0.3 tonnes
CO2 emissions per m²	4 kg/m²	-0 kg/m²	4 kg/m²
Primary energy	37 kWh/m²	9 kWh/m²	28 kWh/m²

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

1. Overall dwelling characteristics

	Area (m²)	Storey height (m)	Volume (m³)
Ground floor	34.9880 (1b)	x 2.4000 (2b)	= 83.9712 (1b) - (3b)
First floor	34.9880 (1c)	x 2.6000 (2c)	= 90.9688 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.9760		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 174.9400 (5)

2. Ventilation rate

	m³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

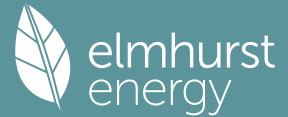
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 0.0000 / (5) = 0.0000 (8)

Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 3.0000 (17)
Infiltration rate 0.1500 (18)
Number of sides sheltered 1 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1388 (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	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (22b)

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Mechanical extract ventilation - decentralised

If mechanical ventilation

0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)

0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)
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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Solid Door			1.9550	1.0000	1.9600			(26)
Windows (Uw = 1.30)			12.2350	1.2357	15.1255			(27)
Flr - Ground			34.9880	0.1100	3.8487	75.0000	2624.1000	(28a)
Wl - 1	83.8050	14.1900	69.6150	0.1800	12.5307	60.0000	4176.9000	(29a)
Rf - Ins Joist	34.9880		34.9880	0.0900	3.1489	9.0000	314.8920	(30)
Total net area of external elements Aum(A, m2)			153.7910					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.6138			(33)
Party Wall			39.3650	0.0000	0.0000	110.0000	4330.1502	(32)
Stud			70.8384			9.0000	637.5456	(32c)
Stud			72.5868			9.0000	653.2812	(32c)
Internal Floor 1			34.9880			9.0000	314.8920	(32d)
Internal Ceiling 1			34.9880			9.0000	314.8920	(32e)

Heat capacity Cm = Sum(A x k)

(28)...(30) + (32) + (32a)...(32e) = 13366.6530 (34)

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

191.0177 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	8.8530	0.2210	1.9565	
E3 Sill	6.3160	0.0240	0.1516	
E4 Jamb	24.8880	0.0190	0.4729	
E5 Ground floor (normal)	14.2240	0.0450	0.6401	
E6 Intermediate floor within a dwelling	16.7610	0.0000	0.0000	
E7 Party floor between dwellings (in blocks of flats)	2.5370	0.0360	0.0913	
E10 Eaves (insulation at ceiling level)	16.7610	0.0510	0.8548	
E16 Corner (normal)	10.0000	0.0370	0.3700	
E18 Party wall between dwellings	10.0000	0.0310	0.3100	
P1 Party wall - Ground floor	7.8730	0.0430	0.3385	
P2 Party wall - Intermediate floor within a dwelling	7.8730	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	7.8730	0.4800	3.7790	

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

8.9648 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 45.5785 (37)

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

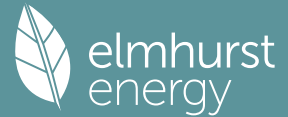
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	(38)
Heat transfer coeff	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	(39)
Average = Sum(39)m / 12 =													74.4436

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	(40)
HLP (average)													1.0638
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2455 (42)
Hot water usage for mixer showers	61.8700	60.9402	59.5853	56.9930	55.0800	52.9465	51.7339	53.0785	54.5525	56.8431	59.4911	61.6330	(42a)
Hot water usage for baths	26.7294	26.3324	25.7734	24.7426	23.9709	23.1151	22.6528	23.2079	23.8123	24.7280	25.7800	26.6390	(42b)
Hot water usage for other uses	37.6266	36.2584	34.8901	33.5219	32.1536	30.7854	30.7854	32.1536	33.5219	34.8901	36.2584	37.6266	(42c)
Average daily hot water use (litres/day)													116.0304 (43)
Daily hot water use	126.2259	123.5310	120.2488	115.2575	111.2044	106.8470	105.1721	108.4400	111.8866	116.4613	121.5295	125.8985	(44)
Energy conte	199.9110	175.9064	184.8180	157.7818	149.7026	131.3808	127.1965	134.2714	137.9674	158.0369	173.1410	197.1267	(45)
Energy content (annual)										Total = Sum(45)m =		1927.2405	
Distribution loss (46)m = 0.15 x (45)m	29.9867	26.3860	27.7227	23.6673	22.4554	19.7071	19.0795	20.1407	20.6951	23.7055	25.9712	29.5690	(46)
Water storage loss:													
Store volume													210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.4400 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.7776 (55)
Total storage loss	24.1056	21.7728	24.1056	23.3280	24.1056	23.3280	24.1056	24.1056	23.3280	24.1056	23.3280	24.1056	(56)
If cylinder contains dedicated solar storage	24.1056	21.7728	24.1056	23.3280	24.1056	23.3280	24.1056	24.1056	23.3280	24.1056	23.3280	24.1056	(57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	247.2790	218.6904	230.7902	196.8682	184.2762	164.6141	161.5376	169.5430	178.4045	204.0091	218.9810	244.4947	(62)
WVHRS	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)
Aperture area of solar collector													3.0000 (H1)
Zero-loss collector efficiency													0.8000 (H2)
Collector linear heat loss coefficient													1.8000 (H3)
Collector 2nd order heat loss coefficient													0.0000 (H4)
Collector loop efficiency													0.9000 (H5)
Incidence angle modifier													1.0000 (H6)
Overshading factor													0.8000 (H8)
Overall heat loss coefficient of system													6.5000 (H10)
Heat loss coefficient of collector loop													3.9667 (H11)
Dedicated solar storage volume													75.0000 (H12)
Effective solar volume													75.0000 (H14)
Reference volume													225.0000 (H15)
Storage tank correction coefficient													1.3161 (H16)
Heat delivered to hot water													607.4574 (H24)
Heat delivered to space heating													0.0000 (H29)
Solar input													607.4574

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Solar input	-0.0000	-16.2310	-57.6609	-78.6189	-101.7022	-93.5187	-92.7010	-81.5860	-56.8628	-28.5759	-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	247.2790	202.4594	173.1293	118.2493	82.5740	71.0954	68.8365	87.9570	121.5417	175.4332	218.9810	244.4947 (64)
								Total per year (kWh/year) = Sum(64)m =				1812.0307 (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	104.3648	92.7161	98.2298	83.7316	77.4350	70.2707	69.7657	72.8625	78.2239	89.3251	94.2414	103.4390 (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
	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	22.4693	19.9570	16.2301	12.2873	9.1849	7.7543	8.3787	10.8910	14.6179	18.5608	21.6632	23.0938 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	294.3896	297.4445	289.7463	273.3580	252.6706	233.2274	220.2382	217.1833	224.8815	241.2698	261.9572	281.4004 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188 (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)												
	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217 (71)
Water heating gains (Table 5)												
	140.2753	137.9704	132.0293	116.2938	104.0794	97.5983	93.7711	97.9335	108.6443	120.0606	130.8908	139.0309 (72)
Total internal gains	552.7638	551.0015	533.6354	497.5687	461.5645	434.2096	418.0176	421.6374	443.7732	475.5208	510.1408	539.1547 (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					0.6510	10.6334	0.4700	0.0000	0.7700	2.5052 (74)		
East					5.0880	19.6403	0.4700	0.0000	0.7700	36.1645 (76)		
West					6.4960	19.6403	0.4700	0.0000	0.7700	46.1723 (80)		
Solar gains	84.8421	165.8560	273.3920	399.9284	491.7157	504.1832	479.6560	410.8630	318.2857	196.8202	105.7549	69.7983 (83)
Total gains	637.6059	716.8574	807.0274	897.4971	953.2801	938.3928	897.6736	832.5005	762.0590	672.3410	615.8957	608.9530 (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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251
util living area	0.9721	0.9535	0.9089	0.8137	0.6653	0.4940	0.3619	0.4061	0.6286	0.8647	0.9542	0.9767 (86)
Living	19.8029	20.0110	20.3358	20.6726	20.8884	20.9753	20.9949	20.9916	20.9335	20.6297	20.1415	19.7405
Non living	18.6624	18.9215	19.3183	19.7102	19.9379	20.0154	20.0285	20.0270	19.9848	19.6746	19.0889	18.5842
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.3876	20.0110	20.3358	20.6726	20.8884	20.9753	20.9949	20.9916	20.9335	20.6297	20.1415	19.9167 (87)
Th 2	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305 (88)
util rest of house												
	0.9658	0.9434	0.8900	0.7784	0.6111	0.4243	0.2836	0.3229	0.5550	0.8293	0.9425	0.9713 (89)
MIT 2	19.4851	18.9215	19.3183	19.7102	19.9379	20.0154	20.0285	20.0270	19.9848	19.6746	19.0889	18.8448 (90)
Living area fraction												
MIT	19.6548	19.1264	19.5097	19.8913	20.1167	20.1960	20.2103	20.2084	20.1632	19.8542	19.2869	19.0464 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6548	19.1264	19.5097	19.8913	20.1167	20.1960	20.2103	20.2084	20.1632	19.8542	19.2869	19.0464 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9629	0.9317	0.8781	0.7729	0.6162	0.4365	0.2983	0.3384	0.5656	0.8220	0.9311	0.9644 (94)
Useful gains	613.9728	667.9008	708.6396	693.6394	587.4123	409.5836	267.7379	281.7361	431.0154	552.6405	573.4627	587.2862 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	18.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1143.0699	1059.0665	968.4897	818.2289	626.5709	416.5861	268.7619	283.5138	451.3702	688.9174	907.2369	1105.2228 (97)
Space heating kWh	393.6482	262.8633	193.3285	89.7045	29.1341	0.0000	0.0000	0.0000	0.0000	101.3900	240.3174	385.3449 (98a)
Space heating requirement - total per year (kWh/year)												1695.7308
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	393.6482	262.8633	193.3285	89.7045	29.1341	0.0000	0.0000	0.0000	0.0000	101.3900	240.3174	385.3449 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1695.7308
Space heating per m2												(98c) / (4) =
												24.2330 (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 %)		249.4589 (206)
Efficiency of main space heating system 2 (in %)		0.0000 (207)
Efficiency of secondary/supplementary heating system, %		0.0000 (208)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	393.6482	262.8633	193.3285	89.7045	29.1341	0.0000	0.0000	0.0000	0.0000	101.3900	240.3174	385.3449	(98)
Space heating efficiency (main heating system 1)	249.4589	249.4589	249.4589	249.4589	249.4589	0.0000	0.0000	0.0000	0.0000	249.4589	249.4589	249.4589	(210)
Space heating fuel (main heating system)	157.8008	105.3734	77.4991	35.9596	11.6789	0.0000	0.0000	0.0000	0.0000	40.6440	96.3355	154.4723	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	247.2790	202.4594	173.1293	118.2493	82.5740	71.0954	68.8365	87.9570	121.5417	175.4332	218.9810	244.4947	(64)
Efficiency of water heater	268.5210	268.5210	268.5210	268.5210	268.5210	268.5210	268.5210	268.5210	268.5210	268.5210	268.5210	268.5210	(216)
Fuel for water heating, kWh/month	92.0893	75.3980	64.4751	44.0373	30.7514	26.4767	25.6354	32.7561	45.2634	65.3331	81.5508	91.0523	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
(221)m	8.9722	8.1039	8.9722	8.6828	8.9722	8.6828	8.9722	8.9722	8.6828	8.9722	8.6828	8.9722	(231)
Pumps and Fa	19.6672	15.7778	14.2061	10.4080	8.0395	6.5683	7.3339	9.5328	12.3822	16.2461	18.3500	20.2138	(232)
Lighting	-36.6497	-53.2831	-77.5330	-85.8626	-89.4859	-81.9008	-80.7581	-76.7963	-69.1014	-59.8655	-40.5157	-31.3919	(233a)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
(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	(235a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
(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	(235b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	-13.4368	-30.2969	-64.8132	-104.9094	-146.1969	-149.8129	-147.8934	-122.9777	-87.3617	-46.9804	-18.8941	-10.5219	(233b)
(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	(234b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
(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	(235b)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
(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	(235d)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
(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	(235d)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
(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	(235d)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												679.7636	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												268.5210	(216)
Water heating fuel used												674.8189	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 3.4840, total flow = 29.0000, SFP = 0.1201)													
mechanical ventilation fans (SFP = 0.1201)												25.6407	(230a)
pump for solar water heating												80.0000	(230g)
Total electricity for the above, kWh/year												105.6407	(231)
Electricity for lighting (calculated in Appendix L)												158.7258	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1727.2394	(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												-108.2904	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	679.7636	16.4900	112.0930	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	674.8189	16.4900	111.2776	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	25.6407	16.4900	4.2281	(249)
Pump for solar water heating	80.0000	16.4900	13.1920	(249)
Energy for lighting	158.7258	16.4900	26.1739	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-783.1440	16.4900	-129.1405	
PV Unit electricity exported	-944.0954	5.5900	-52.7749	
Total			-181.9154	(252)
Total energy cost			85.0493	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)		0.2663	(257)
SAP value	[(255) x (256)] / [(4) + 45.0] =	95.6833	
SAP rating (Section 12)		96	(258)
SAP band		A	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	679.7636	0.1565	106.3757	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	674.8189	0.1460	98.5500	(264)
Space and water heating			204.9257	(265)

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Pumps, fans and electric keep-hot	105.6407	0.1387	14.6537 (267)
Energy for lighting	158.7258	0.1443	22.9090 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-783.1440	0.1349	-105.6525
PV Unit electricity exported	-944.0954	0.1238	-116.9252
Total			-222.5777 (269)
Total CO2, kg/year			19.9107 (272)
CO2 emissions per m2			0.2800 (273)
EI value			99.7679
EI rating			100 (274)
EI band			A

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	34.9880 (1b)	x 2.4000 (2b)	= 83.9712 (1b) - (3b)
First floor	34.9880 (1c)	x 2.6000 (2c)	= 90.9688 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.9760		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	174.9400 (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)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1388 (21)

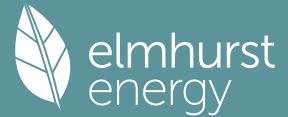
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.1457	0.1388	0.1388	0.1283	0.1283	0.1145	0.1179	0.1110	0.1145	0.1214	0.1214	0.1318 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
Solid Door			1.9550	1.0000	1.9600		(26)
Windows (Uw = 1.30)			12.2350	1.2357	15.1255		(27)
Flr - Ground			34.9880	0.1100	3.8487	75.0000	2624.1000 (28a)
Wl - 1	83.8050	14.1900	69.6150	0.1800	12.5307	60.0000	4176.9000 (29a)
Rf - Ins Joist	34.9880		34.9880	0.0900	3.1489	9.0000	314.8920 (30)
Total net area of external elements Aum(A, m2)			153.7910				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	36.6138			(33)
Party Wall			39.3650	0.0000	0.0000	110.0000	4330.1502 (32)
Stud			70.8384			9.0000	637.5456 (32c)
Stud			72.5868			9.0000	653.2812 (32c)
Internal Floor 1			34.9880			9.0000	314.8920 (32d)
Internal Ceiling 1			34.9880			9.0000	314.8920 (32e)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =	13366.6530			(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K				191.0177			(35)

Element	Length	Psi-value	Total
E1 Element	8.8530	0.2210	1.9565
E2 Other lintels (including other steel lintels)	6.3160	0.0240	0.1516
E3 Sill	24.8880	0.0190	0.4729
E4 Jamb	14.2240	0.0450	0.6401
E5 Ground floor (normal)	16.7610	0.0000	0.0000
E6 Intermediate floor within a dwelling	2.5370	0.0360	0.0913
E7 Party floor between dwellings (in blocks of flats)	16.7610	0.0510	0.8548
E10 Eaves (insulation at ceiling level)	10.0000	0.0370	0.3700
E16 Corner (normal)	10.0000	0.0310	0.3100
E18 Party wall between dwellings			

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P1 Party wall - Ground floor	7.8730	0.0430	0.3385									
P2 Party wall - Intermediate floor within a dwelling	7.8730	0.0000	0.0000									
P4 Party wall - Roof (insulation at ceiling level)	7.8730	0.4800	3.7790									
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				8.9648 (36)								
Point Thermal bridges			(36a) =	0.0000								
Total fabric heat loss		(33) + (36) + (36a) =		45.5785 (37)								
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651 (38)
Heat transfer coeff	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436 (39)
Average = Sum(39)m / 12 =												74.4436
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638 (40)
HLP (average)												1.0638
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2455 (42)
Hot water usage for mixer showers													
61.8700	60.9402	59.5853	56.9930	55.0800	52.9465	51.7339	53.0785	54.5525	56.8431	59.4911	61.6330	61.6330 (42a)	
Hot water usage for baths													
26.7294	26.3324	25.7734	24.7426	23.9709	23.1151	22.6528	23.2079	23.8123	24.7280	25.7800	26.6390	26.6390 (42b)	
Hot water usage for other uses													
37.6266	36.2584	34.8901	33.5219	32.1536	30.7854	30.7854	32.1536	33.5219	34.8901	36.2584	37.6266	37.6266 (42c)	
Average daily hot water use (litres/day)													116.0304 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	126.2259	123.5310	120.2488	115.2575	111.2044	106.8470	105.1721	108.4400	111.8866	116.4613	121.5295	125.8985	(44)
Energy content (annual)	199.9110	175.9064	184.8180	157.7818	149.7026	131.3808	127.1965	134.2714	137.9674	158.0369	173.1410	197.1267	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1927.2405	
29.9867	26.3860	27.7227	23.6673	22.4554	19.7071	19.0795	20.1407	20.6951	23.7055	25.9712	29.5690	(46)	
Water storage loss:													
Store volume													210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.4400 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.7776 (55)
Total storage loss													
24.1056	21.7728	24.1056	23.3280	24.1056	23.3280	24.1056	24.1056	23.3280	24.1056	23.3280	24.1056	(56)	
If cylinder contains dedicated solar storage													
24.1056	21.7728	24.1056	23.3280	24.1056	23.3280	24.1056	24.1056	23.3280	24.1056	23.3280	24.1056	(57)	
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
247.2790	218.6904	230.7902	196.8682	184.2762	164.6141	161.5376	169.5430	178.4045	204.0091	218.9810	244.4947	(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)
Aperture area of solar collector													3.0000 (H1)
Zero-loss collector efficiency													0.8000 (H2)
Collector linear heat loss coefficient													1.8000 (H3)
Collector 2nd order heat loss coefficient													0.0000 (H4)
Collector loop efficiency													0.9000 (H5)
Incidence angle modifier													1.0000 (H6)
Overshading factor													0.8000 (H8)
Overall heat loss coefficient of system													6.5000 (H10)
Heat loss coefficient of collector loop													3.9667 (H11)
Dedicated solar storage volume													75.0000 (H12)
Effective solar volume													75.0000 (H14)
Reference volume													225.0000 (H15)
Storage tank correction coefficient													1.3161 (H16)
Heat delivered to hot water													662.4314 (H24)
Heat delivered to space heating													0.0000 (H29)
Solar input													662.4314
Solar input	-0.0000	-17.5788	-58.6710	-82.8477	-103.6578	-102.5219	-100.3938	-91.5969	-65.2678	-35.3506	-4.5451	-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													
247.2790	201.1116	172.1192	114.0205	80.6185	62.0922	61.1437	77.9461	113.1368	168.6585	214.4359	244.4947	(64)	
Electric shower(s)										Total per year (kWh/year) = Sum(64)m =	1757.0567	(64)	
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)
Heat gains from water heating, kWh/month										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)	
104.3648	92.7161	98.2298	83.7316	77.4350	70.2707	69.7657	72.8625	78.2239	89.3251	94.2414	103.4390	(65)	

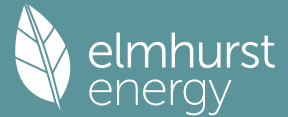
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.4693	19.9570	16.2301	12.2873	9.1849	7.7543	8.3787	10.8910	14.6179	18.5608	21.6632	23.0938 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	294.3896	297.4445	289.7463	273.3580	252.6706	233.2274	220.2382	217.1833	224.8815	241.2698	261.9572	281.4004 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188 (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)	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217 (71)
Water heating gains (Table 5)	140.2753	137.9704	132.0293	116.2938	104.0794	97.5983	93.7711	97.9335	108.6443	120.0606	130.8908	139.0309 (72)
Total internal gains	552.7638	551.0015	533.6354	497.5687	461.5645	434.2096	418.0176	421.6374	443.7732	475.5208	510.1408	539.1547 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
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	m2		Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W
North	0.6510		11.9814	0.4700	0.0000	0.7700	2.8228 (74)
East	5.0880		22.3313	0.4700	0.0000	0.7700	41.1197 (76)
West	6.4960		22.3313	0.4700	0.0000	0.7700	52.4987 (80)

Solar gains	96.4412	169.6326	275.8059	414.7141	495.7922	543.6206	511.7459	448.9396	347.7088	214.8499	123.1627	78.5650 (83)
Total gains	649.2051	720.6340	809.4413	912.2829	957.3567	977.8302	929.7636	870.5771	791.4820	690.3707	633.3035	617.7197 (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	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761
alpha	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251
util living area	0.9650	0.9455	0.8906	0.7700	0.5893	0.3770	0.2478	0.2729	0.5267	0.8177	0.9383	0.9704 (86)
Living	19.9301	20.1070	20.4402	20.7621	20.9397	20.9932	20.9992	20.9988	20.9715	20.7402	20.2828	19.8782
Non living	18.8225	19.0411	19.4441	19.8085	19.9858	20.0274	20.0303	20.0302	20.0143	19.7966	19.2630	18.7581
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.4527	20.1070	20.4402	20.7621	20.9397	20.9932	20.9992	20.9988	20.9715	20.7402	20.2828	20.0351 (87)
Th 2	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305 (88)
util rest of house	0.9569	0.9335	0.8676	0.7279	0.5277	0.3056	0.1705	0.1906	0.4460	0.7716	0.9223	0.9634 (89)
MIT 2	19.5489	19.0411	19.4441	19.8085	19.9858	20.0274	20.0303	20.0302	20.0143	19.7966	19.2630	18.9874 (90)
Living area fraction	19.7189	19.2416	19.6314	19.9879	20.1652	20.2090	20.2126	20.2124	fLA = Living area / (4) =	19.9741	19.4548	0.1881 (91)
MIT	19.7189	19.2416	19.6314	19.9879	20.1652	20.2090	20.2126	20.2124	20.1943	19.9741	19.4548	19.1845 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7189	19.2416	19.6314	19.9879	20.1652	20.2090	20.2126	20.2124	20.1943	19.9741	19.4548	19.1845 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9539	0.9215	0.8567	0.7259	0.5366	0.3188	0.1851	0.2061	0.4601	0.7686	0.9106	0.9557 (94)
Useful gains	619.2500	664.0677	693.4362	662.2655	513.7076	311.7811	172.0596	179.4328	364.1501	530.6167	576.6821	590.3393 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	1088.2832	1015.5316	910.5516	750.9804	533.4035	313.3355	172.1549	179.5873	371.7957	623.3982	852.7355	1048.4994 (97)
Space heating kWh	348.9607	236.1838	161.5339	63.8747	14.6537	0.0000	0.0000	0.0000	0.0000	69.0295	198.7584	340.8711 (98a)
Space heating requirement - total per year (kWh/year)												1433.8658
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	348.9607	236.1838	161.5339	63.8747	14.6537	0.0000	0.0000	0.0000	0.0000	69.0295	198.7584	340.8711 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1433.8658
Space heating per m2										(98c) / (4) =		20.4908 (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 %)												249.4589 (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	348.9607	236.1838	161.5339	63.8747	14.6537	0.0000	0.0000	0.0000	0.0000	69.0295	198.7584	340.8711 (98)
Space heating efficiency (main heating system 1)	249.4589	249.4589	249.4589	249.4589	249.4589	0.0000	0.0000	0.0000	0.0000	249.4589	249.4589	249.4589 (210)
Space heating fuel (main heating system)	139.8870	94.6784	64.7537	25.6053	5.8742	0.0000	0.0000	0.0000	0.0000	27.6717	79.6758	136.6442 (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	247.2790	201.1116	172.1192	114.0205	80.6185	62.0922	61.1437	77.9461	113.1368	168.6585	214.4359	244.4947 (64)
Efficiency of water heater												268.5210 (216)
(217)m	268.5210	268.5210	268.5210	268.5210	268.5210	268.5210	268.5210	268.5210	268.5210	268.5210	268.5210	268.5210 (217)
Fuel for water heating, kWh/month	92.0893	74.8960	64.0990	42.4624	30.0231	23.1238	22.7706	29.0279	42.1333	62.8102	79.8581	91.0523 (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	8.9722	8.1039	8.9722	8.6828	8.9722	8.6828	8.9722	8.9722	8.6828	8.9722	8.6828	8.9722 (231)
Lighting	19.6672	15.7778	14.2061	10.4080	8.0395	6.5683	7.3339	9.5328	12.3822	16.2461	18.3500	20.2138 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-40.0769	-53.3425	-76.6397	-85.9488	-88.5489	-83.9532	-82.4652	-79.3832	-71.9167	-62.1639	-44.8148	-34.0988 (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	-16.0699	-31.0459	-65.4811	-110.5056	-148.0483	-165.0551	-160.5639	-137.6432	-97.4732	-53.0689	-23.4330	-12.4191 (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)

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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	(235d)
Annual totals kWh/year												
Space heating fuel - main system 1											574.7904	(211)
Space heating fuel - main system 2											0.0000	(213)
Space heating fuel - secondary											0.0000	(215)
Efficiency of water heater											268.5210	
Water heating fuel used											654.3460	(219)
Space cooling fuel											0.0000	(221)

Electricity for pumps and fans:												
(MEVDecentralised, Database: total watage = 3.4840, total flow = 29.0000, SFP = 0.1201)												
mechanical ventilation fans (SFP = 0.1201)											25.6407	(230a)
pump for solar water heating											80.0000	(230g)
Total electricity for the above, kWh/year											105.6407	(231)
Electricity for lighting (calculated in Appendix L)											158.7258	(232)

Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation											-1824.1596	(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											-330.6568	(238)

10a. Fuel costs - using BEDF prices (552)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	574.7904	26.0600	149.7904 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	654.3460	26.0600	170.5226 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Pumps, fans and electric keep-hot	25.6407	26.0600	6.6820 (249)
Pump for solar water heating	80.0000	26.0600	20.8480 (249)
Energy for lighting	158.7258	26.0600	41.3639 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-803.3526	26.0600	-209.3537
PV Unit electricity exported	-1020.8070	5.8100	-59.3089
Total			-268.6626 (252)
Total energy cost			120.5443 (255)

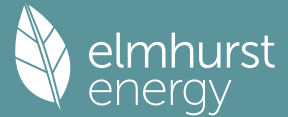
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	574.7904	0.1572	90.3618 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	654.3460	0.1467	95.9723 (264)
Space and water heating			186.3341 (265)
Pumps, fans and electric keep-hot	105.6407	0.1387	14.6537 (267)
Energy for lighting	158.7258	0.1443	22.9090 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-803.3526	0.1350	-108.4446
PV Unit electricity exported	-1020.8070	0.1235	-126.0340
Total			-234.4786 (269)
Total CO2, kg/year			-10.5817 (272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	574.7904	1.5820	909.2971 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	654.3460	1.5426	1009.3844 (278)
Space and water heating			1918.6814 (279)
Pumps, fans and electric keep-hot	105.6407	1.5128	159.8132 (281)
Energy for lighting	158.7258	1.5338	243.4590 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-803.3526	1.4989	-1204.1615
PV Unit electricity exported	-1020.8070	0.4530	-462.4452
Total			-1666.6067 (283)
Total Primary energy kWh/year			655.3469 (286)

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Property Reference	002 block F			Issued on Date	10/09/2024
Assessment Reference	002 block F ELEC, DWHP, PV	Prop Type Ref	002 block F		
Property	002 block F, 002 block F, 0				
SAP Rating	92 A	DER	0.77	TER	12.05
Environmental	100 A	% DER < TER			93.61
CO ₂ Emissions (t/year)	-0.03	DFEE	34.85	TFEE	37.22
Compliance Check	See BREL	% DFEE < TFEE			6.37
% DPER < TPER	56.79	DPER	27.22	TPER	63.00
Assessor Details	Mr. Scott Binstead			Assessor ID	U903-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	34.9880 (1b)	x 2.4000 (2b)	= 83.9712 (1b) - (3b)
First floor	34.9880 (1c)	x 2.6000 (2c)	= 90.9688 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.9760		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 174.9400 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1388 (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	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
Solid Door			1.9550	1.0000	1.9600		(26)
Windows (Uw = 1.30)			12.2350	1.2357	15.1255		(27)
Flr - Ground			34.9880	0.1100	3.8487	75.0000	2624.1000 (28a)
Wl - 1	83.8050	14.1900	69.6150	0.1800	12.5307	60.0000	4176.9000 (29a)
Rf - Ins Joist	34.9880		34.9880	0.0900	3.1489	9.0000	314.8920 (30)
Total net area of external elements Aum(A, m ²)			153.7910				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.6138		(33)
Party Wall			39.3650	0.0000	0.0000	110.0000	4330.1502 (32)
Stud			70.8384			9.0000	637.5456 (32c)
Stud			72.5868			9.0000	653.2812 (32c)
Internal Floor 1			34.9880			9.0000	314.8920 (32d)
Internal Ceiling 1			34.9880			9.0000	314.8920 (32e)
Heat capacity Cm = Sum (A x k)						(28)...(30) + (32) + (32a)...(32e) =	13366.6530 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							191.0177 (35)

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List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.8530	0.2210	1.9565
E3 Sill	6.3160	0.0240	0.1516
E4 Jamb	24.8880	0.0190	0.4729
E5 Ground floor (normal)	14.2240	0.0450	0.6401
E6 Intermediate floor within a dwelling	16.7610	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	2.5370	0.0360	0.0913
E10 Eaves (insulation at ceiling level)	16.7610	0.0510	0.8548
E16 Corner (normal)	10.0000	0.0370	0.3700
E18 Party wall between dwellings	10.0000	0.0310	0.3100
P1 Party wall - Ground floor	7.8730	0.0430	0.3385
P2 Party wall - Intermediate floor within a dwelling	7.8730	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	7.8730	0.4800	3.7790
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.9648 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	45.5785 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	(38)
Average = Sum(39)m / 12 =	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	(39)
HLP	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	(40)
HLP (average)												1.0638	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2455 (42)
Hot water usage for mixer showers	61.8700	60.9402	59.5853	56.9930	55.0800	52.9465	51.7339	53.0785	54.5525	56.8431	59.4911	61.6330	(42a)
Hot water usage for baths	26.7294	26.3324	25.7734	24.7426	23.9709	23.1151	22.6528	23.2079	23.8123	24.7280	25.7800	26.6390	(42b)
Hot water usage for other uses	37.6266	36.2584	34.8901	33.5219	32.1536	30.7854	30.7854	32.1536	33.5219	34.8901	36.2584	37.6266	(42c)
Average daily hot water use (litres/day)												116.0304	(43)
Daily hot water use	126.2259	123.5310	120.2488	115.2575	111.2044	106.8470	105.1721	108.4400	111.8866	116.4613	121.5295	125.8985	(44)
Energy conte	199.9110	175.9064	184.8180	157.7818	149.7026	131.3808	127.1965	134.2714	137.9674	158.0369	173.1410	197.1267	(45)
Energy content (annual)										Total = Sum(45)m =		1927.2405	
Distribution loss (46)m = 0.15 x (45)m	29.9867	26.3860	27.7227	23.6673	22.4554	19.7071	19.0795	20.1407	20.6951	23.7055	25.9712	29.5690	(46)
Water storage loss:													
Store volume												201.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(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	226.8624	200.2496	211.7694	183.8638	176.6540	157.4628	154.1479	161.2228	164.0494	184.9883	199.2230	224.0781	(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	226.8624	200.2496	211.7694	183.8638	176.6540	157.4628	154.1479	161.2228	164.0494	184.9883	199.2230	224.0781	(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	66.4704	58.4889	61.4520	52.4625	49.7761	43.6841	42.2928	44.6452	45.8742	52.5473	57.5694	65.5446	(65)

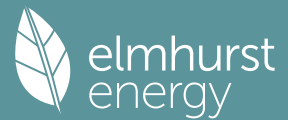
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.4693	19.9570	16.2301	12.2873	9.1849	7.7543	8.3787	10.8910	14.6179	18.5608	21.6632	23.0938	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	294.3896	297.4445	289.7463	273.3580	252.6706	233.2274	220.2382	217.1833	224.8815	241.2698	261.9572	281.4004	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	(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)	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	(71)
Water heating gains (Table 5)	89.3420	87.0370	82.5967	72.8645	66.9034	60.6724	56.8452	60.0071	63.7141	70.6280	79.9575	88.0976	(72)
Total internal gains	501.8305	500.0681	484.2029	454.1394	424.3885	397.2837	381.0918	383.7110	398.8431	426.0882	459.2074	488.2214	(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	0.6510	10.6334	0.4700	0.0000	0.7700	2.5052 (74)
East	5.0880	19.6403	0.4700	0.0000	0.7700	36.1645 (76)

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West				6.4960		19.6403		0.4700		0.0000		0.7700		46.1723 (80)	
Solar gains	84.8421	165.8560	273.3920	399.9284	491.7157	504.1832	479.6560	410.8630	318.2857	196.8202	105.7549	69.7983	(83)		
Total gains	586.6726	665.9241	757.5948	854.0678	916.1041	901.4669	860.7478	794.5741	717.1288	622.9084	564.9623	558.0197	(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	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	
alpha	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	
util living area	0.9791	0.9634	0.9240	0.8332	0.6848	0.5122	0.3769	0.4245	0.6585	0.8887	0.9655	0.9829	(86)
MIT	19.7158	19.9305	20.2714	20.6367	20.8752	20.9717	20.9940	20.9901	20.9205	20.5764	20.0604	19.6517	(87)
Th 2	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	(88)
util rest of house	0.9742	0.9552	0.9074	0.7997	0.6307	0.4406	0.2956	0.3380	0.5842	0.8573	0.9562	0.9788	(89)
MIT 2	18.5534	18.8224	19.2424	19.6718	19.9261	20.0131	20.0282	20.0263	19.9750	19.6165	18.9898	18.4726	(90)
Living area fraction	fLA = Living area / (4) =												
MIT	18.7720	19.0308	19.4360	19.8533	20.1046	20.1934	20.2098	20.2076	20.1528	19.7971	19.1912	18.6944	(92)
Temperature adjustment	0.0000												
adjusted MIT	18.7720	19.0308	19.4360	19.8533	20.1046	20.1934	20.2098	20.2076	20.1528	19.7971	19.1912	18.6944	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9658	0.9443	0.8952	0.7929	0.6351	0.4530	0.3108	0.3541	0.5942	0.8485	0.9458	0.9713	(94)
Useful gains	566.6004	628.8528	678.2171	677.2125	581.7830	408.3271	267.5232	281.3299	426.0867	528.5230	534.3374	541.9867	(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	1077.3512	1051.9505	962.9993	815.4004	625.6697	416.3938	268.7284	283.4508	450.5939	684.6643	900.1105	1079.0149	(97)
Space heating kWh	379.9986	284.3217	211.8780	99.4953	32.6517	0.0000	0.0000	0.0000	0.0000	116.1691	263.3567	399.5490	(98a)
Space heating requirement - total per year (kWh/year)	1787.4200												
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	379.9986	284.3217	211.8780	99.4953	32.6517	0.0000	0.0000	0.0000	0.0000	116.1691	263.3567	399.5490	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1787.4200												
Space heating per m2	(98c) / (4) =												25.5433 (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)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	379.9986	284.3217	211.8780	99.4953	32.6517	0.0000	0.0000	0.0000	0.0000	116.1691	263.3567	399.5490	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	379.9986	284.3217	211.8780	99.4953	32.6517	0.0000	0.0000	0.0000	0.0000	116.1691	263.3567	399.5490	(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)
Space heating fuel used, main system 2													0.0000 (213)
Water heating													
Water heating requirement	226.8624	200.2496	211.7694	183.8638	176.6540	157.4628	154.1479	161.2228	164.0494	184.9883	199.2230	224.0781	(64)
Efficiency of water heater	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	(216)
(217)m	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	(217)
Fuel for water heating, kWh/month	65.8724	58.1450	61.4899	53.3872	51.2937	45.7213	44.7588	46.8131	47.6338	53.7137	57.8469	65.0639	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	2.1777	1.9670	2.1777	2.1075	2.1777	2.1075	2.1777	2.1777	2.1075	2.1777	2.1075	2.1777	(231)
Lighting	19.6672	15.7778	14.2061	10.4080	8.0395	6.5683	7.3339	9.5328	12.3822	16.2461	18.3500	20.2138	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-46.9230	-73.5763	-114.1141	-126.3288	-124.9214	-107.5819	-105.7171	-100.3035	-88.3739	-81.1819	-52.8895	-39.4667	(233a)
(233a)m	-46.9230	-73.5763	-114.1141	-126.3288	-124.9214	-107.5819	-105.7171	-100.3035	-88.3739	-81.1819	-52.8895	-39.4667	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-16.4234	-42.0983	-107.1722	-201.8546	-305.3222	-324.9316	-317.1073	-253.0815	-165.8405	-73.5042	-24.2674	-12.1522	(233b)
(233b)m	-16.4234	-42.0983	-107.1722	-201.8546	-305.3222	-324.9316	-317.1073	-253.0815	-165.8405	-73.5042	-24.2674	-12.1522	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1													1787.4200 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)

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Efficiency of water heater	344.3970
Water heating fuel used	651.7395 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans: (MEVDecentralised, Database: total watage = 3.4840, total flow = 29.0000, SFP = 0.1201)	
mechanical ventilation fans (SFP = 0.1201)	25.6407 (230a)
Total electricity for the above, kWh/year	25.6407 (231)
Electricity for lighting (calculated in Appendix L)	158.7258 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2905.1336 (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	-281.6076 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1787.4200	16.4900	294.7456 (240)
Space heating - main system 2	0.0000	16.4900	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	651.7395	16.4900	107.4718 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	25.6407	16.4900	4.2281 (249)
Energy for lighting	158.7258	16.4900	26.1739 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1061.3781	16.4900	-175.0212
PV Unit electricity exported	-1843.7555	5.5900	-103.0659
Total			-278.0872 (252)
Total energy cost			154.5323 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	0.4839 (257)
SAP value	92.1567
SAP rating (Section 12)	92 (258)
SAP band	A

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1787.4200	0.1561	279.0788 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	651.7395	0.1412	92.0080 (264)
Space and water heating			371.0868 (265)
Pumps, fans and electric keep-hot	25.6407	0.1387	3.5567 (267)
Energy for lighting	158.7258	0.1443	22.9090 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1061.3781	0.1353	-143.5549
PV Unit electricity exported	-1843.7555	0.1206	-222.2775
Total			-365.8325 (269)
Total CO2, kg/year			31.7200 (272)
CO2 emissions per m2			0.4500 (273)
EI value			99.6303
EI rating			100 (274)
EI band			A

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	34.9880 (1b)	x 2.4000 (2b)	= 83.9712 (1b) - (3b)
First floor	34.9880 (1c)	x 2.6000 (2c)	= 90.9688 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	69.9760		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)... (3n) =	174.9400 (5)

2. Ventilation rate

Number of open chimneys	0 * 80 =	0.0000 (6a)
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energy

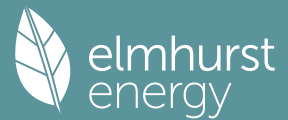
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			3.0000 (17)
Infiltration rate			0.1500 (18)
Number of sides sheltered			1 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1388 (21)

[illegible]

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
	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651 (38)
Heat transfer coeff	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436 (39)
Average = Sum(39)m / 12 =												74.4436
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638 (40)
HLP (average)												1.0638
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

SAP 10 Online 2.15.7 Page 5 of 15

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Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (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	226.8624	200.2496	211.7694	183.8638	176.6540	157.4628	154.1479	161.2228	164.0494	184.9883	199.2230	224.0781 (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	226.8624	200.2496	211.7694	183.8638	176.6540	157.4628	154.1479	161.2228	164.0494	184.9883	199.2230	224.0781 (64)
	Total per year (kWh/year) = Sum(64)m =											2244.5715 (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	66.4704	58.4889	61.4520	52.4625	49.7761	43.6841	42.2928	44.6452	45.8742	52.5473	57.5694	65.5446 (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	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.4693	19.9570	16.2301	12.2873	9.1849	7.7543	8.3787	10.8910	14.6179	18.5608	21.6632	23.0938	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	294.3896	297.4445	289.7463	273.3580	252.6706	233.2274	220.2382	217.1833	224.8815	241.2698	261.9572	281.4004	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	(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)	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	(71)
Water heating gains (Table 5)	89.3420	87.0370	82.5967	72.8645	66.9034	60.6724	56.8452	60.0071	63.7141	70.6280	79.9575	88.0976	(72)
Total internal gains	501.8305	500.0681	484.2029	454.1394	424.3885	397.2837	381.0918	383.7110	398.8431	426.0882	459.2074	488.2214	(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				0.6510	11.9814	0.4700	0.0000	0.7700	2.8228 (74)			
East				5.0880	22.3313	0.4700	0.0000	0.7700	41.1197 (76)			
West				6.4960	22.3313	0.4700	0.0000	0.7700	52.4987 (80)			
Solar gains	96.4412	169.6326	275.8059	414.7141	495.7922	543.6206	511.7459	448.9396	347.7088	214.8499	123.1627	78.5650 (83)
Total gains	598.2717	669.7007	760.0087	868.8535	920.1807	940.9043	892.8377	832.6507	746.5519	640.9382	582.3702	566.7864 (84)

7. Mean internal temperature (heating season)

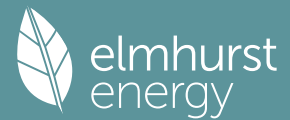
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761
alpha	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251
util living area	0.9734	0.9569	0.9079	0.7913	0.6086	0.3912	0.2579	0.2852	0.5542	0.8460	0.9526	0.9780 (86)
MIT	19.8455	20.0291	20.3808	20.7334	20.9318	20.9921	20.9991	20.9985	20.9654	20.6976	20.2069	19.7916 (87)
Th 2	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305 (88)
util rest of house	0.9671	0.9469	0.8874	0.7507	0.5463	0.3173	0.1776	0.1993	0.4709	0.8036	0.9395	0.9726 (89)
MIT 2	18.7174	18.9461	19.3754	19.7793	19.9795	20.0269	20.0303	20.0302	20.0106	19.7531	19.1719	18.6501 (90)
Living area fraction	18.9296	19.1498	19.5646	19.9588	20.1586	20.2084	20.2125	20.2123	20.1902	FLA = Living area / (4) =		0.1881 (91)
MIT	18.9296	19.1498	19.5646	19.9588	20.1586	20.2084	20.2125	20.2123	20.1902	19.9308	19.3666	18.8648 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9296	19.1498	19.5646	19.9588	20.1586	20.2084	20.2125	20.2123	20.1902	19.9308	19.3666	18.8648 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9576	0.9356	0.8758	0.7474	0.5549	0.3311	0.1927	0.2155	0.4851	0.7986	0.9282	0.9640	(94)
Ext temp.	572.9073	626.5480	665.6411	649.3823	510.5692	311.4888	172.0388	179.3958	362.1388	511.8504	540.5772	546.3575	(95)
Heat loss rate W	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Space heating kWh	1029.5271	1008.6974	905.5740	748.8131	532.9142	313.2905	172.1513	179.5809	371.4858	620.1731	846.1708	1024.7042	(97)
Space heating requirement - total per year (kWh/year)	339.7251	256.8044	178.5101	71.5902	16.6247	0.0000	0.0000	0.0000	0.0000	80.5920	220.0274	355.8900	(98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)	339.7251	256.8044	178.5101	71.5902	16.6247	0.0000	0.0000	0.0000	0.0000	80.5920	220.0274	355.8900	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1519.7639	(99)
Space heating per m ²	(98c) / (4) =											21.7184	(99)

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

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Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	339.7251	256.8044	178.5101	71.5902	16.6247	0.0000	0.0000	0.0000	0.0000	80.5920	220.0274	355.8900	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	339.7251	256.8044	178.5101	71.5902	16.6247	0.0000	0.0000	0.0000	0.0000	80.5920	220.0274	355.8900	(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)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	226.8624	200.2496	211.7694	183.8638	176.6540	157.4628	154.1479	161.2228	164.0494	184.9883	199.2230	224.0781	(64)
Efficiency of water heater (217)m	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	(216)
Fuel for water heating, kWh/month	65.8724	58.1450	61.4899	53.3872	51.2937	45.7213	44.7588	46.8131	47.6338	53.7137	57.8469	65.0639	(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	2.1777	1.9670	2.1777	2.1075	2.1777	2.1075	2.1777	2.1777	2.1075	2.1777	2.1075	2.1777	(231)
Lighting	19.6672	15.7778	14.2061	10.4080	8.0395	6.5683	7.3339	9.5328	12.3822	16.2461	18.3500	20.2138	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-52.1010	-74.4565	-112.7683	-124.2033	-121.1865	-109.9858	-107.8104	-103.6095	-92.2483	-83.5759	-59.0703	-43.5706	(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	-20.4833	-44.8242	-112.2534	-218.5171	-315.2010	-358.8322	-345.8242	-285.0799	-187.6013	-86.6653	-31.5155	-14.9912	(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												1519.7639	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												344.3970	
Water heating fuel used												651.7395	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.4840, total flow = 29.0000, SFP = 0.1201)													
mechanical ventilation fans (SFP = 0.1201)												25.6407	(230a)
Total electricity for the above, kWh/year												25.6407	(231)
Electricity for lighting (calculated in Appendix L)												158.7258	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3106.3749	(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												-750.5050	(238)

10a. Fuel costs - using BEDF prices (552)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1519.7639	26.0600	396.0505 (240)
Space heating - main system 2	0.0000	26.0600	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	651.7395	26.0600	169.8433 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Pumps, fans and electric keep-hot	25.6407	26.0600	6.6820 (249)
Energy for lighting	158.7258	26.0600	41.3639 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1084.5863	26.0600	-282.6432
PV Unit electricity exported	-2021.7886	5.8100	-117.4659
Total			-400.1091 (252)
Total energy cost			213.8306 (255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1519.7639	0.1569	238.4025 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	651.7395	0.1412	92.0080 (264)
Space and water heating			330.4105 (265)
Pumps, fans and electric keep-hot	25.6407	0.1387	3.5567 (267)
Energy for lighting	158.7258	0.1443	22.9090 (268)

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Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1084.5863	0.1354	-146.8285
PV Unit electricity exported	-2021.7886	0.1204	-243.5095
Total			-390.3380 (269)
Total CO2, kg/year			-33.4618 (272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1519.7639	1.5807	2402.3474 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	651.7395	1.5220	991.9605 (278)
Space and water heating			3394.3079 (279)
Pumps, fans and electric keep-hot	25.6407	1.5128	38.7892 (281)
Energy for lighting	158.7258	1.5338	243.4590 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1084.5863	1.5004	-1627.3181
PV Unit electricity exported	-2021.7886	0.4418	-893.1870
Total			-2520.5051 (283)
Total Primary energy kWh/year			1156.0510 (286)

SAP 10 EPC IMPROVEMENTS

002 block F ELEC, DWHP, PV

Current energy efficiency rating: A 92
Current environmental impact rating: A 100

N Solar water heating SAP increase too small
U Solar photovoltaic panels Already installed
V2 Wind turbine Not applicable

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

Measures omitted - SAP change or cost saving too small:			
N Solar water heating	+ 0.6	-£ 21	-13 kg (38.0%)

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

Potential energy efficiency rating: A 92
Potential environmental impact rating: A 100

Fuel prices for cost data on this page from database revision number 552 TEST (30 Aug 2024)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current £614	Potential £614	Saving £0
Electricity			
Space heating	£403	£403	£0
Water heating	£170	£170	£0
Lighting	£41	£41	£0
Generated (PV)	-£400	-£400	£0
Total cost of fuels	£214	£214	£0
Total cost of uses	£214	£214	£0
Delivered energy	-11 kWh/m²	-11 kWh/m²	0 kWh/m²
Carbon dioxide emissions	-0.0 tonnes	-0.0 tonnes	0.0 tonnes
CO2 emissions per m²	-0 kg/m²	-0 kg/m²	0 kg/m²
Primary energy	17 kWh/m²	17 kWh/m²	0 kWh/m²

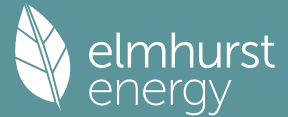
SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	34.9880 (1b)	x 2.4000 (2b)	= 83.9712 (1b) - (3b)
First floor	34.9880 (1c)	x 2.6000 (2c)	= 90.9688 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.9760		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 174.9400 (5)

2. Ventilation rate

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												m3 per hour	
Number of open chimneys												0 * 80 =	0.0000 (6a)
Number of open flues												0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire												0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler												0 * 20 =	0.0000 (6d)
Number of flues attached to other heater												0 * 35 =	0.0000 (6e)
Number of blocked chimneys												0 * 20 =	0.0000 (6f)
Number of intermittent extract fans												0 * 10 =	0.0000 (7a)
Number of passive vents												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												Yes	
Pressure Test Method												Blower Door	
Measured/design AP50												3.0000	(17)
Infiltration rate												0.1500	(18)
Number of sides sheltered												1	(19)
Shelter factor												(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) =	0.1388 (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	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation													0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

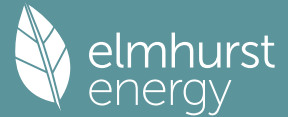
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Solid Door			1.9550	1.0000	1.9600			(26)
Windows (Uw = 1.30)			12.2350	1.2357	15.1255			(27)
Flr - Ground			34.9880	0.1100	3.8487	75.0000	2624.1000	(28a)
Wl - 1	83.8050	14.1900	69.6150	0.1800	12.5307	60.0000	4176.9000	(29a)
Rf - Ins Joist	34.9880		34.9880	0.0900	3.1489	9.0000	314.8920	(30)
Total net area of external elements Aum(A, m2)			153.7910					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.6138			(33)
Party Wall			39.3650	0.0000	0.0000	110.0000	4330.1502	(32)
Stud			70.8384			9.0000	637.5456	(32c)
Stud			72.5868			9.0000	653.2812	(32c)
Internal Floor 1			34.9880			9.0000	314.8920	(32d)
Internal Ceiling 1			34.9880			9.0000	314.8920	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =	13366.6530		(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K						191.0177		(35)
List of Thermal Bridges								
K1 Element					Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)					8.8530	0.2210	1.9565	
E3 Sill					6.3160	0.0240	0.1516	
E4 Jamb					24.8880	0.0190	0.4729	
E5 Ground floor (normal)					14.2240	0.0450	0.6401	
E6 Intermediate floor within a dwelling					16.7610	0.0000	0.0000	
E7 Party floor between dwellings (in blocks of flats)					2.5370	0.0360	0.0913	
E10 Eaves (insulation at ceiling level)					16.7610	0.0510	0.8548	
E16 Corner (normal)					10.0000	0.0370	0.3700	
E18 Party wall between dwellings					10.0000	0.0310	0.3100	
P1 Party wall - Ground floor					7.8730	0.0430	0.3385	
P2 Party wall - Intermediate floor within a dwelling					7.8730	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)					7.8730	0.4800	3.7790	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.9648	(36)
Point Thermal bridges							0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		45.5785	(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
	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651 (38)
Heat transfer coeff	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436 (39)
Average = Sum(39)m / 12 =												74.4436
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2455	(42)
Hot water usage for mixer showers													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	61.8700	60.9402	59.5853	56.9930	55.0800	52.9465	51.7339	53.0785	54.5525	56.8431	59.4911	61.6330	(42a)
Hot water usage for baths													
	26.7294	26.3324	25.7734	24.7426	23.9709	23.1151	22.6528	23.2079	23.8123	24.7280	25.7800	26.6390	(42b)
Hot water usage for other uses													
	37.6266	36.2584	34.8901	33.5219	32.1536	30.7854	30.7854	32.1536	33.5219	34.8901	36.2584	37.6266	(42c)
Average daily hot water use (litres/day)												116.0304	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	126.2259	123.5310	120.2488	115.2575	111.2044	106.8470	105.1721	108.4400	111.8866	116.4613	121.5295	125.8985	(44)
Energy conte	199.9110	175.9064	184.8180	157.7818	149.7026	131.3808	127.1965	134.2714	137.9674	158.0369	173.1410	197.1267	(45)
Energy content (annual)												Total = Sum(45)m =	1927.2405
Distribution loss (46)m = 0.15 x (45)m													
	29.9867	26.3860	27.7227	23.6673	22.4554	19.7071	19.0795	20.1407	20.6951	23.7055	25.9712	29.5690	(46)
Water storage loss:													
Store volume												201.0000	(47)

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a) If manufacturer declared loss factor is known (kWh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8694 (55)
Total storage loss												
26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage												
26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month												
226.8624	200.2496	211.7694	183.8638	176.6540	157.4628	154.1479	161.2228	164.0494	184.9883	199.2230	224.0781	(62)
WWHRS	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	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
226.8624	200.2496	211.7694	183.8638	176.6540	157.4628	154.1479	161.2228	164.0494	184.9883	199.2230	224.0781	(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												
66.4704	58.4889	61.4520	52.4625	49.7761	43.6841	42.2928	44.6452	45.8742	52.5473	57.5694	65.5446	(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
134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
22.4693	19.9570	16.2301	12.2873	9.1849	7.7543	8.3787	10.8910	14.6179	18.5608	21.6632	23.0938	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
294.3896	297.4445	289.7463	273.3580	252.6706	233.2274	220.2382	217.1833	224.8815	241.2698	261.9572	281.4004	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	(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)												
-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	(71)
Water heating gains (Table 5)												
89.3420	87.0370	82.5967	72.8645	66.9034	60.6724	56.8452	60.0071	63.7141	70.6280	79.9575	88.0976	(72)
Total internal gains												
501.8305	500.0681	484.2029	454.1394	424.3885	397.2837	381.0918	383.7110	398.8431	426.0882	459.2074	488.2214	(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					0.6510	10.6334	0.4700	0.0000	0.7700	2.5052 (74)		
East					5.0880	19.6403	0.4700	0.0000	0.7700	36.1645 (76)		
West					6.4960	19.6403	0.4700	0.0000	0.7700	46.1723 (80)		
Solar gains	84.8421	165.8560	273.3920	399.9284	491.7157	504.1832	479.6560	410.8630	318.2857	196.8202	105.7549	69.7983 (83)
Total gains	586.6726	665.9241	757.5948	854.0678	916.1041	901.4669	860.7478	794.5741	717.1288	622.9084	564.9623	558.0197 (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	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761
alpha	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251
util living area	0.9791	0.9634	0.9240	0.8332	0.6848	0.5122	0.3769	0.4245	0.6585	0.8887	0.9655	0.9829 (86)
MIT	19.7158	19.9305	20.2714	20.6367	20.8752	20.9717	20.9940	20.9901	20.9205	20.5764	20.0604	19.6517 (87)
Th 2	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305 (88)
util rest of house	0.9742	0.9552	0.9074	0.7997	0.6307	0.4406	0.2956	0.3380	0.5842	0.8573	0.9562	0.9788 (89)
MIT 2	18.5534	18.8224	19.2424	19.6718	19.9261	20.0131	20.0282	20.0263	19.9750	19.6165	18.9898	18.4726 (90)
Living area fraction									fLA = Living area / (4) =			0.1881 (91)
MIT	18.7720	19.0308	19.4360	19.8533	20.1046	20.1934	20.2098	20.2076	20.1528	19.7971	19.1912	18.6944 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7720	19.0308	19.4360	19.8533	20.1046	20.1934	20.2098	20.2076	20.1528	19.7971	19.1912	18.6944 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9658	0.9443	0.8952	0.7929	0.6351	0.4530	0.3108	0.3541	0.5942	0.8485	0.9458	0.9713	(94)
Useful gains	566.6004	628.8528	678.2171	677.2125	581.7830	408.3271	267.5232	281.3299	426.0867	528.5230	534.3374	541.9867	(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	1077.3512	1051.9505	962.9993	815.4004	625.6697	416.3938	268.7284	283.4508	450.5939	684.6643	900.1105	1079.0149	(97)
Space heating kWh	379.9986	284.3217	211.8780	99.4953	32.6517	0.0000	0.0000	0.0000	0.0000	116.1691	263.3567	399.5490	(98a)
Space heating requirement - total per year (kWh/year)												1787.4200	
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	379.9986	284.3217	211.8780	99.4953	32.6517	0.0000	0.0000	0.0000	0.0000	116.1691	263.3567	399.5490	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1787.4200	
Space heating per m2												(98c) / (4) =	25.5433 (99)

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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)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	379.9986	284.3217	211.8780	99.4953	32.6517	0.0000	0.0000	0.0000	0.0000	116.1691	263.3567	399.5490	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	379.9986	284.3217	211.8780	99.4953	32.6517	0.0000	0.0000	0.0000	0.0000	116.1691	263.3567	399.5490	(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)
Space heating fuel used, main system 2													0.0000 (213)
Water heating													
Water heating requirement	226.8624	200.2496	211.7694	183.8638	176.6540	157.4628	154.1479	161.2228	164.0494	184.9883	199.2230	224.0781	(64)
Efficiency of water heater	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	(216)
(217)m	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	(217)
Fuel for water heating, kWh/month	65.8724	58.1450	61.4899	53.3872	51.2937	45.7213	44.7588	46.8131	47.6338	53.7137	57.8469	65.0639	(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	2.1777	1.9670	2.1777	2.1075	2.1777	2.1075	2.1777	2.1777	2.1075	2.1777	2.1075	2.1777	(231)
Lighting	19.6672	15.7778	14.2061	10.4080	8.0395	6.5683	7.3339	9.5328	12.3822	16.2461	18.3500	20.2138	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-46.9230	-73.5763	-114.1141	-126.3288	-124.9214	-107.5819	-105.7171	-100.3035	-88.3739	-81.1819	-52.8895	-39.4667	(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	-16.4234	-42.0983	-107.1722	-201.8546	-305.3222	-324.9316	-317.1073	-253.0815	-165.8405	-73.5042	-24.2674	-12.1522	(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													1787.4200 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													344.3970
Water heating fuel used													651.7395 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 3.4840, total flow = 29.0000, SFP = 0.1201)													
mechanical ventilation fans (SFP = 0.1201)													25.6407 (230a)
Total electricity for the above, kWh/year													25.6407 (231)
Electricity for lighting (calculated in Appendix L)													158.7258 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-2905.1336 (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													-281.6076 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1787.4200	16.4900	294.7456	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	651.7395	16.4900	107.4718	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	25.6407	16.4900	4.2281	(249)
Energy for lighting	158.7258	16.4900	26.1739	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1061.3781	16.4900	-175.0212	
PV Unit electricity exported	-1843.7555	5.5900	-103.0659	
Total			-278.0872	(252)
Total energy cost			154.5323	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)		0.4839	(257)
SAP value		92.1567	
SAP rating (Section 12)		92	(258)
SAP band		A	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1787.4200	0.1561	279.0788 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	651.7395	0.1412	92.0080 (264)
Space and water heating			371.0868 (265)
Pumps, fans and electric keep-hot	25.6407	0.1387	3.5567 (267)
Energy for lighting	158.7258	0.1443	22.9090 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1061.3781	0.1353	-143.5549
PV Unit electricity exported	-1843.7555	0.1206	-222.2775
Total			-365.8325 (269)
Total CO2, kg/year			31.7200 (272)
CO2 emissions per m2			0.4500 (273)
EI value			99.6303
EI rating			100 (274)
EI band			A

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	34.9880 (1b)	x 2.4000 (2b)	= 83.9712 (1b) - (3b)
First floor	34.9880 (1c)	x 2.6000 (2c)	= 90.9688 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.9760		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	174.9400 (5)

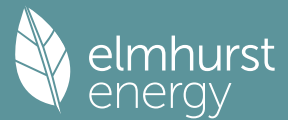
2. Ventilation rate

		m3 per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1388 (21)
Wind speed	Jan 4.2000 Feb 4.0000 Mar 4.0000 Apr 3.7000 May 3.7000 Jun 3.3000 Jul 3.4000 Aug 3.2000 Sep 3.3000 Oct 3.5000 Nov 3.5000 Dec 3.8000	(22)
Wind factor	1.0500 1.0000 1.0000 0.9250 0.9250 0.8250 0.8500 0.8000 0.8250 0.8750 0.8750 0.9500	(22a)
Adj infilt rate	0.1457 0.1388 0.1388 0.1283 0.1283 0.1145 0.1179 0.1110 0.1145 0.1214 0.1214 0.1318	(22b)
Mechanical extract ventilation - decentralised		
If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
Effective ac	0.5000 0.5000 0.5000 0.5000 0.5000 0.5000 0.5000 0.5000 0.5000 0.5000 0.5000 0.5000	(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
Solid Door			1.9550	1.0000	1.9600		(26)
Windows (Uw = 1.30)			12.2350	1.2357	15.1255		(27)
Flr - Ground			34.9880	0.1100	3.8487	75.0000	2624.1000 (28a)
Wl - 1	83.8050	14.1900	69.6150	0.1800	12.5307	60.0000	4176.9000 (29a)
Rf - Ins Joist	34.9880		34.9880	0.0900	3.1489	9.0000	314.8920 (30)
Total net area of external elements Aum(A, m2)			153.7910				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.6138		(33)
Party Wall			39.3650	0.0000	0.0000	110.0000	4330.1502 (32)
Stud			70.8384			9.0000	637.5456 (32c)
Stud			72.5868			9.0000	653.2812 (32c)
Internal Floor 1			34.9880			9.0000	314.8920 (32d)
Internal Ceiling 1			34.9880			9.0000	314.8920 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13366.6530 (34)

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

191.0177 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	8.8530	0.2210	1.9565
E2 Other lintels (including other steel lintels)	6.3160	0.0240	0.1516
E3 Sill	24.8880	0.0190	0.4729
E4 Jamb	14.2240	0.0450	0.6401
E5 Ground floor (normal)	16.7610	0.0000	0.0000
E6 Intermediate floor within a dwelling	2.5370	0.0360	0.0913
E7 Party floor between dwellings (in blocks of flats)	16.7610	0.0510	0.8548
E10 Eaves (insulation at ceiling level)	10.0000	0.0370	0.3700
E16 Corner (normal)	10.0000	0.0310	0.3100
E18 Party wall between dwellings	7.8730	0.0430	0.3385
P1 Party wall - Ground floor	7.8730	0.0000	0.0000
P2 Party wall - Intermediate floor within a dwelling	7.8730	0.4800	3.7790
P4 Party wall - Roof (insulation at ceiling level)			

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

Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	45.5785 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	(38)
Heat transfer coeff	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	(39)
Average = Sum(39)m / 12 =													74.4436

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	(40)
HLP (average)													1.0638
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2455 (42)
Hot water usage for mixer showers	61.8700	60.9402	59.5853	56.9930	55.0800	52.9465	51.7339	53.0785	54.5525	56.8431	59.4911	61.6330	(42a)
Hot water usage for baths	26.7294	26.3324	25.7734	24.7426	23.9709	23.1151	22.6528	23.2079	23.8123	24.7280	25.7800	26.6390	(42b)
Hot water usage for other uses	37.6266	36.2584	34.8901	33.5219	32.1536	30.7854	30.7854	32.1536	33.5219	34.8901	36.2584	37.6266	(42c)
Average daily hot water use (litres/day)													116.0304 (43)
Daily hot water use	126.2259	123.5310	120.2488	115.2575	111.2044	106.8470	105.1721	108.4400	111.8866	116.4613	121.5295	125.8985	(44)
Energy conte	199.9110	175.9064	184.8180	157.7818	149.7026	131.3808	127.1965	134.2714	137.9674	158.0369	173.1410	197.1267	(45)
Energy content (annual)										Total = Sum(45)m =			1927.2405
Distribution loss (46)m = 0.15 x (45)m	29.9867	26.3860	27.7227	23.6673	22.4554	19.7071	19.0795	20.1407	20.6951	23.7055	25.9712	29.5690	(46)
Water storage loss:													
Store volume													201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6100 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8694 (55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(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	226.8624	200.2496	211.7694	183.8638	176.6540	157.4628	154.1479	161.2228	164.0494	184.9883	199.2230	224.0781	(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	226.8624	200.2496	211.7694	183.8638	176.6540	157.4628	154.1479	161.2228	164.0494	184.9883	199.2230	224.0781	(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	66.4704	58.4889	61.4520	52.4625	49.7761	43.6841	42.2928	44.6452	45.8742	52.5473	57.5694	65.5446	(65)

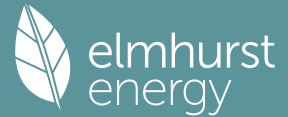
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.4693	19.9570	16.2301	12.2873	9.1849	7.7543	8.3787	10.8910	14.6179	18.5608	21.6632	23.0938	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	294.3896	297.4445	289.7463	273.3580	252.6706	233.2274	220.2382	217.1833	224.8815	241.2698	261.9572	281.4004	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	(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)	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	(71)
Water heating gains (Table 5)	89.3420	87.0370	82.5967	72.8645	66.9034	60.6724	56.8452	60.0071	63.7141	70.6280	79.9575	88.0976	(72)
Total internal gains	501.8305	500.0681	484.2029	454.1394	424.3885	397.2837	381.0918	383.7110	398.8431	426.0882	459.2074	488.2214	(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	0.6510	11.9814	0.4700	0.0000	0.7700	2.8228 (74)

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East	5.0880	22.3313	0.4700	0.0000	0.7700	41.1197 (76)
West	6.4960	22.3313	0.4700	0.0000	0.7700	52.4987 (80)

Solar gains	96.4412	169.6326	275.8059	414.7141	495.7922	543.6206	511.7459	448.9396	347.7088	214.8499	123.1627	78.5650 (83)
Total gains	598.2717	669.7007	760.0087	868.8535	920.1807	940.9043	892.8377	832.6507	746.5519	640.9382	582.3702	566.7864 (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	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761
alpha	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251
util living area	0.9734	0.9569	0.9079	0.7913	0.6086	0.3912	0.2579	0.2852	0.5542	0.8460	0.9526	0.9780 (86)
MIT	19.8455	20.0291	20.3808	20.7334	20.9318	20.9921	20.9991	20.9985	20.9654	20.6976	20.2069	19.7916 (87)
Th 2	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305 (88)
util rest of house	0.9671	0.9469	0.8874	0.7507	0.5463	0.3173	0.1776	0.1993	0.4709	0.8036	0.9395	0.9726 (89)
MIT 2	18.7174	18.9461	19.3754	19.7793	19.9795	20.0269	20.0303	20.0302	20.0106	19.7531	19.1719	18.6501 (90)
Living area fraction									fLA = Living area / (4) =			0.1881 (91)
MIT	18.9296	19.1498	19.5646	19.9588	20.1586	20.2084	20.2125	20.2123	20.1902	19.9308	19.3666	18.8648 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9296	19.1498	19.5646	19.9588	20.1586	20.2084	20.2125	20.2123	20.1902	19.9308	19.3666	18.8648 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9576	0.9356	0.8758	0.7474	0.5549	0.3311	0.1927	0.2155	0.4851	0.7986	0.9282	0.9640 (94)
Useful gains	572.9073	626.5480	665.6411	649.3823	510.5692	311.4888	172.0388	179.3958	362.1388	511.8504	540.5772	546.3575 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	1029.5271	1008.6974	905.5740	748.8131	532.9142	313.2905	172.1513	179.5809	371.4858	620.1731	846.1708	1024.7042 (97)
Space heating kWh	339.7251	256.8044	178.5101	71.5902	16.6247	0.0000	0.0000	0.0000	0.0000	80.5920	220.0274	355.8900 (98a)
Space heating requirement - total per year (kWh/year)												1519.7639
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	339.7251	256.8044	178.5101	71.5902	16.6247	0.0000	0.0000	0.0000	0.0000	80.5920	220.0274	355.8900 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1519.7639
Space heating per m2										(98c) / (4) =		21.7184 (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)
Fraction of main heating from main system 2												0.0000 (203)
Fraction of total heating from main system 1												1.0000 (204)
Fraction of total heating from main system 2												0.0000 (205)
Efficiency of main space heating system 1 (in %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	339.7251	256.8044	178.5101	71.5902	16.6247	0.0000	0.0000	0.0000	0.0000	80.5920	220.0274	355.8900 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	339.7251	256.8044	178.5101	71.5902	16.6247	0.0000	0.0000	0.0000	0.0000	80.5920	220.0274	355.8900 (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)
Space heating fuel used, main 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)
Water heating												
Water heating requirement	226.8624	200.2496	211.7694	183.8638	176.6540	157.4628	154.1479	161.2228	164.0494	184.9883	199.2230	224.0781 (64)
Efficiency of water heater (217)m	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970 (216)
Fuel for water heating, kWh/month	65.8724	58.1450	61.4899	53.3872	51.2937	45.7213	44.7588	46.8131	47.6338	53.7137	57.8469	65.0639 (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	2.1777	1.9670	2.1777	2.1075	2.1777	2.1075	2.1777	2.1777	2.1075	2.1777	2.1075	2.1777 (231)
Lighting	19.6672	15.7778	14.2061	10.4080	8.0395	6.5683	7.3339	9.5328	12.3822	16.2461	18.3500	20.2138 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-52.1010	-74.4565	-112.7683	-124.2033	-121.1865	-109.9858	-107.8104	-103.6095	-92.2483	-83.5759	-59.0703	-43.5706 (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	-20.4833	-44.8242	-112.2534	-218.5171	-315.2010	-358.8322	-345.8242	-285.0799	-187.6013	-86.6653	-31.5155	-14.9912 (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												1519.7639 (211)
Space heating fuel - main system 2												0.0000 (213)

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Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	344.3970
Water heating fuel used	651.7395 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans: (MEVDecentralised, Database: total watage = 3.4840, total flow = 29.0000, SFP = 0.1201)	
mechanical ventilation fans (SFP = 0.1201)	25.6407 (230a)
Total electricity for the above, kWh/year	25.6407 (231)
Electricity for lighting (calculated in Appendix L)	158.7258 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-3106.3749 (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	-750.5050 (238)

10a. Fuel costs - using BEDF prices (552)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1519.7639	26.0600	396.0505 (240)
Space heating - main system 2	0.0000	26.0600	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	651.7395	26.0600	169.8433 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Pumps, fans and electric keep-hot	25.6407	26.0600	6.6820 (249)
Energy for lighting	158.7258	26.0600	41.3639 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1084.5863	26.0600	-282.6432
PV Unit electricity exported	-2021.7886	5.8100	-117.4659
Total			-400.1091 (252)
Total energy cost			213.8306 (255)

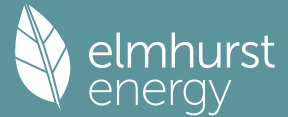
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1519.7639	0.1569	238.4025 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	651.7395	0.1412	92.0080 (264)
Space and water heating			330.4105 (265)
Pumps, fans and electric keep-hot	25.6407	0.1387	3.5567 (267)
Energy for lighting	158.7258	0.1443	22.9090 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1084.5863	0.1354	-146.8285
PV Unit electricity exported	-2021.7886	0.1204	-243.5095
Total			-390.3380 (269)
Total CO2, kg/year			-33.4618 (272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1519.7639	1.5807	2402.3474 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	651.7395	1.5220	991.9605 (278)
Space and water heating			3394.3079 (279)
Pumps, fans and electric keep-hot	25.6407	1.5128	38.7892 (281)
Energy for lighting	158.7258	1.5338	243.4590 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1084.5863	1.5004	-1627.3181
PV Unit electricity exported	-2021.7886	0.4418	-893.1870
Total			-2520.5051 (283)
Total Primary energy kWh/year			1156.0510 (286)

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Property Reference	002 block F				Issued on Date	10/09/2024
Assessment Reference	002 block F ELEC, DWHP	Prop Type Ref	002 block F			
Property	002 block F, 002 block F, 0					
SAP Rating	78 C	DER	6.00	TER	12.05	
Environmental	95 A	% DER < TER				50.21
CO ₂ Emissions (t/year)	0.36	DFEE	34.85	TFEE	37.22	
Compliance Check	See BREL	% DFEE < TFEE				6.37
% DPER < TPER	2.06	DPER	61.70	TPER	63.00	
Assessor Details	Mr. Scott Binstead				Assessor ID	U903-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	34.9880 (1b)	x 2.4000 (2b)	= 83.9712 (1b) - (3b)
First floor	34.9880 (1c)	x 2.6000 (2c)	= 90.9688 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.9760		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 174.9400 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1388 (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	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
Solid Door			1.9550	1.0000	1.9600		(26)
Windows (Uw = 1.30)			12.2350	1.2357	15.1255		(27)
Flr - Ground			34.9880	0.1100	3.8487	75.0000	2624.1000 (28a)
Wl - 1	83.8050	14.1900	69.6150	0.1800	12.5307	60.0000	4176.9000 (29a)
Rf - Ins Joist	34.9880		34.9880	0.0900	3.1489	9.0000	314.8920 (30)
Total net area of external elements Aum(A, m ²)			153.7910				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.6138		(33)
Party Wall			39.3650	0.0000	0.0000	110.0000	4330.1502 (32)
Stud			70.8384			9.0000	637.5456 (32c)
Stud			72.5868			9.0000	653.2812 (32c)
Internal Floor 1			34.9880			9.0000	314.8920 (32d)
Internal Ceiling 1			34.9880			9.0000	314.8920 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13366.6530 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							191.0177 (35)

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List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.8530	0.2210	1.9565
E3 Sill	6.3160	0.0240	0.1516
E4 Jamb	24.8880	0.0190	0.4729
E5 Ground floor (normal)	14.2240	0.0450	0.6401
E6 Intermediate floor within a dwelling	16.7610	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	2.5370	0.0360	0.0913
E10 Eaves (insulation at ceiling level)	16.7610	0.0510	0.8548
E16 Corner (normal)	10.0000	0.0370	0.3700
E18 Party wall between dwellings	10.0000	0.0310	0.3100
P1 Party wall - Ground floor	7.8730	0.0430	0.3385
P2 Party wall - Intermediate floor within a dwelling	7.8730	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	7.8730	0.4800	3.7790
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.9648 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	45.5785 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(38)
Heat transfer coeff	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	(39)
Average = Sum(39)m / 12 =	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	(39)
HLP	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	(40)
HLP (average)													(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	(40)

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2455 (42)
Hot water usage for mixer showers	61.8700	60.9402	59.5853	56.9930	55.0800	52.9465	51.7339	53.0785	54.5525	56.8431	59.4911	61.6330	(42a)
Hot water usage for baths	26.7294	26.3324	25.7734	24.7426	23.9709	23.1151	22.6528	23.2079	23.8123	24.7280	25.7800	26.6390	(42b)
Hot water usage for other uses	37.6266	36.2584	34.8901	33.5219	32.1536	30.7854	30.7854	32.1536	33.5219	34.8901	36.2584	37.6266	(42c)
Average daily hot water use (litres/day)													116.0304 (43)
Daily hot water use	126.2259	123.5310	120.2488	115.2575	111.2044	106.8470	105.1721	108.4400	111.8866	116.4613	121.5295	125.8985	(44)
Energy conte	199.9110	175.9064	184.8180	157.7818	149.7026	131.3808	127.1965	134.2714	137.9674	158.0369	173.1410	197.1267	(45)
Energy content (annual)													(45)
Distribution loss (46)m = 0.15 x (45)m	29.9867	26.3860	27.7227	23.6673	22.4554	19.7071	19.0795	20.1407	20.6951	23.7055	25.9712	29.5690	(46)
Water storage loss:													(46)
Store volume													201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6100 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8694 (55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(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	226.8624	200.2496	211.7694	183.8638	176.6540	157.4628	154.1479	161.2228	164.0494	184.9883	199.2230	224.0781	(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	226.8624	200.2496	211.7694	183.8638	176.6540	157.4628	154.1479	161.2228	164.0494	184.9883	199.2230	224.0781	(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	66.4704	58.4889	61.4520	52.4625	49.7761	43.6841	42.2928	44.6452	45.8742	52.5473	57.5694	65.5446	(65)

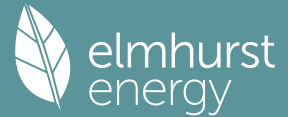
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.4693	19.9570	16.2301	12.2873	9.1849	7.7543	8.3787	10.8910	14.6179	18.5608	21.6632	23.0938	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	294.3896	297.4445	289.7463	273.3580	252.6706	233.2274	220.2382	217.1833	224.8815	241.2698	261.9572	281.4004	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	(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)	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	(71)
Water heating gains (Table 5)	89.3420	87.0370	82.5967	72.8645	66.9034	60.6724	56.8452	60.0071	63.7141	70.6280	79.9575	88.0976	(72)
Total internal gains	501.8305	500.0681	484.2029	454.1394	424.3885	397.2837	381.0918	383.7110	398.8431	426.0882	459.2074	488.2214	(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	0.6510	10.6334	0.4700	0.0000	0.7700	2.5052 (74)
East	5.0880	19.6403	0.4700	0.0000	0.7700	36.1645 (76)

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West	6.4960			19.6403			0.4700			0.0000			0.7700			46.1723 (80)		
Solar gains	84.8421	165.8560	273.3920	399.9284	491.7157	504.1832	479.6560	410.8630	318.2857	196.8202	105.7549	69.7983	49.8783	21.0000	0.0000	0.0000	0.0000	(83)
Total gains	586.6726	665.9241	757.5948	854.0678	916.1041	901.4669	860.7478	794.5741	717.1288	622.9084	564.9623	558.0197	558.0197	558.0197	558.0197	558.0197	558.0197	(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	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	
alpha	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	
util living area	0.9791	0.9634	0.9240	0.8332	0.6848	0.5122	0.3769	0.4245	0.6585	0.8887	0.9655	0.9829	(86)
MIT	19.7158	19.9305	20.2714	20.6367	20.8752	20.9717	20.9940	20.9901	20.9205	20.5764	20.0604	19.6517	(87)
Th 2	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	(88)
util rest of house	0.9742	0.9552	0.9074	0.7997	0.6307	0.4406	0.2956	0.3380	0.5842	0.8573	0.9562	0.9788	(89)
MIT 2	18.5534	18.8224	19.2424	19.6718	19.9261	20.0131	20.0282	20.0263	19.9750	19.6165	18.9898	18.4726	(90)
Living area fraction	0.9742	0.9552	0.9074	0.7997	0.6307	0.4406	0.2956	0.3380	0.5842	0.8573	0.9562	0.9788	(91)
MIT	18.7720	19.0308	19.4360	19.8533	20.1046	20.1934	20.2098	20.2076	20.1528	19.7971	19.1912	18.6944	(92)
Temperature adjustment	18.7720	19.0308	19.4360	19.8533	20.1046	20.1934	20.2098	20.2076	20.1528	19.7971	19.1912	18.6944	(93)
adjusted MIT	18.7720	19.0308	19.4360	19.8533	20.1046	20.1934	20.2098	20.2076	20.1528	19.7971	19.1912	18.6944	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9658	0.9443	0.8952	0.7929	0.6351	0.4530	0.3108	0.3541	0.5942	0.8485	0.9458	0.9713	(94)
Useful gains	566.6004	628.8528	678.2171	677.2125	581.7830	408.3271	267.5232	281.3299	426.0867	528.5230	534.3374	541.9867	(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	1077.3512	1051.9505	962.9993	815.4004	625.6697	416.3938	268.7284	283.4508	450.5939	684.6643	900.1105	1079.0149	(97)
Space heating kWh	379.9986	284.3217	211.8780	99.4953	32.6517	0.0000	0.0000	0.0000	0.0000	116.1691	263.3567	399.5490	(98a)
Space heating requirement - total per year (kWh/year)												1787.4200	
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	379.9986	284.3217	211.8780	99.4953	32.6517	0.0000	0.0000	0.0000	0.0000	116.1691	263.3567	399.5490	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1787.4200	
Space heating per m2										(98c) / (4) =		25.5433	(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)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	379.9986	284.3217	211.8780	99.4953	32.6517	0.0000	0.0000	0.0000	0.0000	116.1691	263.3567	399.5490	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	379.9986	284.3217	211.8780	99.4953	32.6517	0.0000	0.0000	0.0000	0.0000	116.1691	263.3567	399.5490	(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)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	226.8624	200.2496	211.7694	183.8638	176.6540	157.4628	154.1479	161.2228	164.0494	184.9883	199.2230	224.0781	(64)
Efficiency of water heater (217)m	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	(216)
Fuel for water heating, kWh/month	65.8724	58.1450	61.4899	53.3872	51.2937	45.7213	44.7588	46.8131	47.6338	53.7137	57.8469	65.0639	(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	2.1777	1.9670	2.1777	2.1075	2.1075	2.1075	2.1777	2.1777	2.1075	2.1777	2.1075	2.1777	(231)
Lighting	19.6672	15.7778	14.2061	10.4080	8.0395	6.5683	7.3339	9.5328	12.3822	16.2461	18.3500	20.2138	(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												1787.4200	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

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Efficiency of water heater	344.3970
Water heating fuel used	651.7395 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 3.4840, total flow = 29.0000, SFP = 0.1201)	
mechanical ventilation fans (SFP = 0.1201)	25.6407 (230a)
Total electricity for the above, kWh/year	25.6407 (231)
Electricity for lighting (calculated in Appendix L)	158.7258 (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	2623.5260 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1787.4200	16.4900	294.7456 (240)
Space heating - main system 2	0.0000	16.4900	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	651.7395	16.4900	107.4718 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	25.6407	16.4900	4.2281 (249)
Energy for lighting	158.7258	16.4900	26.1739 (250)
Additional standing charges			0.0000 (251)
Total energy cost			432.6194 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] = 1.3546 (257)
SAP value	78.0424
SAP rating (Section 12)	78 (258)
SAP band	C

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1787.4200	0.1561	279.0788 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	651.7395	0.1412	92.0080 (264)
Space and water heating			371.0868 (265)
Pumps, fans and electric keep-hot	25.6407	0.1387	3.5567 (267)
Energy for lighting	158.7258	0.1443	22.9090 (268)
Total CO2, kg/year			397.5525 (272)
CO2 emissions per m2			5.6800 (273)
EI value			95.3667
EI rating			95 (274)
EI band			A

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

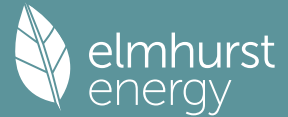
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	34.9880 (1b)	x 2.4000 (2b)	= 83.9712 (1b) - (3b)
First floor	34.9880 (1c)	x 2.6000 (2c)	= 90.9688 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.9760		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	174.9400 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Air changes per hour	

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Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 0.0000 / (5) = 0.0000 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 3.0000 (17)
Infiltration rate 0.1500 (18)
Number of sides sheltered 1 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1388 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000	(22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500	(22a)
Adj infilt rate	0.1457	0.1388	0.1388	0.1283	0.1283	0.1145	0.1179	0.1110	0.1145	0.1214	0.1214	0.1318	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(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	
Solid Door			1.9550	1.0000	1.9600			(26)
Windows (Uw = 1.30)			12.2350	1.2357	15.1255			(27)
Flr - Ground			34.9880	0.1100	3.8487	75.0000	2624.1000	(28a)
Wl - 1	83.8050	14.1900	69.6150	0.1800	12.5307	60.0000	4176.9000	(29a)
Rf - Ins Joist	34.9880		34.9880	0.0900	3.1489	9.0000	314.8920	(30)
Total net area of external elements Aum(A, m ²)			153.7910					(31)
Fabric heat loss, W/K = Sum (A x U)								(32)
Party Wall			39.3650	0.0000	0.0000	110.0000	4330.1502	(32e)
Stud			70.8384			9.0000	637.5456	(32c)
Stud			72.5868			9.0000	653.2812	(32c)
Internal Floor 1			34.9880			9.0000	314.8920	(32d)
Internal Ceiling 1			34.9880			9.0000	314.8920	(32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K (28)...(30) + (32) + (32a)...(32e) = 13366.6530 (34)
List of Thermal Bridges 191.0177 (35)

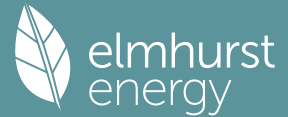
K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	8.8530	0.2210	1.9565	
E3 Sill	6.3160	0.0240	0.1516	
E4 Jamb	24.8880	0.0190	0.4729	
E5 Ground floor (normal)	14.2240	0.0450	0.6401	
E6 Intermediate floor within a dwelling	16.7610	0.0000	0.0000	
E7 Party floor between dwellings (in blocks of flats)	2.5370	0.0360	0.0913	
E10 Eaves (insulation at ceiling level)	16.7610	0.0510	0.8548	
E16 Corner (normal)	10.0000	0.0370	0.3700	
E18 Party wall between dwellings	10.0000	0.0310	0.3100	
P1 Party wall - Ground floor	7.8730	0.0430	0.3385	
P2 Party wall - Intermediate floor within a dwelling	7.8730	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	7.8730	0.4800	3.7790	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.9648	(36)
Point Thermal Bridges			0.0000	(36a) =
Total fabric heat loss			45.5785	(33) + (36) + (36a) =

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	(38)
Average = Sum(39)m / 12 =	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	(39)
	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	(39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2455 (42)
Hot water usage for mixer showers	61.8700	60.9402	59.5853	56.9930	55.0800	52.9465	51.7339	53.0785	54.5525	56.8431	59.4911	61.6330 (42a)
Hot water usage for baths	26.7294	26.3324	25.7734	24.7426	23.9709	23.1151	22.6528	23.2079	23.8123	24.7280	25.7800	26.6390 (42b)
Hot water usage for other uses	37.6266	36.2584	34.8901	33.5219	32.1536	30.7854	30.7854	32.1536	33.5219	34.8901	36.2584	37.6266 (42c)
Average daily hot water use (litres/day)												116.0304 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	126.2259	123.5310	120.2488	115.2575	111.2044	106.8470	105.1721	108.4400	111.8866	116.4613	121.5295	125.8985 (44)
Energy content (annual)	199.9110	175.9064	184.8180	157.7818	149.7026	131.3808	127.1965	134.2714	137.9674	158.0369	173.1410	197.1267 (45)
Distribution loss (46)m = 0.15 x (45)m	Total = Sum(45)m =											1927.2405
	29.9867	26.3860	27.7227	23.6673	22.4554	19.7071	19.0795	20.1407	20.6951	23.7055	25.9712	29.5690 (46)
Water storage loss:												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8694 (55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (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	226.8624	200.2496	211.7694	183.8638	176.6540	157.4628	154.1479	161.2228	164.0494	184.9883	199.2230	224.0781 (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)

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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	226.8624	200.2496	211.7694	183.8638	176.6540	157.4628	154.1479	161.2228	164.0494	184.9883	199.2230	224.0781 (64)
	Total per year (kWh/year) = Sum(64)m =										2244.5715 (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	66.4704	58.4889	61.4520	52.4625	49.7761	43.6841	42.2928	44.6452	45.8742	52.5473	57.5694	65.5446 (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	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.4693	19.9570	16.2301	12.2873	9.1849	7.7543	8.3787	10.8910	14.6179	18.5608	21.6632	23.0938	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	294.3896	297.4445	289.7463	273.3580	252.6706	233.2274	220.2382	217.1833	224.8815	241.2698	261.9572	281.4004	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	(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)	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	(71)
Water heating gains (Table 5)	89.3420	87.0370	82.5967	72.8645	66.9034	60.6724	56.8452	60.0071	63.7141	70.6280	79.9575	88.0976	(72)
Total internal gains	501.8305	500.0681	484.2029	454.1394	424.3885	397.2837	381.0918	383.7110	398.8431	426.0882	459.2074	488.2214	(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				0.6510	11.9814	0.4700	0.0000	0.7700	2.8228 (74)				
East				5.0880	22.3313	0.4700	0.0000	0.7700	41.1197 (76)				
West				6.4960	22.3313	0.4700	0.0000	0.7700	52.4987 (80)				
Solar gains	96.4412	169.6326	275.8059	414.7141	495.7922	543.6206	511.7459	448.9396	347.7088	214.8499	123.1627	78.5650	(83)
Total gains	598.2717	669.7007	760.0087	868.8535	920.1807	940.9043	892.8377	832.6507	746.5519	640.9382	582.3702	566.7864	(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	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	
alpha	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	
util living area	0.9734	0.9569	0.9079	0.7913	0.6086	0.3912	0.2579	0.2852	0.5542	0.8460	0.9526	0.9780 (86)	
MIT	19.8455	20.0291	20.3808	20.7334	20.9318	20.9921	20.9991	20.9985	20.9654	20.6976	20.2069	19.7916 (87)	
Th 2	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305 (88)	
util rest of house	0.9671	0.9469	0.8874	0.7507	0.5463	0.3173	0.1776	0.1993	0.4709	0.8036	0.9395	0.9726 (89)	
MIT 2	18.7174	18.9461	19.3754	19.7793	19.9795	20.0269	20.0303	20.0302	20.0106	19.7531	19.1719	18.6501 (90)	
Living area fraction	fLA = Living area / (4) =												0.1881 (91)
MIT	18.9296	19.1498	19.5646	19.9588	20.1586	20.2084	20.2125	20.2123	20.1902	19.9308	19.3666	18.8648 (92)	
Temperature adjustment													0.0000
adjusted MIT	18.9296	19.1498	19.5646	19.9588	20.1586	20.2084	20.2125	20.2123	20.1902	19.9308	19.3666	18.8648 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	572.9073	626.5480	665.6411	649.3823	510.5692	311.4888	172.0388	179.3958	362.1388	511.8504	540.5772	546.3575	(95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Heat loss rate W	1029.5271	1008.6974	905.5740	748.8131	532.9142	313.2905	172.1513	179.5809	371.4858	620.1731	846.1708	1024.7042	(97)
Space heating kWh	339.7251	256.8044	178.5101	71.5902	16.6247	0.0000	0.0000	0.0000	0.0000	80.5920	220.0274	355.8900	(98a)
Space heating requirement - total per year (kWh/year)												1519.7639	
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	339.7251	256.8044	178.5101	71.5902	16.6247	0.0000	0.0000	0.0000	0.0000	80.5920	220.0274	355.8900	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1519.7639	
Space heating per m2												(98c) / (4) =	21.7184 (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)	
Fraction of main heating from main system 2												0.0000 (203)	
Fraction of total heating from main system 1												1.0000 (204)	
Fraction of total heating from main system 2												0.0000 (205)	
Efficiency of main space heating system 1 (in %)												100.0000 (206)	
Efficiency of main space heating system 2 (in %)												0.0000 (207)	
Efficiency of secondary/supplementary heating system, %												0.0000 (208)	

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

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Space heating requirement	339.7251	256.8044	178.5101	71.5902	16.6247	0.0000	0.0000	0.0000	0.0000	80.5920	220.0274	355.8900 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	339.7251	256.8044	178.5101	71.5902	16.6247	0.0000	0.0000	0.0000	0.0000	80.5920	220.0274	355.8900 (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)
Space heating fuel used, main system 2												0.0000 (213)
Water heating requirement	226.8624	200.2496	211.7694	183.8638	176.6540	157.4628	154.1479	161.2228	164.0494	184.9883	199.2230	224.0781 (64)
Efficiency of water heater	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970 (216)
Fuel for water heating, kWh/month	65.8724	58.1450	61.4899	53.3872	51.2937	45.7213	44.7588	46.8131	47.6338	53.7137	57.8469	65.0639 (217)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	2.1777	1.9670	2.1777	2.1075	2.1777	2.1075	2.1777	2.1777	2.1075	2.1777	2.1075	2.1777 (231)
Lighting	19.6672	15.7778	14.2061	10.4080	8.0395	6.5683	7.3339	9.5328	12.3822	16.2461	18.3500	20.2138 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1519.7639 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												344.3970
Water heating fuel used												651.7395 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(MEV)Decentralised, Database: total watage = 3.4840, total flow = 29.0000, SFP = 0.1201)												
mechanical ventilation fans (SFP = 0.1201)												25.6407 (230a)
Total electricity for the above, kWh/year												25.6407 (231)
Electricity for lighting (calculated in Appendix L)												158.7258 (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												2355.8699 (238)

10a. Fuel costs - using BEDF prices (552)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1519.7639	26.0600	396.0505 (240)
Space heating - main system 2	0.0000	26.0600	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	651.7395	26.0600	169.8433 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Pumps, fans and electric keep-hot	25.6407	26.0600	6.6820 (249)
Energy for lighting	158.7258	26.0600	41.3639 (250)
Additional standing charges			0.0000 (251)
Total energy cost			613.9397 (255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1519.7639	0.1569	238.4025 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	651.7395	0.1412	92.0080 (264)
Space and water heating			330.4105 (265)
Pumps, fans and electric keep-hot	25.6407	0.1387	3.5567 (267)
Energy for lighting	158.7258	0.1443	22.9090 (268)
Total CO2, kg/year			356.8762 (272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1519.7639	1.5807	2402.3474 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	651.7395	1.5220	991.9605 (278)
Space and water heating			3394.3079 (279)
Pumps, fans and electric keep-hot	25.6407	1.5128	38.7892 (281)

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Energy for lighting
Total Primary energy kWh/year

158.7258

1.5338

243.4590 (282)
3676.5561 (286)

SAP 10 EPC IMPROVEMENTS

002 block F ELEC, DWHP

Current energy efficiency rating: C 78
Current environmental impact rating: A 95

N Solar water heating
U Solar photovoltaic panels
V2 Wind turbine

SAP increase too small
Recommended
Not applicable

Recommended measures:
U Solar photovoltaic panels

SAP change + 9.4
Cost change -£ 276
CO2 change -234 kg (65.6%)

Measures omitted - SAP change or cost saving too small:
N Solar water heating

+ 0.8
-£ 29
-13 kg (3.7%)

Recommended measures
Solar photovoltaic panels

Typical annual savings
£276
3.35 kg/m²

Energy efficiency B 87
Environmental impact A 98

Potential energy efficiency rating: B 87
Potential environmental impact rating: A 98

Fuel prices for cost data on this page from database revision number 552 TEST (30 Aug 2024)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£614	£614	£0
Space heating	£403	£403	£0
Water heating	£170	£170	£0
Lighting	£41	£41	£0
Generated (PV)	-£0	-£276	£276
Total cost of fuels	£614	£338	£276
Total cost of uses	£614	£338	£276
Delivered energy	34 kWh/m ²	8 kWh/m ²	26 kWh/m ²
Carbon dioxide emissions	0.4 tonnes	0.1 tonnes	0.2 tonnes
CO2 emissions per m ²	5 kg/m ²	2 kg/m ²	3 kg/m ²
Primary energy	53 kWh/m ²	28 kWh/m ²	24 kWh/m ²

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	34.9880 (1b)	x 2.4000 (2b)	= 83.9712 (1b) - (3b)
First floor	34.9880 (1c)	x 2.6000 (2c)	= 90.9688 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.9760		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 174.9400 (5)

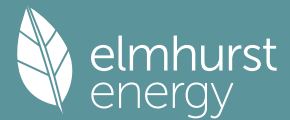
2. Ventilation rate

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

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1388 (21)

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

Full SAP Calculation Printout



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	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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	
Solid Door			1.9550	1.0000	1.9600			(26)
Windows (Uw = 1.30)			12.2350	1.2357	15.1255			(27)
Flr - Ground			34.9880	0.1100	3.8487	75.0000	2624.1000	(28a)
Wl - 1	83.8050	14.1900	69.6150	0.1800	12.5307	60.0000	4176.9000	(29a)
Rf - Ins Joist	34.9880		34.9880	0.0900	3.1489	9.0000	314.8920	(30)
Total net area of external elements Aum(A, m2)			153.7910					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.6138			(33)
Party Wall			39.3650	0.0000	0.0000	110.0000	4330.1502	(32)
Stud			70.8384			9.0000	637.5456	(32c)
Stud			72.5868			9.0000	653.2812	(32c)
Internal Floor 1			34.9880			9.0000	314.8920	(32d)
Internal Ceiling 1			34.9880			9.0000	314.8920	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13366.6530 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 191.0177 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.8530	0.2210	1.9565
E3 Sill	6.3160	0.0240	0.1516
E4 Jamb	24.8880	0.0190	0.4729
E5 Ground floor (normal)	14.2240	0.0450	0.6401
E6 Intermediate floor within a dwelling	16.7610	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	2.5370	0.0360	0.0913
E10 Eaves (insulation at ceiling level)	16.7610	0.0510	0.8548
E16 Corner (normal)	10.0000	0.0370	0.3700
E18 Party wall between dwellings	10.0000	0.0310	0.3100
P1 Party wall - Ground floor	7.8730	0.0430	0.3385
P2 Party wall - Intermediate floor within a dwelling	7.8730	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	7.8730	0.4800	3.7790

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.9648 (36)

Point Thermal Bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 45.5785 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	(38)
Heat transfer coeff	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	(39)
Average = Sum(39)m / 12 =													74.4436

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	(40)
HLP (average)													1.0638
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2455 (42)
Hot water usage for mixer showers	61.8700	60.9402	59.5853	56.9930	55.0800	52.9465	51.7339	53.0785	54.5525	56.8431	59.4911	61.6330	(42a)
Hot water usage for baths	26.7294	26.3324	25.7734	24.7426	23.9709	23.1151	22.6528	23.2079	23.8123	24.7280	25.7800	26.6390	(42b)
Hot water usage for other uses	37.6266	36.2584	34.8901	33.5219	32.1536	30.7854	30.7854	32.1536	33.5219	34.8901	36.2584	37.6266	(42c)
Average daily hot water use (litres/day)													116.0304 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	126.2259	123.5310	120.2488	115.2575	111.2044	106.8470	105.1721	108.4400	111.8866	116.4613	121.5295	125.8985	(44)
Energy conte	199.9110	175.9064	184.8180	157.7818	149.7026	131.3808	127.1965	134.2714	137.9674	158.0369	173.1410	197.1267	(45)
Energy content (annual)										Total = Sum(45)m =			1927.2405

Distribution loss (46)m = 0.15 x (45)m 29.9867 26.3860 27.7227 23.6673 22.4554 19.7071 19.0795 20.1407 20.6951 23.7055 25.9712 29.5690 (46)

Water storage loss:

Store volume 201.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.8694 (55)

Total storage loss 26.9514 24.3432 26.9514 26.0820 26.9514 26.0820 26.9514 26.9514 26.0820 26.9514 26.0820 26.9514 26.9514 (56)

If cylinder contains dedicated solar storage 26.9514 24.3432 26.9514 26.0820 26.9514 26.0820 26.9514 26.9514 26.0820 26.9514 26.0820 26.9514 26.9514 (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 226.8624 200.2496 211.7694 183.8638 176.6540 157.4628 154.1479 161.2228 164.0494 184.9883 199.2230 224.0781 (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 (64a)

Output from w/h 226.8624 200.2496 211.7694 183.8638 176.6540 157.4628 154.1479 161.2228 164.0494 184.9883 199.2230 224.0781 (64)

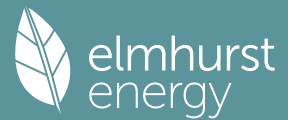
Total per year (kWh/year) = Sum(64)m = 2244.5715 (64)

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 66.4704 58.4889 61.4520 52.4625 49.7761 43.6841 42.2928 44.6452 45.8742 52.5473 57.5694 65.5446 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.4693	19.9570	16.2301	12.2873	9.1849	7.7543	8.3787	10.8910	14.6179	18.5608	21.6632	23.0938	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	294.3896	297.4445	289.7463	273.3580	252.6706	233.2274	220.2382	217.1833	224.8815	241.2698	261.9572	281.4004	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	(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)	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	(71)
Water heating gains (Table 5)	89.3420	87.0370	82.5967	72.8645	66.9034	60.6724	56.8452	60.0071	63.7141	70.6280	79.9575	88.0976	(72)
Total internal gains	501.8305	500.0681	484.2029	454.1394	424.3885	397.2837	381.0918	383.7110	398.8431	426.0882	459.2074	488.2214	(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				0.6510	10.6334		0.4700	0.0000	0.7700		2.5052 (74)	
East				5.0880	19.6403		0.4700	0.0000	0.7700		36.1645 (76)	
West				6.4960	19.6403		0.4700	0.0000	0.7700		46.1723 (80)	
Solar gains	84.8421	165.8560	273.3920	399.9284	491.7157	504.1832	479.6560	410.8630	318.2857	196.8202	105.7549	69.7983 (83)
Total gains	586.6726	665.9241	757.5948	854.0678	916.1041	901.4669	860.7478	794.5741	717.1288	622.9084	564.9623	558.0197 (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	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	
alpha	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	
util living area	0.9791	0.9634	0.9240	0.8332	0.6848	0.5122	0.3769	0.4245	0.6585	0.8887	0.9655	0.9829	(86)
MIT	19.7158	19.9305	20.2714	20.6367	20.8752	20.9717	20.9940	20.9901	20.9205	20.5764	20.0604	19.6517	(87)
Th 2	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	(88)
util rest of house	0.9742	0.9552	0.9074	0.7997	0.6307	0.4406	0.2956	0.3380	0.5842	0.8573	0.9562	0.9788	(89)
MIT 2	18.5534	18.8224	19.2424	19.6718	19.9261	20.0131	20.0282	20.0263	19.9750	19.6165	18.9898	18.4726	(90)
Living area fraction	18.7720	19.0308	19.4360	19.8533	20.1046	20.1934	20.2098	20.2076	20.1528	19.7971	19.1912	0.1881	(91)
MIT	18.7720	19.0308	19.4360	19.8533	20.1046	20.1934	20.2098	20.2076	20.1528	19.7971	19.1912	18.6944	(92)
Temperature adjustment	18.7720	19.0308	19.4360	19.8533	20.1046	20.1934	20.2098	20.2076	20.1528	19.7971	19.1912	0.0000	
adjusted MIT	18.7720	19.0308	19.4360	19.8533	20.1046	20.1934	20.2098	20.2076	20.1528	19.7971	19.1912	18.6944	(93)

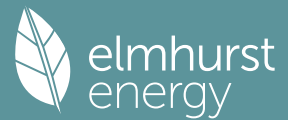
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9658	0.9443	0.8952	0.7929	0.6351	0.4530	0.3108	0.3541	0.5942	0.8485	0.9458	0.9713	(94)
Useful gains	566.6004	628.8528	678.2171	677.2125	581.7830	408.3271	267.5232	281.3299	426.0867	528.5230	534.3374	541.9867	(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	1077.3512	1051.9505	962.9993	815.4004	625.6697	416.3938	268.7284	283.4508	450.5939	684.6643	900.1105	1079.0149	(97)
Space heating kWh	379.9986	284.3217	211.8780	99.4953	32.6517	0.0000	0.0000	0.0000	0.0000	116.1691	263.3567	399.5490	(98a)
Space heating requirement - total per year (kWh/year)												1787.4200	
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	379.9986	284.3217	211.8780	99.4953	32.6517	0.0000	0.0000	0.0000	0.0000	116.1691	263.3567	399.5490	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1787.4200	
Space heating per m2										(98c) / (4) =		25.5433	(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)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	379.9986	284.3217	211.8780	99.4953	32.6517	0.0000	0.0000	0.0000	0.0000	116.1691	263.3567	399.5490	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	379.9986	284.3217	211.8780	99.4953	32.6517	0.0000	0.0000	0.0000	0.0000	116.1691	263.3567	399.5490	(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)

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Space heating fuel used, main system 2													0.0000 (213)
Water heating													
Water heating requirement	226.8624	200.2496	211.7694	183.8638	176.6540	157.4628	154.1479	161.2228	164.0494	184.9883	199.2230	224.0781 (64)	
Efficiency of water heater (217)m	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970 (216)	
Fuel for water heating, kWh/month	65.8724	58.1450	61.4899	53.3872	51.2937	45.7213	44.7588	46.8131	47.6338	53.7137	57.8469	65.0639 (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	2.1777	1.9670	2.1777	2.1075	2.1777	2.1075	2.1777	2.1777	2.1075	2.1777	2.1075	2.1777 (231)	
Lighting	19.6672	15.7778	14.2061	10.4080	8.0395	6.5683	7.3339	9.5328	12.3822	16.2461	18.3500	20.2138 (232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-38.3817	-56.9729	-83.9043	-92.5298	-94.9391	-84.2742	-83.0717	-77.9627	-68.6009	-62.6616	-42.6931	-32.9268 (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	-11.7048	-26.6071	-58.4420	-98.2422	-140.7437	-147.4395	-145.5799	-121.8113	-87.8622	-44.1843	-16.7167	-8.9871 (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												1787.4200 (211)	
Space heating fuel - main system 2												0.0000 (213)	
Space heating fuel - secondary												0.0000 (215)	
Efficiency of water heater												344.3970	
Water heating fuel used												651.7395 (219)	
Space cooling fuel												0.0000 (221)	
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.4840, total flow = 29.0000, SFP = 0.1201)													
mechanical ventilation fans (SFP = 0.1201)												25.6407 (230a)	
Total electricity for the above, kWh/year												25.6407 (231)	
Electricity for lighting (calculated in Appendix L)												158.7258 (232)	
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1727.2394 (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												896.2866 (238)	

10a. Fuel costs - using Table 12 prices													

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	34.9880 (1b)	x 2.4000 (2b)	= 83.9712 (1b) - (3b)
First floor	34.9880 (1c)	x 2.6000 (2c)	= 90.9688 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.9760		(4)
Dwelling volume		(3a) + (3b) + (3c) + (3d) + (3e) ... (3n) =	174.9400 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure Test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1388 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.1457	0.1388	0.1388	0.1283	0.1283	0.1145	0.1179	0.1110	0.1145	0.1214	0.1214	0.1318 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
Solid Door			1.9550	1.0000	1.9600		(26)
Windows (Uw = 1.30)			12.2350	1.2357	15.1255		(27)
Flr - Ground			34.9880	0.1100	3.8487	75.0000	2624.1000 (28a)
Wl - 1	83.8050	14.1900	69.6150	0.1800	12.5307	60.0000	4176.9000 (29a)
Rf - Ins Joist	34.9880		34.9880	0.0900	3.1489	9.0000	314.8920 (30)
Total net area of external elements Aum(A, m ²)			153.7910				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.6138		(33)
Party Wall			39.3650	0.0000	0.0000	110.0000	4330.1502 (32)
Stud			70.8384			9.0000	637.5456 (32c)
Stud			72.5868			9.0000	653.2812 (32c)
Internal Floor 1			34.9880			9.0000	314.8920 (32d)
Internal Ceiling 1			34.9880			9.0000	314.8920 (32e)

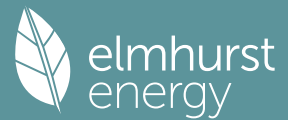
Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13366.6530 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 191.0177 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.8530	0.2210	1.9565
E3 Sill	6.3160	0.0240	0.1516
E4 Jamb	24.8880	0.0190	0.4729
E5 Ground floor (normal)	14.2240	0.0450	0.6401
E6 Intermediate floor within a dwelling	16.7610	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	2.5370	0.0360	0.0913
E10 Eaves (insulation at ceiling level)	16.7610	0.0510	0.8548
E16 Corner (normal)	10.0000	0.0370	0.3700
E18 Party wall between dwellings	10.0000	0.0310	0.3100
P1 Party wall - Ground floor	7.8730	0.0430	0.3385
P2 Party wall - Intermediate floor within a dwelling	7.8730	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	7.8730	0.4800	3.7790
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.9648 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 45.5785 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651	28.8651 (38)
Heat transfer coeff	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436	74.4436 (39)
Average = Sum(39)m / 12 =												74.4436

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HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638	1.0638 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2455 (42)
Hot water usage for mixer showers	61.8700	60.9402	59.5853	56.9930	55.0800	52.9465	51.7339	53.0785	54.5525	56.8431	59.4911	61.6330 (42a)
Hot water usage for baths	26.7294	26.3324	25.7734	24.7426	23.9709	23.1151	22.6528	23.2079	23.8123	24.7280	25.7800	26.6390 (42b)
Hot water usage for other uses	37.6266	36.2584	34.8901	33.5219	32.1536	30.7854	30.7854	32.1536	33.5219	34.8901	36.2584	37.6266 (42c)
Average daily hot water use (litres/day)												116.0304 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	126.2259	123.5310	120.2488	115.2575	111.2044	106.8470	105.1721	108.4400	111.8866	116.4613	121.5295	125.8985 (44)
Energy content (annual)	199.9110	175.9064	184.8180	157.7818	149.7026	131.3808	127.1965	134.2714	137.9674	158.0369	173.1410	197.1267 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1927.2405
Water storage loss:	29.9867	26.3860	27.7227	23.6673	22.4554	19.7071	19.0795	20.1407	20.6951	23.7055	25.9712	29.5690 (46)
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8694 (55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (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	226.8624	200.2496	211.7694	183.8638	176.6540	157.4628	154.1479	161.2228	164.0494	184.9883	199.2230	224.0781 (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	226.8624	200.2496	211.7694	183.8638	176.6540	157.4628	154.1479	161.2228	164.0494	184.9883	199.2230	224.0781 (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	66.4704	58.4889	61.4520	52.4625	49.7761	43.6841	42.2928	44.6452	45.8742	52.5473	57.5694	65.5446 (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	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325	134.7325 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.4693	19.9570	16.2301	12.2873	9.1849	7.7543	8.3787	10.8910	14.6179	18.5608	21.6632	23.0938 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	294.3896	297.4445	289.7463	273.3580	252.6706	233.2274	220.2382	217.1833	224.8815	241.2698	261.9572	281.4004 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188	50.7188 (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)	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217	-89.8217 (71)
Water heating gains (Table 5)	89.3420	87.0370	82.5967	72.8645	66.9034	60.6724	56.8452	60.0071	63.7141	70.6280	79.9575	88.0976 (72)
Total internal gains	501.8305	500.0681	484.2029	454.1394	424.3885	397.2837	381.0918	383.7110	398.8431	426.0882	459.2074	488.2214 (73)

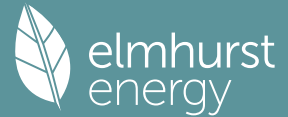
6. Solar gains

[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				0.6510	11.9814	0.4700	0.0000	0.7700	2.8228 (74)			
East				5.0880	22.3313	0.4700	0.0000	0.7700	41.1197 (76)			
West				6.4960	22.3313	0.4700	0.0000	0.7700	52.4987 (80)			
Solar gains	96.4412	169.6326	275.8059	414.7141	495.7922	543.6206	511.7459	448.9396	347.7088	214.8499	123.1627	78.5650 (83)
Total gains	598.2717	669.7007	760.0087	868.8535	920.1807	940.9043	892.8377	832.6507	746.5519	640.9382	582.3702	566.7864 (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	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761	49.8761
alpha	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251	4.3251
util living area	0.9734	0.9569	0.9079	0.7913	0.6086	0.3912	0.2579	0.2852	0.5542	0.8460	0.9526	0.9780 (86)
MIT	19.8455	20.0291	20.3808	20.7334	20.9318	20.9921	20.9991	20.9985	20.9654	20.6976	20.2069	19.7916 (87)
Th 2	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305	20.0305 (88)
util rest of house	0.9671	0.9469	0.8874	0.7507	0.5463	0.3173	0.1776	0.1993	0.4709	0.8036	0.9395	0.9726 (89)
MIT 2	18.7174	18.9461	19.3754	19.7793	19.9795	20.0269	20.0303	20.0302	20.0106	19.7531	19.1719	18.6501 (90)

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Living area fraction									fLA = Living area / (4) =	0.1881 (91)	
MIT	18.9296	19.1498	19.5646	19.9588	20.1586	20.2084	20.2125	20.2123	20.1902	19.9308	18.8648 (92)
Temperature adjustment											0.0000
adjusted MIT	18.9296	19.1498	19.5646	19.9588	20.1586	20.2084	20.2125	20.2123	20.1902	19.9308	18.8648 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9576	0.9356	0.8758	0.7474	0.5549	0.3311	0.1927	0.2155	0.4851	0.7986	0.9282	0.9640	(94)
Useful gains	572.9073	626.5480	665.6411	649.3823	510.5692	311.4888	172.0388	179.3958	362.1388	511.8504	540.5772	546.3575	(95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Heat loss rate W	1029.5271	1008.6974	905.5740	748.8131	532.9142	313.2905	172.1513	179.5809	371.4858	620.1731	846.1708	1024.7042	(97)
Space heating kWh	339.7251	256.8044	178.5101	71.5902	16.6247	0.0000	0.0000	0.0000	0.0000	80.5920	220.0274	355.8900	(98a)
Space heating requirement - total per year (kWh/year)												1519.7639	
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	339.7251	256.8044	178.5101	71.5902	16.6247	0.0000	0.0000	0.0000	0.0000	80.5920	220.0274	355.8900	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1519.7639	
Space heating per m2										(98c) / (4) =		21.7184	(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)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	339.7251	256.8044	178.5101	71.5902	16.6247	0.0000	0.0000	0.0000	0.0000	80.5920	220.0274	355.8900	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	339.7251	256.8044	178.5101	71.5902	16.6247	0.0000	0.0000	0.0000	0.0000	80.5920	220.0274	355.8900	(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)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	226.8624	200.2496	211.7694	183.8638	176.6540	157.4628	154.1479	161.2228	164.0494	184.9883	199.2230	224.0781	(64)
Efficiency of water heater													
(217)m	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	344.3970	(216)
Fuel for water heating, kWh/month	65.8724	58.1450	61.4899	53.3872	51.2937	45.7213	44.7588	46.8131	47.6338	53.7137	57.8469	65.0639	(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	2.1777	1.9670	2.1777	2.1075	2.1777	2.1075	2.1777	2.1777	2.1075	2.1777	2.1075	2.1777	(231)
Lighting	19.6672	15.7778	14.2061	10.4080	8.0395	6.5683	7.3339	9.5328	12.3822	16.2461	18.3500	20.2138	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-41.9793	-56.8575	-82.3024	-91.5288	-92.6949	-87.1964	-85.5104	-81.3190	-71.7763	-64.3363	-47.1425	-35.7646	(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	-14.1674	-27.5309	-59.8183	-104.9256	-143.9023	-161.8119	-157.5187	-135.7075	-97.6136	-50.8965	-21.1053	-10.7533	(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												1519.7639	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												344.3970	
Water heating fuel used												651.7395	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.4840, total flow = 29.0000, SFP = 0.1201)													
mechanical ventilation fans (SFP = 0.1201)													25.6407 (230a)
Total electricity for the above, kWh/year													25.6407 (231)
Electricity for lighting (calculated in Appendix L)													158.7258 (232)

Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-1824.1596 (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													531.7102 (238)

10a. Fuel costs - using BEDF prices (552)

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	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1519.7639	26.0600	396.0505 (240)
Space heating - main system 2	0.0000	26.0600	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	651.7395	26.0600	169.8433 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Pumps, fans and electric keep-hot	25.6407	26.0600	6.6820 (249)
Energy for lighting	158.7258	26.0600	41.3639 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-838.4082	26.0600	-218.4892
PV Unit electricity exported	-985.7514	5.8100	-57.2722
Total			-275.7613 (252)
Total energy cost			338.1783 (255)

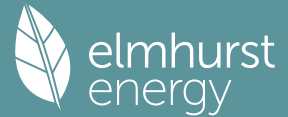
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1519.7639	0.1569	238.4025 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	651.7395	0.1412	92.0080 (264)
Space and water heating			330.4105 (265)
Pumps, fans and electric keep-hot	25.6407	0.1387	3.5567 (267)
Energy for lighting	158.7258	0.1443	22.9090 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-838.4082	0.1352	-113.3740
PV Unit electricity exported	-985.7514	0.1226	-120.8039
Total			-234.1779 (269)
Total CO2, kg/year			122.6984 (272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1519.7639	1.5807	2402.3474 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	651.7395	1.5220	991.9605 (278)
Space and water heating			3394.3079 (279)
Pumps, fans and electric keep-hot	25.6407	1.5128	38.7892 (281)
Energy for lighting	158.7258	1.5338	243.4590 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-838.4082	1.4998	-1257.4546
PV Unit electricity exported	-985.7514	0.4496	-443.2163
Total			-1700.6710 (283)
Total Primary energy kWh/year			1975.8851 (286)

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Property Reference	004 TF				Issued on Date	10/09/2024
Assessment Reference	004 TF Flat Elec DWHP PV	Prop Type Ref	004 TF			
Property	004 TF, 004 TF, 0					
SAP Rating	85 B	DER	4.08	TER	12.92	
Environmental	97 A	% DER < TER				68.42
CO ₂ Emissions (t/year)	0.21	DFEE	34.75	TFEE	35.15	
Compliance Check	See BREL	% DFEE < TFEE				1.12
% DPER < TPER	33.12	DPER	45.50	TPER	68.03	
Assessor Details	Mr. Scott Binstead				Assessor ID	U903-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	66.2930 (1b)	2.4000 (2b)	159.1032 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.2930		159.1032 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	159.1032 (5)

2. Ventilation rate

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

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		1	(19)

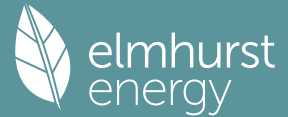
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1388	(21)

	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	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
Solid Door			2.1000	1.0000	2.1000		(26)
Windows (Uw = 1.30)			18.8490	1.2357	23.2937		(27)
Wl - 1	65.3810	18.8490	46.5320	0.1800	8.3758	60.0000	2791.9198 (29a)
Wl - 3	3.6360	2.1000	1.5360	0.2400	0.3686	60.0000	92.1600 (29a)
Rf - Ins Joist	66.2930		66.2930	0.0900	5.9664	9.0000	596.6370 (30)
Total net area of external elements Aum(A, m ²)			135.3110				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.1045		(33)
Party Wall			23.7400	0.0000	0.0000	110.0000	2611.4000 (32)
Party Floor 1			66.2930			40.0000	2651.7200 (32d)
Stud			120.9072			9.0000	1088.1648 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		9832.0016 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							148.3113 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				10.3180	0.0500	0.5159	

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E3 Sill	1.9210	0.0240	0.0461
E4 Jamb	40.2860	0.0190	0.7654
E7 Party floor between dwellings (in blocks of flats)	28.7550	0.0360	1.0352
E14 Flat roof	28.7580	0.1600	4.6013
E16 Corner (normal)	7.2000	0.0370	0.2664
E18 Party wall between dwellings	4.8000	0.0310	0.1488
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	9.8920	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	9.8920	0.2400	2.3741
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			9.7532 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	49.8577 (37)

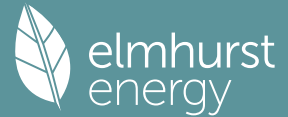
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520 (38)
Average = Sum(39)m / 12 =	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481 (40)
HLP (average)												1.1481
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.1529 (42)
Hot water usage for mixer showers												
	60.3163	59.4099	58.0890	55.5618	53.6968	51.6169	50.4347	51.7456	53.1826	55.4157	57.9972	60.0852 (42a)
Hot water usage for baths												
	26.0612	25.6742	25.1291	24.1242	23.3717	22.5373	22.0866	22.6278	23.2171	24.1099	25.1356	25.9731 (42b)
Hot water usage for other uses												
	36.6776	35.3439	34.0102	32.6764	31.3427	30.0090	30.0090	31.3427	32.6764	34.0102	35.3439	36.6776 (42c)
Average daily hot water use (litres/day)												113.1158 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	123.0552	120.4280	117.2284	112.3624	108.4112	104.1632	102.5303	105.7161	109.0761	113.5358	118.4767	122.7360 (44)
Energy conte	194.8894	171.4879	180.1756	153.8186	145.9423	128.0808	124.0015	130.8986	134.5017	154.0670	168.7918	192.1749 (45)
Energy content (annual)										Total = Sum(45)m =		1878.8301
Distribution loss (46)m = 0.15 x (45)m												
	29.2334	25.7232	27.0263	23.0728	21.8913	19.2121	18.6002	19.6348	20.1753	23.1101	25.3188	28.8262 (46)
Water storage loss:												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8694 (55)
Total storage loss												
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage												
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (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												
	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263 (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												
	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263 (64)
								Total per year (kWh/year) = Sum(64)m =				2196.1611 (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												
	64.8007	57.0197	59.9084	51.1447	48.5258	42.5869	41.2305	43.5238	44.7218	51.2273	56.1233	63.8982 (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	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728 (66)
	22.0167	19.5551	15.9033	12.0398	8.9999	7.5981	8.2100	10.6717	14.3235	18.1869	21.2268	22.6287 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	281.3365	284.2559	276.8991	261.2374	241.4673	222.8862	210.4729	207.5535	214.9103	230.5720	250.3421	268.9232 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702 (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)												
	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152 (71)
Water heating gains (Table 5)												
	87.0977	84.8508	80.5220	71.0343	65.2229	59.1484	55.4173	58.4997	62.1136	68.8539	77.9490	85.8846 (72)
Total internal gains												
	483.5787	481.7895	466.4521	437.4392	408.8178	382.7605	367.2280	369.8527	384.4752	410.7406	442.6457	470.5642 (73)

6. Solar gains												
[Jan]												
	Area											
	m2											
	Solar flux											
	Table 6a											
	W/m2											
	Specific data											
	or Table 6b											
	Specific data											
	or Table 6c											
	Access											
	factor											
	Table 6d											
	Gains											
	W											
East	6.4140											45.5895 (76)
South	6.3150											106.8471 (78)
West	6.1200											43.4998 (80)
Solar gains	195.9364	349.2656	509.9141	670.5171	775.5209	777.7871	746.8062	669.1806	566.6542	395.5360	237.7341	165.5884 (83)
Total gains	679.5151	831.0551	976.3662	1107.9563	1184.3387	1160.5476	1114.0342	1039.0333	951.1293	806.2766	680.3798	636.1527 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)
Utilisation factor for gains for living area, nil,m (see Table 9a)

21.0000 (85)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	
alpha	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	
util living area	0.9406	0.8947	0.8171	0.6964	0.5508	0.4066	0.2970	0.3313	0.5165	0.7652	0.9067	0.9506 (86)	
MIT	19.4932	19.8509	20.2708	20.6439	20.8677	20.9637	20.9905	20.9861	20.9193	20.5836	19.9484	19.3930 (87)	
Th 2	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618 (88)	
util rest of house	0.9302	0.8779	0.7906	0.6573	0.4999	0.3450	0.2285	0.2589	0.4492	0.7225	0.8887	0.9418 (89)	
MIT 2	18.2484	18.6865	19.1885	19.6139	19.8494	19.9382	19.9577	19.9553	19.9041	19.5639	18.8166	18.1243 (90)	
Living area fraction									fLA = Living area / (4) =				0.3660 (91)
MIT	18.7039	19.1126	19.5846	19.9909	20.2221	20.3135	20.3356	20.3325	20.2756	19.9371	19.2308	18.5886 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.7039	19.1126	19.5846	19.9909	20.2221	20.3135	20.3356	20.3325	20.2756	19.9371	19.2308	18.5886 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9145	0.8618	0.7799	0.6584	0.5131	0.3662	0.2534	0.2850	0.4702	0.7214	0.8735	0.9269 (94)
Useful gains	621.4115	716.2334	761.4706	729.5216	607.6492	424.9869	282.2526	296.1647	447.2323	581.6106	594.3158	589.6394 (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	1096.2798	1081.7195	995.8676	844.1237	648.6142	434.8520	284.3179	299.3039	470.0246	710.6426	923.2702	1095.1110 (97)
Space heating kWh	353.3020	245.6066	174.3914	82.5135	30.4779	0.0000	0.0000	0.0000	0.0000	95.9998	236.8471	376.0709 (98a)
Space heating requirement - total per year (kWh/year)												1595.2093
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	353.3020	245.6066	174.3914	82.5135	30.4779	0.0000	0.0000	0.0000	0.0000	95.9998	236.8471	376.0709 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1595.2093
Space heating per m2										(98c) / (4) =		24.0630 (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)
Fraction of main heating from main system 2												0.0000 (203)
Fraction of total heating from main system 1												1.0000 (204)
Fraction of total heating from main system 2												0.0000 (205)
Efficiency of main space heating system 1 (in %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	353.3020	245.6066	174.3914	82.5135	30.4779	0.0000	0.0000	0.0000	0.0000	95.9998	236.8471	376.0709 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	353.3020	245.6066	174.3914	82.5135	30.4779	0.0000	0.0000	0.0000	0.0000	95.9998	236.8471	376.0709 (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)
Space heating fuel used, main system 2												0.0000 (213)
Water heating												
Water heating requirement	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263 (64)
Efficiency of water heater												345.3200 (216)
(217)m	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200 (217)
Fuel for water heating, kWh/month	64.2421	56.7100	59.9812	52.0968	50.0677	44.6435	43.7139	45.7112	46.5029	52.4205	56.4328	63.4560 (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	1.8370	1.6592	1.8370	1.7777	1.8370	1.7777	1.8370	1.8370	1.7777	1.8370	1.7777	1.8370 (231)
Lighting	19.2711	15.4600	13.9200	10.1984	7.8775	6.4360	7.1862	9.3408	12.1328	15.9189	17.9804	19.8067 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-20.6621	-31.5316	-48.1765	-56.2642	-61.3912	-56.1604	-55.3794	-50.9337	-43.3611	-36.1522	-23.3581	-17.6135 (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	-4.3811	-10.2583	-22.9966	-39.1218	-56.4501	-59.6964	-58.9464	-48.9533	-34.8704	-17.2708	-6.3468	-3.3434 (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												1595.2093 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												345.3200
Water heating fuel used												635.9785 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:

(MEVDecentralised, Database: total watage = 2.3400, total flow = 21.0000, SFP = 0.1114)

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mechanical ventilation fans (SFP = 0.1114) 21.6289 (230a)
 Total electricity for the above, kWh/year 21.6289 (231)
 Electricity for lighting (calculated in Appendix L) 155.5290 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
 PV generation -863.6197 (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 1544.7261 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1595.2093	16.4900	263.0500 (240)
Space heating - main system 2	0.0000	16.4900	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	635.9785	16.4900	104.8729 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	21.6289	16.4900	3.5666 (249)
Energy for lighting	155.5290	16.4900	25.6467 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-500.9841	16.4900	-82.6123
PV Unit electricity exported	-362.6356	5.5900	-20.2713
Total			-102.8836 (252)
Total energy cost			294.2526 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12): 0.3600 (256)
 Energy cost factor (ECF) $[(255) \times (256)] / [(4) + 45.0] =$ 0.9518 (257)
 SAP value 84.5710
 SAP rating (Section 12) 85 (258)
 SAP band B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1595.2093	0.1564	249.5091 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	635.9785	0.1412	89.7773 (264)
Space and water heating			339.2864 (265)
Pumps, fans and electric keep-hot	21.6289	0.1387	3.0002 (267)
Energy for lighting	155.5290	0.1443	22.4476 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-500.9841	0.1340	-67.1292
PV Unit electricity exported	-362.6356	0.1223	-44.3538
Total			-111.4830 (269)
Total CO2, kg/year			253.2513 (272)
CO2 emissions per m2			3.8200 (273)
EI value			96.9508
EI rating			97 (274)
EI band			A

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

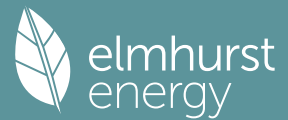
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	66.2930 (1b)	x 2.4000 (2b)	= 159.1032 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.2930		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	159.1032 (5)

2. Ventilation rate

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

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Number of flueless gas fires

0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =
Pressure test
Pressure Test Method
Measured/design AP50
Infiltration rate
Number of sides sheltered

Air changes per hour
0.0000 / (5) = 0.0000 (8)
Yes
Blower Door
3.0000 (17)
0.1500 (18)
1 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1388 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000	(22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500	(22a)
Adj infilt rate	0.1457	0.1388	0.1388	0.1283	0.1283	0.1145	0.1179	0.1110	0.1145	0.1214	0.1214	0.1318	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(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	
Solid Door			2.1000	1.0000	2.1000			(26)
Windows (Uw = 1.30)			18.8490	1.2357	23.2937			(27)
W1 - 1	65.3810	18.8490	46.5320	0.1800	8.3758	60.0000	2791.9198	(29a)
W1 - 3	3.6360	2.1000	1.5360	0.2400	0.3686	60.0000	92.1600	(29a)
Rf - Ins Joist	66.2930		66.2930	0.0900	5.9664	9.0000	596.6370	(30)
Total net area of external elements Aum(A, m2)			135.3110					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.1045			(33)
Party Wall			23.7400	0.0000	0.0000	110.0000	2611.4000	(32)
Party Floor 1			66.2930			40.0000	2651.7200	(32d)
Stud			120.9072			9.0000	1088.1648	(32c)

Heat capacity Cm = Sum(A x K) (28)...(30) + (32) + (32a)...(32e) = 9832.0016 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 148.3113 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	10.3180	0.0500	0.5159	
E3 Sill	1.9210	0.0240	0.0461	
E4 Jamb	40.2860	0.0190	0.7654	
E7 Party floor between dwellings (in blocks of flats)	28.7550	0.0360	1.0352	
E14 Flat roof	28.7580	0.1600	4.6013	
E16 Corner (normal)	7.2000	0.0370	0.2664	
E18 Party wall between dwellings	4.8000	0.0310	0.1488	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	9.8920	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	9.8920	0.2400	2.3741	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			9.7532	(36)
Point Thermal bridges			0.0000	(36a) =
Total fabric heat loss			49.8577	(33) + (36) + (36a) =

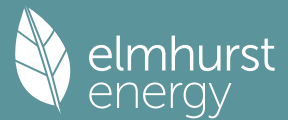
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
(38)m Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
26.2520 26.2520 26.2520 26.2520 26.2520 26.2520 26.2520 26.2520 26.2520 26.2520 26.2520 26.2520 (38)
Heat transfer coeff 76.1097 76.1097 76.1097 76.1097 76.1097 76.1097 76.1097 76.1097 76.1097 76.1097 76.1097 76.1097 (39)
Average = Sum(39)m / 12 = 76.1097

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	(40)
HLP (average)												1.1481	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1529 (42)
Hot water usage for mixer showers	60.3163	59.4099	58.0890	55.5618	53.6968	51.6169	50.4347	51.7456	53.1826	55.4157	57.9972	60.0852 (42a)
Hot water usage for baths	26.0612	25.6742	25.1291	24.1242	23.3717	22.5373	22.0866	22.6278	23.2171	24.1099	25.1356	25.9731 (42b)
Hot water usage for other uses	36.6776	35.3439	34.0102	32.6764	31.3427	30.0090	30.0090	31.3427	32.6764	34.0102	35.3439	36.6776 (42c)
Average daily hot water use (litres/day)												113.1158 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	123.0552	120.4280	117.2284	112.3624	108.4112	104.1632	102.5303	105.7161	109.0761	113.5358	118.4767	122.7360 (44)
Energy content (annual)	194.8894	171.4879	180.1756	153.8186	145.9423	128.0808	124.0015	130.8986	134.5017	154.0670	168.7918	192.1749 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1878.8301
	29.2334	25.7232	27.0263	23.0728	21.8913	19.2121	18.6002	19.6348	20.1753	23.1101	25.3188	28.8262 (46)
Water storage loss:												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												
Temperature factor from Table 2b												1.6100 (48)
Enter (49) or (54) in (55)												0.5400 (49)
Total storage loss												0.8694 (55)
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (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												
	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263 (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)

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Output from w/h	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263 (64)
	Total per year (kWh/year) = Sum(64)m =											2196.1611 (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	64.8007	57.0197	59.9084	51.1447	48.5258	42.5869	41.2305	43.5238	44.7218	51.2273	56.1233	63.8982 (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	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.0167	19.5551	15.9033	12.0398	8.9999	7.5981	8.2100	10.6717	14.3235	18.1869	21.2268	22.6287 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	281.3365	284.2559	276.8991	261.2374	241.4673	222.8862	210.4729	207.5535	214.9103	230.5720	250.3421	268.9232 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702 (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)	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152 (71)
Water heating gains (Table 5)	87.0977	84.8508	80.5220	71.0343	65.2229	59.1484	55.4173	58.4997	62.1136	68.8539	77.9490	85.8846 (72)
Total internal gains	483.5787	481.7895	466.4521	437.4392	408.8178	382.7605	367.2280	369.8527	384.4752	410.7406	442.6457	470.5642 (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	
East					6.4140	22.3313		0.4700	0.0000	0.7700		51.8360 (76)	
South					6.3150	50.9848		0.4700	0.0000	0.7700		116.5206 (78)	
West					6.1200	22.3313		0.4700	0.0000	0.7700		49.4600 (80)	
Solar gains	217.8167	349.5042	504.5830	685.2415	773.9169	831.6290	789.4539	721.9383	608.2462	422.7328	270.7714	182.2921 (83)	
Total gains	701.3954	831.2936	971.0352	1122.6807	1182.7347	1214.3895	1156.6819	1091.7910	992.7214	833.4734	713.4170	652.8563 (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	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839
alpha	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923
util living area	0.9273	0.8836	0.7963	0.6530	0.4870	0.3091	0.2032	0.2220	0.4284	0.7102	0.8793	0.9392 (86)
MIT	19.6652	19.9566	20.3757	20.7335	20.9217	20.9878	20.9980	20.9972	20.9615	20.7055	20.1365	19.5764 (87)
Th 2	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618 (88)
util rest of house	0.9144	0.8647	0.7663	0.6093	0.4313	0.2466	0.1355	0.1505	0.3574	0.6594	0.8560	0.9280 (89)
MIT 2	18.4631	18.8167	19.3131	19.7117	19.9013	19.9556	19.9613	19.9611	19.9384	19.6961	19.0447	18.3545 (90)
Living area fraction	FLA = Living area / (4) =											0.3660 (91)
MIT	18.9030	19.2339	19.7020	20.0857	20.2747	20.3333	20.3407	20.3403	20.3128	20.0655	19.4443	18.8017 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9030	19.2339	19.7020	20.0857	20.2747	20.3333	20.3407	20.3403	20.3128	20.0655	19.4443	18.8017 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.8983	0.8494	0.7581	0.6148	0.4485	0.2692	0.1603	0.1767	0.3819	0.6648	0.8425	0.9125 (94)
Useful gains	630.0964	706.1009	736.1040	690.1967	530.4139	326.9135	185.4437	192.8902	379.1021	554.1330	601.0791	595.6998 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	1050.5450	1037.6687	936.2999	775.2274	553.6750	329.8089	185.7590	193.3384	389.1356	644.3085	871.0214	1042.8308 (97)
Space heating kWh	312.8137	222.8135	148.9458	61.2221	17.3063	0.0000	0.0000	0.0000	0.0000	67.0906	194.3585	332.6655 (98a)
Space heating requirement - total per year (kWh/year)												1357.2159
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	312.8137	222.8135	148.9458	61.2221	17.3063	0.0000	0.0000	0.0000	0.0000	67.0906	194.3585	332.6655 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1357.2159
Space heating per m2												(98c) / (4) =
												20.4730 (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)
Fraction of main heating from main system 2												0.0000 (203)
Fraction of total heating from main system 1												1.0000 (204)
Fraction of total heating from main system 2												0.0000 (205)
Efficiency of main space heating system 1 (in %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	312.8137	222.8135	148.9458	61.2221	17.3063	0.0000	0.0000	0.0000	0.0000	67.0906	194.3585	332.6655 (98)

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Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	312.8137	222.8135	148.9458	61.2221	17.3063	0.0000	0.0000	0.0000	0.0000	67.0906	194.3585	332.6655 (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	(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	(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	(215)
Space heating fuel used, main system 2												0.0000 (213)
Water heating requirement	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263 (64)
Efficiency of water heater (217)m	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200 (216)
Fuel for water heating, kWh/month	64.2421	56.7100	59.9812	52.0968	50.0677	44.6435	43.7139	45.7112	46.5029	52.4205	56.4328	63.4560 (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	1.8370	1.6592	1.8370	1.7777	1.8370	1.7777	1.8370	1.7777	1.8370	1.7777	1.8370	1.8370 (231)
Lighting	19.2711	15.4600	13.9200	10.1984	7.8775	6.4360	7.1862	9.3408	12.1328	15.9189	17.9804	19.8067 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-22.7442	-31.5869	-47.5807	-56.4876	-60.5796	-58.7366	-57.5266	-53.7442	-45.8106	-37.7091	-26.0558	-19.2416 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-5.3292	-10.6073	-23.4797	-41.7397	-57.7190	-65.7675	-63.9880	-54.7690	-38.8843	-19.9073	-8.0681	-4.0173 (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												1357.2159 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												345.3200
Water heating fuel used												635.9785 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(MEV)Decentralised, Database: total watage = 2.3400, total flow = 21.0000, SFP = 0.1114)												
mechanical ventilation fans (SFP = 0.1114)												21.6289 (230a)
Total electricity for the above, kWh/year												21.6289 (231)
Electricity for lighting (calculated in Appendix L)												155.5290 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-912.0798 (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												1258.2726 (238)

10a. Fuel costs - using BEDF prices (552)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1357.2159	26.0600	353.6905 (240)
Space heating - main system 2	0.0000	26.0600	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	635.9785	26.0600	165.7360 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Pumps, fans and electric keep-hot	21.6289	26.0600	5.6365 (249)
Energy for lighting	155.5290	26.0600	40.5309 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-517.8035	26.0600	-134.9396
PV Unit electricity exported	-394.2764	5.8100	-22.9075
Total			-157.8470 (252)
Total energy cost			407.7468 (255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1357.2159	0.1571	213.1636 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	635.9785	0.1412	89.7773 (264)
Space and water heating			302.9409 (265)
Pumps, fans and electric keep-hot	21.6289	0.1387	3.0002 (267)
Energy for lighting	155.5290	0.1443	22.4476 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-517.8035	0.1339	-69.3566
PV Unit electricity exported	-394.2764	0.1221	-48.1319
Total			-117.4886 (269)
Total CO2, kg/year			210.9002 (272)

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

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	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1357.2159	1.5814	2146.3309	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	635.9785	1.5220	967.9508	(278)
Space and water heating			3114.2816	(279)
Pumps, fans and electric keep-hot	21.6289	1.5128	32.7203	(281)
Energy for lighting	155.5290	1.5338	238.5556	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-517.8035	1.4950	-774.1135	
PV Unit electricity exported	-394.2764	0.4479	-176.5776	
Total			-950.6911	(283)
Total Primary energy kWh/year			2434.8664	(286)

SAP 10 EPC IMPROVEMENTS

004 TF Flat Elec DWHP PV

Current energy efficiency rating: B 85
Current environmental impact rating: A 97

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

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

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

Potential energy efficiency rating: B 85
Potential environmental impact rating: A 97

Fuel prices for cost data on this page from database revision number 552 TEST (30 Aug 2024)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current £566	Potential £566	Saving £0
Electricity			
Space heating	£359	£359	£0
Water heating	£166	£166	£0
Lighting	£41	£41	£0
Generated (PV)	-£158	-£158	£0
Total cost of fuels	£408	£408	£0
Total cost of uses	£408	£408	£0
Delivered energy	19 kWh/m²	19 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m²	3 kg/m²	3 kg/m²	0 kg/m²
Primary energy	37 kWh/m²	37 kWh/m²	0 kWh/m²

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

1. Overall dwelling characteristics

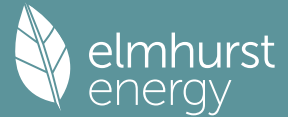
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	66.2930 (1b)	x 2.4000 (2b)	= 159.1032 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.2930		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 159.1032 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 0.0000 / (5) = 0.0000 (8)
Pressure test Yes
Pressure Test Method Blower Door

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Measured/design AP50 3.0000 (17)
Infiltration rate 0.1500 (18)
Number of sides sheltered 1 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1388 (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	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(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	
Solid Door			2.1000	1.0000	2.1000			(26)
Windows (Uw = 1.30)			18.8490	1.2357	23.2937			(27)
W1 - 1	65.3810	18.8490	46.5320	0.1800	8.3758	60.0000	2791.9198	(29a)
W1 - 3	3.6360	2.1000	1.5360	0.2400	0.3686	60.0000	92.1600	(29a)
Rf - Ins Joist	66.2930		66.2930	0.0900	5.9664	9.0000	596.6370	(30)
Total net area of external elements Aum(A, m2)			135.3110					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.1045			(33)
Party Wall			23.7400	0.0000	0.0000	110.0000	2611.4000	(32)
Party Floor 1			66.2930			40.0000	2651.7200	(32d)
Stud			120.9072			9.0000	1088.1648	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9832.0016 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 148.3113 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.3180	0.0500	0.5159
E3 Sill	1.9210	0.0240	0.0461
E4 Jamb	40.2860	0.0190	0.7654
E7 Party floor between dwellings (in blocks of flats)	28.7550	0.0360	1.0352
E14 Flat roof	28.7580	0.1600	4.6013
E16 Corner (normal)	7.2000	0.0370	0.2664
E18 Party wall between dwellings	4.8000	0.0310	0.1488
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	9.8920	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	9.8920	0.2400	2.3741
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			9.7532 (36)
Point Thermal bridges			0.0000 (36a)
Total fabric heat loss			(33) + (36) + (36a) = 49.8577 (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	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	(38)
Heat transfer coeff	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	(39)
Average = Sum(39)m / 12 =													76.1097 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	(40)
HLP (average)													1.1481
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1529 (42)

Hot water usage for mixer showers 60.3163 59.4099 58.0890 55.5618 53.6968 51.6169 50.4347 51.7456 53.1826 55.4157 57.9972 60.0852 (42a)

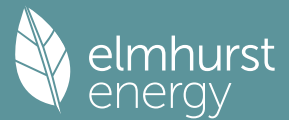
Hot water usage for baths 26.0612 25.6742 25.1291 24.1242 23.3717 22.5373 22.0866 22.6278 23.2171 24.1099 25.1356 25.9731 (42b)

Hot water usage for other uses 36.6776 35.3439 34.0102 32.6764 31.3427 30.0090 30.0090 31.3427 32.6764 34.0102 35.3439 36.6776 (42c)

Average daily hot water use (litres/day) 113.1158 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.0552	120.4280	117.2284	112.3624	108.4112	104.1632	102.5303	105.7161	109.0761	113.5358	118.4767	122.7360	(44)
Energy conte	194.8894	171.4879	180.1756	153.8186	145.9423	128.0808	124.0015	130.8986	134.5017	154.0670	168.7918	192.1749	(45)
Energy content (annual)										Total = Sum(45)m =			1878.8301
Distribution loss (46)m = 0.15 x (45)m	29.2334	25.7232	27.0263	23.0728	21.8913	19.2121	18.6002	19.6348	20.1753	23.1101	25.3188	28.8262	(46)
Water storage loss:													
Store volume													201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6100 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8694 (55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(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	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263	(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	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263	(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)

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Heat gains from water heating, kWh/month
64.8007 57.0197 59.9084 51.1447 48.5258 42.5869 41.2305 43.5238 44.7218 51.2273 56.1233 63.8982 (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	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.0167	19.5551	15.9033	12.0398	8.9999	7.5981	8.2100	10.6717	14.3235	18.1869	21.2268	22.6287	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	281.3365	284.2559	276.8991	261.2374	241.4673	222.8862	210.4729	207.5535	214.9103	230.5720	250.3421	268.9232	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	(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)	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	(71)
Water heating gains (Table 5)	87.0977	84.8508	80.5220	71.0343	65.2229	59.1484	55.4173	58.4997	62.1136	68.8539	77.9490	85.8846	(72)
Total internal gains	483.5787	481.7895	466.4521	437.4392	408.8178	382.7605	367.2280	369.8527	384.4752	410.7406	442.6457	470.5642	(73)

6. Solar gains

[Jan]				Area	Solar flux	g		FF		Access		Gains
				m2	Table 6a	Specific data		Specific data		factor		W
					W/m2	or Table 6b		or Table 6c		Table 6d		
East				6.4140	19.6403	0.4700		0.0000		0.7700		45.5895 (76)
South				6.3150	46.7521	0.4700		0.0000		0.7700		106.8471 (78)
West				6.1200	19.6403	0.4700		0.0000		0.7700		43.4998 (80)
Solar gains	195.9364	349.2656	509.9141	670.5171	775.5209	777.7871	746.8062	669.1806	566.6542	395.5360	237.7341	165.5884 (83)
Total gains	679.5151	831.0551	976.3662	1107.9563	1184.3387	1160.5476	1114.0342	1039.0333	951.1293	806.2766	680.3798	636.1527 (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	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	
alpha	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	
util living area	0.9406	0.8947	0.8171	0.6964	0.5508	0.4066	0.2970	0.3313	0.5165	0.7652	0.9067	0.9506	(86)
MIT	19.4932	19.8509	20.2708	20.6439	20.8677	20.9637	20.9905	20.9861	20.9193	20.5836	19.9484	19.3930	(87)
Th 2	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	(88)
util rest of house	0.9302	0.8779	0.7906	0.6573	0.4999	0.3450	0.2285	0.2589	0.4492	0.7225	0.8887	0.9418	(89)
MIT 2	18.2484	18.6865	19.1885	19.6139	19.8494	19.9382	19.9577	19.9553	19.9041	19.5639	18.8166	18.1243	(90)
Living area fraction									fLA = Living area / (4) =			0.3660	(91)
MIT	18.7039	19.1126	19.5846	19.9909	20.2221	20.3135	20.3356	20.3325	20.2756	19.9371	19.2308	18.5886	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7039	19.1126	19.5846	19.9909	20.2221	20.3135	20.3356	20.3325	20.2756	19.9371	19.2308	18.5886	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9145	0.8618	0.7799	0.6584	0.5131	0.3662	0.2534	0.2850	0.4702	0.7214	0.8735	0.9269	(94)
Useful gains	621.4115	716.2334	761.4706	729.5216	607.6492	424.9869	282.2526	296.1647	447.2323	581.6106	594.3158	589.6394	(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	1096.2798	1081.7195	995.8676	844.1237	648.6142	434.8520	284.3179	299.3039	470.0246	710.6426	923.2702	1095.1110	(97)
Space heating kWh	353.3020	245.6066	174.3914	82.5135	30.4779	0.0000	0.0000	0.0000	0.0000	95.9998	236.8471	376.0709	(98a)
Space heating requirement - total per year (kWh/year)												1595.2093	
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	353.3020	245.6066	174.3914	82.5135	30.4779	0.0000	0.0000	0.0000	0.0000	95.9998	236.8471	376.0709	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1595.2093	
Space heating per m2										(98c) / (4) =		24.0630	(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)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	353.3020	245.6066	174.3914	82.5135	30.4779	0.0000	0.0000	0.0000	0.0000	95.9998	236.8471	376.0709	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	353.3020	245.6066	174.3914	82.5135	30.4779	0.0000	0.0000	0.0000	0.0000	95.9998	236.8471	376.0709	(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)

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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)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263	(64)
Efficiency of water heater												345.3200	(216)
(217)m	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	(217)
Fuel for water heating, kWh/month	64.2421	56.7100	59.9812	52.0968	50.0677	44.6435	43.7139	45.7112	46.5029	52.4205	56.4328	63.4560	(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	1.8370	1.6592	1.8370	1.7777	1.8370	1.7777	1.8370	1.7777	1.8370	1.7777	1.8370	1.8370	(231)
Lighting	19.2711	15.4600	13.9200	10.1984	7.8775	6.4360	7.1862	9.3408	12.1328	15.9189	17.9804	19.8067	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-20.6621	-31.5316	-48.1765	-56.2642	-61.3912	-56.1604	-55.3794	-50.9337	-43.3611	-36.1522	-23.3581	-17.6135	(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	-4.3811	-10.2583	-22.9966	-39.1218	-56.4501	-59.6964	-58.9464	-48.9533	-34.8704	-17.2708	-6.3468	-3.3434	(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												1595.2093	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												345.3200	
Water heating fuel used												635.9785	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.3400, total flow = 21.0000, SFP = 0.1114)													
mechanical ventilation fans (SFP = 0.1114)												21.6289	(230a)
Total electricity for the above, kWh/year												21.6289	(231)
Electricity for lighting (calculated in Appendix L)												155.5290	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-863.6197	(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												1544.7261	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1595.2093	16.4900	263.0500 (240)
Space heating - main system 2	0.0000	16.4900	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	635.9785	16.4900	104.8729 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	21.6289	16.4900	3.5666 (249)
Energy for lighting	155.5290	16.4900	25.6467 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-500.9841	16.4900	-82.6123
PV Unit electricity exported	-362.6356	5.5900	-20.2713
Total			-102.8836 (252)
Total energy cost			294.2526 (255)

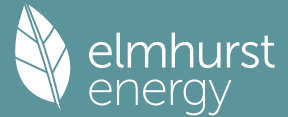
11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)		0.9518 (257)
SAP value		84.5710
SAP rating (Section 12)		85 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1595.2093	0.1564	249.5091 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	635.9785	0.1412	89.7773 (264)
Space and water heating			339.2864 (265)
Pumps, fans and electric keep-hot	21.6289	0.1387	3.0002 (267)
Energy for lighting	155.5290	0.1443	22.4476 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-500.9841	0.1340	-67.1292
PV Unit electricity exported	-362.6356	0.1223	-44.3538
Total			-111.4830 (269)
Total CO2, kg/year			253.2513 (272)
CO2 emissions per m2			3.8200 (273)

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EI value
EI rating
EI band

96.9508
97 (274)
A

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	66.2930 (1b)	x 2.4000 (2b)	= 159.1032 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.2930		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 159.1032 (5)

2. Ventilation rate

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

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1388	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500
Adj infilt rate	0.1457	0.1388	0.1388	0.1283	0.1283	0.1145	0.1179	0.1110	0.1145	0.1214	0.1214	0.1318
Mechanical extract ventilation - decentralised												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
Solid Door			2.1000	1.0000	2.1000		(26)
Windows (Uw = 1.30)			18.8490	1.2357	23.2937		(27)
W1 - 1	65.3810	18.8490	46.5320	0.1800	8.3758	60.0000	2791.9198 (29a)
W1 - 3	3.6360	2.1000	1.5360	0.2400	0.3686	60.0000	92.1600 (29a)
RF - Ins Joist	66.2930		66.2930	0.0900	5.9664	9.0000	596.6370 (30)
Total net area of external elements Aum(A, m ²)			135.3110				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.1045		(33)
Party Wall			23.7400	0.0000	0.0000	110.0000	2611.4000 (32)
Party Floor 1			66.2930			40.0000	2651.7200 (32d)
Stud			120.9072			9.0000	1088.1648 (32c)

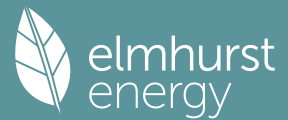
Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9832.0016 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		148.3113 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.3180	0.0500	0.5159
E3 Sill	1.9210	0.0240	0.0461
E4 Jamb	40.2860	0.0190	0.7654
E7 Party floor between dwellings (in blocks of flats)	28.7550	0.0360	1.0352
E14 Flat roof	28.7580	0.1600	4.6013
E16 Corner (normal)	7.2000	0.0370	0.2664
E18 Party wall between dwellings	4.8000	0.0310	0.1488
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	9.8920	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	9.8920	0.2400	2.3741
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			9.7532 (36)
Point Thermal bridges			0.0000
Total fabric heat loss	(33) + (36) + (36a) =		49.8577 (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	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520 (38)
Average = Sum(39)m / 12 =	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

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HLP	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481 (40)
HLP (average)												1.1481
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1529 (42)
Hot water usage for mixer showers	60.3163	59.4099	58.0890	55.5618	53.6968	51.6169	50.4347	51.7456	53.1826	55.4157	57.9972	60.0852 (42a)
Hot water usage for baths	26.0612	25.6742	25.1291	24.1242	23.3717	22.5373	22.0866	22.6278	23.2171	24.1099	25.1356	25.9731 (42b)
Hot water usage for other uses	36.6776	35.3439	34.0102	32.6764	31.3427	30.0090	30.0090	31.3427	32.6764	34.0102	35.3439	36.6776 (42c)
Average daily hot water use (litres/day)												113.1158 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	123.0552	120.4280	117.2284	112.3624	108.4112	104.1632	102.5303	105.7161	109.0761	113.5358	118.4767	122.7360 (44)
Energy content (annual)	194.8894	171.4879	180.1756	153.8186	145.9423	128.0808	124.0015	130.8986	134.5017	154.0670	168.7918	192.1749 (45)
Distribution loss (46)m = 0.15 x (45)m	29.2334	25.7232	27.0263	23.0728	21.8913	19.2121	18.6002	19.6348	20.1753	23.1101	25.3188	28.8262 (46)
Water storage loss:												201.0000 (47)
Store volume												1.6100 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.8694 (55)
Enter (49) or (54) in (55)												
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (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	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263 (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	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263 (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	64.8007	57.0197	59.9084	51.1447	48.5258	42.5869	41.2305	43.5238	44.7218	51.2273	56.1233	63.8982 (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	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.0167	19.5551	15.9033	12.0398	8.9999	7.5981	8.2100	10.6717	14.3235	18.1869	21.2268	22.6287 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	281.3365	284.2559	276.8991	261.2374	241.4673	222.8862	210.4729	207.5535	214.9103	230.5720	250.3421	268.9232 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702 (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)	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152 (71)
Water heating gains (Table 5)	87.0977	84.8508	80.5220	71.0343	65.2229	59.1484	55.4173	58.4997	62.1136	68.8539	77.9490	85.8846 (72)
Total internal gains	483.5787	481.7895	466.4521	437.4392	408.8178	382.7605	367.2280	369.8527	384.4752	410.7406	442.6457	470.5642 (73)

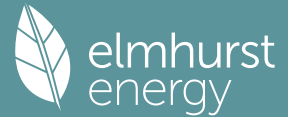
6. Solar gains

[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	
East					6.4140	22.3313		0.4700	0.0000	0.7700		51.8360 (76)	
South					6.3150	50.9848		0.4700	0.0000	0.7700		116.5206 (78)	
West					6.1200	22.3313		0.4700	0.0000	0.7700		49.4600 (80)	
Solar gains	217.8167	349.5042	504.5830	685.2415	773.9169	831.6290	789.4539	721.9383	608.2462	422.7328	270.7714	182.2921 (83)	
Total gains	701.3954	831.2936	971.0352	1122.6807	1182.7347	1214.3895	1156.6819	1091.7910	992.7214	833.4734	713.4170	652.8563 (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	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839
alpha	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923
util living area	0.9273	0.8836	0.7963	0.6530	0.4870	0.3091	0.2032	0.2220	0.4284	0.7102	0.8793	0.9392 (86)
MIT	19.6652	19.9566	20.3757	20.7335	20.9217	20.9878	20.9980	20.9972	20.9615	20.7055	20.1365	19.5764 (87)
Th 2	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618 (88)
util rest of house	0.9144	0.8647	0.7663	0.6093	0.4313	0.2466	0.1355	0.1505	0.3574	0.6594	0.8560	0.9280 (89)
MIT 2	18.4631	18.8167	19.3131	19.7117	19.9013	19.9556	19.9613	19.9611	19.9384	19.6961	19.0447	18.3545 (90)
Living area fraction	18.9030	19.2339	19.7020	20.0857	20.2747	20.3333	20.3407	20.3403	20.3128	20.0655	19.4443	18.8017 (92)
MIT												
FLA = Living area / (4) =												0.3660 (91)

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Temperature adjustment												0.0000
adjusted MIT	18.9030	19.2339	19.7020	20.0857	20.2747	20.3333	20.3407	20.3403	20.3128	20.0655	19.4443	18.8017 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8983	0.8494	0.7581	0.6148	0.4485	0.2692	0.1603	0.1767	0.3819	0.6648	0.8425	0.9125	(94)
Useful gains	630.0964	706.1009	736.1040	690.1967	530.4139	326.9135	185.4437	192.8902	379.1021	554.1330	601.0791	595.6998	(95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Heat loss rate W	1050.5450	1037.6687	936.2999	775.2274	553.6750	329.8089	185.7590	193.3384	389.1356	644.3085	871.0214	1042.8308	(97)
Space heating kWh	312.8137	222.8135	148.9458	61.2221	17.3063	0.0000	0.0000	0.0000	0.0000	67.0906	194.3585	332.6655	(98a)
Space heating requirement - total per year (kWh/year)												1357.2159	
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	312.8137	222.8135	148.9458	61.2221	17.3063	0.0000	0.0000	0.0000	0.0000	67.0906	194.3585	332.6655	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1357.2159	
Space heating per m2										(98c) / (4) =		20.4730	(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)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	312.8137	222.8135	148.9458	61.2221	17.3063	0.0000	0.0000	0.0000	0.0000	67.0906	194.3585	332.6655	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	312.8137	222.8135	148.9458	61.2221	17.3063	0.0000	0.0000	0.0000	0.0000	67.0906	194.3585	332.6655	(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)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263	(64)
Efficiency of water heater												345.3200	(216)
(217)m	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	(217)
Fuel for water heating, kWh/month	64.2421	56.7100	59.9812	52.0968	50.0677	44.6435	43.7139	45.7112	46.5029	52.4205	56.4328	63.4560	(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	1.8370	1.6592	1.8370	1.7777	1.8370	1.7777	1.8370	1.8370	1.7777	1.8370	1.7777	1.8370	(231)
Lighting	19.2711	15.4600	13.9200	10.1984	7.8775	6.4360	7.1862	9.3408	12.1328	15.9189	17.9804	19.8067	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-22.7442	-31.5869	-47.5807	-56.4876	-60.5796	-58.7366	-57.5266	-53.7442	-45.8106	-37.7091	-26.0558	-19.2416	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-5.3292	-10.6073	-23.4797	-41.7397	-57.7190	-65.7675	-63.9880	-54.7690	-38.8843	-19.9073	-8.0681	-4.0173	(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												1357.2159	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												345.3200	
Water heating fuel used												635.9785	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVDe)centralised, Database: total watage = 2.3400, total flow = 21.0000, SFP = 0.1114)													
mechanical ventilation fans (SFP = 0.1114)												21.6289	(230a)
Total electricity for the above, kWh/year												21.6289	(231)
Electricity for lighting (calculated in Appendix L)												155.5290	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-912.0798	(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												1258.2726	(238)

10a. Fuel costs - using BEDF prices (552)

Fuel	Fuel price	Fuel cost
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	kWh/year	p/kWh	£/year
Space heating - main system 1	1357.2159	26.0600	353.6905 (240)
Space heating - main system 2	0.0000	26.0600	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	635.9785	26.0600	165.7360 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Pumps, fans and electric keep-hot	21.6289	26.0600	5.6365 (249)
Energy for lighting	155.5290	26.0600	40.5309 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-517.8035	26.0600	-134.9396
PV Unit electricity exported	-394.2764	5.8100	-22.9075
Total			-157.8470 (252)
Total energy cost			407.7468 (255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1357.2159	0.1571	213.1636 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	635.9785	0.1412	89.7773 (264)
Space and water heating			302.9409 (265)
Pumps, fans and electric keep-hot	21.6289	0.1387	3.0002 (267)
Energy for lighting	155.5290	0.1443	22.4476 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-517.8035	0.1339	-69.3566
PV Unit electricity exported	-394.2764	0.1221	-48.1319
Total			-117.4886 (269)
Total CO2, kg/year			210.9002 (272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1357.2159	1.5814	2146.3309 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	635.9785	1.5220	967.9508 (278)
Space and water heating			3114.2816 (279)
Pumps, fans and electric keep-hot	21.6289	1.5128	32.7203 (281)
Energy for lighting	155.5290	1.5338	238.5556 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-517.8035	1.4950	-774.1135
PV Unit electricity exported	-394.2764	0.4479	-176.5776
Total			-950.6911 (283)
Total Primary energy kWh/year			2434.8664 (286)

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Property Reference	004 TF				Issued on Date	10/09/2024
Assessment Reference	004 TF Flat ASHP		Prop Type Ref	004 TF		
Property	004 TF, 004 TF, 0					
SAP Rating	85 B	DER	3.91	TER	12.92	
Environmental	97 A	% DER < TER				69.74
CO ₂ Emissions (t/year)	0.24	DFEE	34.75	TFEE	35.15	
Compliance Check	See BREL	% DFEE < TFEE				1.12
% DPER < TPER	39.77	DPER	40.97	TPER	68.03	
Assessor Details	Mr. Scott Binstead				Assessor ID	U903-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	66.2930 (1b)	2.4000 (2b)	159.1032 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.2930		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	159.1032 (5)

2. Ventilation rate

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

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	1	(19)

Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1388 (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	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

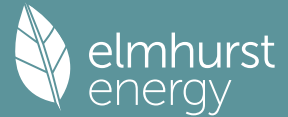
3. Heat losses and heat loss parameter

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
Solid Door			2.1000	1.0000	2.1000		(26)
Windows (Uw = 1.30)			18.8490	1.2357	23.2937		(27)
Wl - 1	65.3810	18.8490	46.5320	0.1800	8.3758	60.0000	2791.9198 (29a)
Wl - 3	3.6360	2.1000	1.5360	0.2400	0.3686	60.0000	92.1600 (29a)
Rf - Ins Joist	66.2930		66.2930	0.0900	5.9664	9.0000	596.6370 (30)
Total net area of external elements Aum(A, m ²)			135.3110				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.1045		(33)
Party Wall			23.7400	0.0000	0.0000	110.0000	2611.4000 (32)
Party Floor 1			66.2930			40.0000	2651.7200 (32d)
Stud			120.9072			9.0000	1088.1648 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9832.0016 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		148.3113 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	10.3180	0.0500	0.5159
E2 Other lintels (including other steel lintels)			

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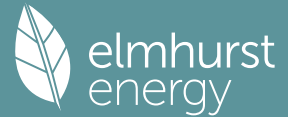
E3 Sill						1.9210		0.0240		0.0461		
E4 Jamb						40.2860		0.0190		0.7654		
E7 Party floor between dwellings (in blocks of flats)						28.7550		0.0360		1.0352		
E14 Flat roof						28.7580		0.1600		4.6013		
E16 Corner (normal)						7.2000		0.0370		0.2664		
E18 Party wall between dwellings						4.8000		0.0310		0.1488		
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)						9.8920		0.0000		0.0000		
P4 Party wall - Roof (insulation at ceiling level)						9.8920		0.2400		2.3741		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)											9.7532	(36)
Point Thermal bridges											0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	49.8577 (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	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520 (38)
Average = Sum(39)m / 12 =	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.1529 (42)
Hot water usage for mixer showers	60.3163	59.4099	58.0890	55.5618	53.6968	51.6169	50.4347	51.7456	53.1826	55.4157	57.9972	60.0852 (42a)
Hot water usage for baths	26.0612	25.6742	25.1291	24.1242	23.3717	22.5373	22.0866	22.6278	23.2171	24.1099	25.1356	25.9731 (42b)
Hot water usage for other uses	36.6776	35.3439	34.0102	32.6764	31.3427	30.0090	30.0090	31.3427	32.6764	34.0102	35.3439	36.6776 (42c)
Average daily hot water use (litres/day)												113.1158 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	123.0552	120.4280	117.2284	112.3624	108.4112	104.1632	102.5303	105.7161	109.0761	113.5358	118.4767	122.7360 (44)
Energy content (annual)	194.8894	171.4879	180.1756	153.8186	145.9423	128.0808	124.0015	130.8986	134.5017	154.0670	168.7918	192.1749 (45)
Distribution loss (46)m = 0.15 x (45)m	29.2334	25.7232	27.0263	23.0728	21.8913	19.2121	18.6002	19.6348	20.1753	23.1101	25.3188	28.8262 (46)
Water storage loss:												150.0000 (47)
Store volume												1.0000 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.5400 (55)
Enter (49) or (54) in (55)												0.5400 (55)
Total storage loss	16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400 (56)
If cylinder contains dedicated solar storage	16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	234.8918	207.6191	220.1780	192.5306	185.9447	166.7928	164.0039	170.9010	173.2137	194.0694	207.5038	232.1773 (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	234.8918	207.6191	220.1780	192.5306	185.9447	166.7928	164.0039	170.9010	173.2137	194.0694	207.5038	232.1773 (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	96.8026	85.9247	91.9103	82.1143	80.5277	73.5565	73.2324	75.5257	75.6914	83.2292	87.0929	95.9001 (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	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	22.0167	19.5551	15.9033	12.0398	8.9999	7.5981	8.2100	10.6717	14.3235	18.1869	21.2268	22.6287 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	281.3365	284.2559	276.8991	261.2374	241.4673	222.8862	210.4729	207.5535	214.9103	230.5720	250.3421	268.9232 (68)
Pumps, fans	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702 (69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Water heating gains (Table 5)	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152 (71)
Total internal gains	130.1111	127.8641	123.5354	114.0476	108.2362	102.1618	98.4307	101.5131	105.1270	111.8672	120.9623	128.8980 (72)
	526.5920	524.8028	509.4655	480.4525	451.8312	425.7738	410.2413	412.8660	427.4885	453.7539	485.6590	513.5775 (73)

6. Solar gains												
[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	Specific data	Specific data	factor	W						
		W/m2	or Table 6b	or Table 6c	Table 6d							
East	6.4140	19.6403	0.4700	0.0000	0.7700	45.5895 (76)						
South	6.3150	46.7521	0.4700	0.0000	0.7700	106.8471 (78)						
West	6.1200	19.6403	0.4700	0.0000	0.7700	43.4998 (80)						
Solar gains	195.9364	349.2656	509.9141	670.5171	775.5209	777.7871	746.8062	669.1806	566.6542	395.5360	237.7341	165.5884 (83)
Total gains	722.5285	874.0684	1019.3795	1150.9696	1227.3520	1203.5609	1157.0476	1082.0466	994.1427	849.2899	723.3931	679.1660 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839
alpha	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923
util living area	0.9307	0.8821	0.8020	0.6799	0.5353	0.3933	0.2863	0.3188	0.4978	0.7444	0.8927	0.9416 (86)
Living	19.5726	19.9166	20.3178	20.6701	20.8788	20.9672	20.9915	20.9876	20.9278	20.6201	20.0172	19.4758
Non living	18.7025	19.0290	19.4007	19.7118	19.8819	19.9452	19.9589	19.9573	19.9219	19.6812	19.1329	18.6095
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.2698	19.9166	20.3178	20.6701	20.8788	20.9672	20.9915	20.9876	20.9278	20.6201	20.0172	19.6890 (87)
Th 2	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618 (88)
util rest of house	0.9189	0.8640	0.7743	0.6404	0.4850	0.3333	0.2201	0.2488	0.4319	0.7004	0.8727	0.9314 (89)
MIT 2	19.3176	19.0290	19.4007	19.7118	19.8819	19.9452	19.9589	19.9573	19.9219	19.6812	19.1329	18.7987 (90)
Living area fraction									fLA = Living area / (4) =			0.3660 (91)
MIT	19.6661	19.3538	19.7363	20.0625	20.2467	20.3192	20.3368	20.3344	20.2900	20.0248	19.4565	19.1245 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6661	19.3538	19.7363	20.0625	20.2467	20.3192	20.3368	20.3344	20.2900	20.0248	19.4565	19.1245 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9152	0.8519	0.7677	0.6444	0.4992	0.3543	0.2442	0.2742	0.4533	0.7033	0.8615	0.9216 (94)
Useful gains	661.2268	744.6194	782.6236	741.7290	612.6812	426.3666	282.5662	296.6614	450.6703	597.3054	623.1950	625.8935 (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	1169.5063	1100.0779	1007.4120	849.5761	650.4875	435.2897	284.4072	299.4444	471.1203	717.3181	940.4520	1135.8992 (97)
Space heating kWh	378.1599	238.8682	167.2426	77.6499	28.1279	0.0000	0.0000	0.0000	0.0000	89.2895	228.4250	379.4443 (98a)
Space heating requirement - total per year (kWh/year)												1587.2072
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	378.1599	238.8682	167.2426	77.6499	28.1279	0.0000	0.0000	0.0000	0.0000	89.2895	228.4250	379.4443 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1587.2072
Space heating per m2										(98c) / (4) =		23.9423 (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 %)												243.2803 (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	378.1599	238.8682	167.2426	77.6499	28.1279	0.0000	0.0000	0.0000	0.0000	89.2895	228.4250	379.4443 (98)
Space heating efficiency (main heating system 1)	243.2803	243.2803	243.2803	243.2803	243.2803	0.0000	0.0000	0.0000	0.0000	243.2803	243.2803	243.2803 (210)
Space heating fuel (main heating system)	155.4420	98.1864	68.7448	31.9179	11.5619	0.0000	0.0000	0.0000	0.0000	36.7023	93.8937	155.9700 (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	234.8918	207.6191	220.1780	192.5306	185.9447	166.7928	164.0039	170.9010	173.2137	194.0694	207.5038	232.1773 (64)
Efficiency of water heater (217)m	266.5596	266.5596	266.5596	266.5596	266.5596	266.5596	266.5596	266.5596	266.5596	266.5596	266.5596	266.5596 (216)
Fuel for water heating, kWh/month	88.1198	77.8884	82.5999	72.2280	69.7573	62.5724	61.5262	64.1136	64.9812	72.8053	77.8452	87.1015 (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	1.8370	1.6592	1.8370	1.7777	1.8370	1.7777	1.8370	1.8370	1.7777	1.8370	1.7777	1.8370 (231)
Lighting	19.2711	15.4600	13.9200	10.1984	7.8775	6.4360	7.1862	9.3408	12.1328	15.9189	17.9804	19.8067 (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												652.4190 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												266.5596
Water heating fuel used												881.5388 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												

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(MEVDecentralised, Database: total watage = 2.3400, total flow = 21.0000, SFP = 0.1114)	
mechanical ventilation fans (SFP = 0.1114)	21.6289 (230a)
Total electricity for the above, kWh/year	21.6289 (231)
Electricity for lighting (calculated in Appendix L)	155.5290 (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	1711.1158 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	652.4190	16.4900	107.5839 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	881.5388	16.4900	145.3657 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	21.6289	16.4900	3.5666 (249)
Energy for lighting	155.5290	16.4900	25.6467 (250)
Additional standing charges			0.0000 (251)
Total energy cost			282.1630 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.9127 (257)
SAP value		85.2049
SAP rating (Section 12)		85 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	652.4190	0.1567	102.2478 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	881.5388	0.1410	124.3002 (264)
Space and water heating			226.5481 (265)
Pumps, fans and electric keep-hot	21.6289	0.1387	3.0002 (267)
Energy for lighting	155.5290	0.1443	22.4476 (268)
Total CO2, kg/year			251.9959 (272)
CO2 emissions per m2			3.8000 (273)
EI value			96.9659
EI rating			97 (274)
EI band			A

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

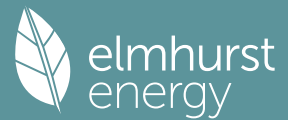
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	66.2930 (1b)	2.4000 (2b)	159.1032 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.2930		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	159.1032 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Air changes per hour	0.0000 / (5) = 0.0000 (8)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Yes
Pressure test	Blower Door
Pressure Test Method	3.0000 (17)
Measured/design AP50	0.1500 (18)
Infiltration rate	1 (19)
Number of sides sheltered	
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)

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Infiltration rate adjusted to include shelter factor

(21) = (18) x (20) = 0.1388 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000	(22)
Adj infilt rate	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500	(22a)
	0.1457	0.1388	0.1388	0.1283	0.1283	0.1145	0.1179	0.1110	0.1145	0.1214	0.1214	0.1318	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(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	
Solid Door			2.1000	1.0000	2.1000			(26)
Windows (Uw = 1.30)			18.8490	1.2357	23.2937			(27)
W1 - 1	65.3810	18.8490	46.5320	0.1800	8.3758	60.0000	2791.9198	(29a)
W1 - 3	3.6360	2.1000	1.5360	0.2400	0.3686	60.0000	92.1600	(29a)
Rf - Ins Joist	66.2930		66.2930	0.0900	5.9664	9.0000	596.6370	(30)
Total net area of external elements Aum(A, m2)			135.3110					(31)
Fabric heat loss, W/K = Sum (A x U)								(32)
Party Wall			23.7400	0.0000	0.0000	110.0000	2611.4000	(32)
Party Floor 1			66.2930			40.0000	2651.7200	(32d)
Stud			120.9072			9.0000	1088.1648	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) = 9832.0016 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 148.3113 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element	10.3180	0.0500	0.5159	
E2 Other lintels (including other steel lintels)	1.9210	0.0240	0.0461	
E3 Sill	40.2860	0.0190	0.7654	
E4 Jamb	28.7550	0.0360	1.0352	
E7 Party floor between dwellings (in blocks of flats)	28.7580	0.1600	4.6013	
E14 Flat roof	7.2000	0.0370	0.2664	
E16 Corner (normal)	4.8000	0.0310	0.1488	
E18 Party wall between dwellings	9.8920	0.0000	0.0000	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	9.8920	0.2400	2.3741	9.7532 (36)
P4 Party wall - Roof (insulation at ceiling level)				0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				(33) + (36) + (36a) = 49.8577 (37)
Point Thermal bridges				
Total fabric heat loss				

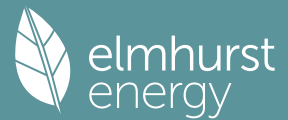
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	(38)
Average = Sum(39)m / 12 =	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	(39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1529 (42)
Hot water usage for mixer showers	60.3163	59.4099	58.0890	55.5618	53.6968	51.6169	50.4347	51.7456	53.1826	55.4157	57.9972	60.0852 (42a)
Hot water usage for baths	26.0612	25.6742	25.1291	24.1242	23.3717	22.5373	22.0866	22.6278	23.2171	24.1099	25.1356	25.9731 (42b)
Hot water usage for other uses	36.6776	35.3439	34.0102	32.6764	31.3427	30.0090	30.0090	31.3427	32.6764	34.0102	35.3439	36.6776 (42c)
Average daily hot water use (litres/day)												113.1158 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	123.0552	120.4280	117.2284	112.3624	108.4112	104.1632	102.5303	105.7161	109.0761	113.5358	118.4767	122.7360 (44)
Energy content (annual)	194.8894	171.4879	180.1756	153.8186	145.9423	128.0808	124.0015	130.8986	134.5017	154.0670	168.7918	192.1749 (45)
Distribution loss (46)m = 0.15 x (45)m	29.2334	25.7232	27.0263	23.0728	21.8913	19.2121	18.6002	19.6348	20.1753	23.1101	25.3188	28.8262 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.0000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.5400 (55)
Total storage loss	16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400 (56)
If cylinder contains dedicated solar storage	16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	234.8918	207.6191	220.1780	192.5306	185.9447	166.7928	164.0039	170.9010	173.2137	194.0694	207.5038	232.1773 (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	234.8918	207.6191	220.1780	192.5306	185.9447	166.7928	164.0039	170.9010	173.2137	194.0694	207.5038	232.1773 (64)
	Total per year (kWh/year) = Sum(64)m =											2349.8261 (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	96.8026	85.9247	91.9103	82.1143	80.5277	73.5565	73.2324	75.5257	75.6914	83.2292	87.0929	95.9001 (65)

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.0167	19.5551	15.9033	12.0398	8.9999	7.5981	8.2100	10.6717	14.3235	18.1869	21.2268	22.6287 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	281.3365	284.2559	276.8991	261.2374	241.4673	222.8862	210.4729	207.5535	214.9103	230.5720	250.3421	268.9232 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702 (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)	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152 (71)
Water heating gains (Table 5)	130.1111	127.8641	123.5354	114.0476	108.2362	102.1618	98.4307	101.5131	105.1270	111.8672	120.9623	128.8980 (72)
Total internal gains	526.5920	524.8028	509.4655	480.4525	451.8312	425.7738	410.2413	412.8660	427.4885	453.7539	485.6590	513.5775 (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
East					6.4140	22.3313		0.4700	0.0000	0.7700		51.8360 (76)
South					6.3150	50.9848		0.4700	0.0000	0.7700		116.5206 (78)
West					6.1200	22.3313		0.4700	0.0000	0.7700		49.4600 (80)
Solar gains	217.8167	349.5042	504.5830	685.2415	773.9169	831.6290	789.4539	721.9383	608.2462	422.7328	270.7714	182.2921 (83)
Total gains	744.4088	874.3070	1014.0485	1165.6941	1225.7480	1257.4028	1199.6952	1134.8043	1035.7347	876.4868	756.4304	695.8697 (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	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839
alpha	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923
util living area	0.9160	0.8702	0.7802	0.6363	0.4723	0.2990	0.1960	0.2137	0.4123	0.6886	0.8632	0.9287 (86)
Living	19.7403	20.0192	20.4183	20.7542	20.9286	20.9890	20.9982	20.9975	20.9657	20.7332	20.1977	19.6553
Non living	18.8650	19.1271	19.4933	19.7829	19.9190	19.9574	19.9614	19.9613	19.9457	19.7758	19.3024	18.7845
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.3556	20.0192	20.4183	20.7542	20.9286	20.9890	20.9982	20.9975	20.9657	20.7332	20.1977	19.8434 (87)
Th 2	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618 (88)
util rest of house	0.9016	0.8499	0.7491	0.5926	0.4176	0.2384	0.1307	0.1448	0.3434	0.6371	0.8380	0.9160 (89)
MIT 2	19.4007	19.1271	19.4933	19.7829	19.9190	19.9574	19.9614	19.9613	19.9457	19.7758	19.3024	18.9491 (90)
Living area fraction	19.7502	19.4536	19.8318	20.1383	20.2885	20.3349	20.3408	20.3405	20.3190	20.1262	19.6300	19.2764 (92)
MIT	19.7502	19.4536	19.8318	20.1383	20.2885	20.3349	20.3408	20.3405	20.3190	20.1262	19.6300	19.2764 (93)
Temperature adjustment												0.0000
adjusted MIT	19.7502	19.4536	19.8318	20.1383	20.2885	20.3349	20.3408	20.3405	20.3190	20.1262	19.6300	19.2764 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8984	0.8386	0.7449	0.6003	0.4352	0.2603	0.1546	0.1700	0.3675	0.6458	0.8288	0.9061 (94)
Useful gains	668.7448	733.2243	755.3393	699.8016	533.4460	327.3231	185.4917	192.9612	380.6654	566.0150	626.9582	630.5493 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	1115.0186	1054.3919	946.1796	779.2369	554.7242	329.9316	185.7722	193.3577	389.6030	648.9259	885.1574	1078.9617 (97)
Space heating kWh	332.0277	215.8246	141.9852	57.1934	15.8310	0.0000	0.0000	0.0000	0.0000	61.6857	185.9035	333.6188 (98a)
Space heating requirement - total per year (kWh/year)												1344.0699
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	332.0277	215.8246	141.9852	57.1934	15.8310	0.0000	0.0000	0.0000	0.0000	61.6857	185.9035	333.6188 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1344.0699
Space heating per m ²										(98c) / (4) =		20.2747 (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 %)												243.2803 (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	332.0277	215.8246	141.9852	57.1934	15.8310	0.0000	0.0000	0.0000	0.0000	61.6857	185.9035	333.6188 (98)
Space heating efficiency (main heating system 1)	243.2803	243.2803	243.2803	243.2803	243.2803	0.0000	0.0000	0.0000	0.0000	243.2803	243.2803	243.2803 (210)
Space heating fuel (main heating system)	136.4795	88.7144	58.3628	23.5093	6.5073	0.0000	0.0000	0.0000	0.0000	25.3558	76.4153	137.1335 (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)												

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	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	234.8918	207.6191	220.1780	192.5306	185.9447	166.7928	164.0039	170.9010	173.2137	194.0694	207.5038	232.1773	(64)
Efficiency of water heater	266.5596	266.5596	266.5596	266.5596	266.5596	266.5596	266.5596	266.5596	266.5596	266.5596	266.5596	266.5596	(216)
(217)m	266.5596	266.5596	266.5596	266.5596	266.5596	266.5596	266.5596	266.5596	266.5596	266.5596	266.5596	266.5596	(217)
Fuel for water heating, kWh/month	88.1198	77.8884	82.5999	72.2280	69.7573	62.5724	61.5262	64.1136	64.9812	72.8053	77.8452	87.1015	(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	1.8370	1.6592	1.8370	1.7777	1.8370	1.7777	1.8370	1.7777	1.8370	1.7777	1.8370	1.7777	(231)
Lighting	19.2711	15.4600	13.9200	10.1984	7.8775	6.4360	7.1862	9.3408	12.1328	15.9189	17.9804	19.8067	(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												552.4778	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												266.5596	
Water heating fuel used												881.5388	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.3400, total flow = 21.0000, SFP = 0.1114)													
mechanical ventilation fans (SFP = 0.1114)												21.6289	(230a)
Total electricity for the above, kWh/year												21.6289	(231)
Electricity for lighting (calculated in Appendix L)												155.5290	(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												1611.1746	(238)

10a. Fuel costs - using BEDF prices (552)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	552.4778	26.0600	143.9757	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	881.5388	26.0600	229.7290	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	21.6289	26.0600	5.6365	(249)
Energy for lighting	155.5290	26.0600	40.5309	(250)
Additional standing charges			0.0000	(251)
Total energy cost			419.8721	(255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	552.4778	0.1573	86.9306	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	881.5388	0.1410	124.3002	(264)
Space and water heating			211.2309	(265)
Pumps, fans and electric keep-hot	21.6289	0.1387	3.0002	(267)
Energy for lighting	155.5290	0.1443	22.4476	(268)
Total CO2, kg/year			236.6787	(272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	552.4778	1.5825	874.2729	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	881.5388	1.5214	1341.1606	(278)
Space and water heating			2215.4334	(279)
Pumps, fans and electric keep-hot	21.6289	1.5128	32.7203	(281)
Energy for lighting	155.5290	1.5338	238.5556	(282)
Total Primary energy kWh/year			2486.7092	(286)

SAP 10 EPC IMPROVEMENTS

004 TF Flat ASHP

Current energy efficiency rating:
Current environmental impact rating:

B 85
A 97

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

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

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

Potential energy efficiency rating: B 85
Potential environmental impact rating: A 97

Fuel prices for cost data on this page from database revision number 552 TEST (30 Aug 2024)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current £420	Potential £420	Saving £0
Electricity			
Space heating	£150	£150	£0
Water heating	£230	£230	£0
Lighting	£41	£41	£0
Total cost of fuels	£420	£420	£0
Total cost of uses	£421	£421	£0
Delivered energy	24 kWh/m ²	24 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m ²	4 kg/m ²	4 kg/m ²	0 kg/m ²
Primary energy	38 kWh/m ²	38 kWh/m ²	0 kWh/m ²

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	66.2930 (1b)	x 2.4000 (2b)	= 159.1032 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.2930		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 159.1032 (5)

2. Ventilation rate

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

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 0.0000 / (5) = 0.0000 (8)

Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 3.0000 (17)
Infiltration rate 0.1500 (18)
Number of sides sheltered 1 (19)

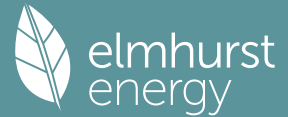
Shelter factor (20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1388 (21)

	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	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
Solid Door			2.1000	1.0000	2.1000		(26)
Windows (Uw = 1.30)			18.8490	1.2357	23.2937		(27)

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W1 - 1	65.3810	18.8490	46.5320	0.1800	8.3758	60.0000	2791.9198 (29a)
W1 - 3	3.6360	2.1000	1.5360	0.2400	0.3686	60.0000	92.1600 (29a)
Rf - Ins Joist	66.2930		66.2930	0.0900	5.9664	9.0000	596.6370 (30)
Total net area of external elements Aum(A, m2)			135.3110				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	40.1045			(33)
Party Wall			23.7400	0.0000	0.0000	110.0000	2611.4000 (32)
Party Floor 1			66.2930			40.0000	2651.7200 (32d)
Stud			120.9072			9.0000	1088.1648 (32c)

Heat capacity Cm = Sum(A x k)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
 List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.3180	0.0500	0.5159
E3 Sill	1.9210	0.0240	0.0461
E4 Jamb	40.2860	0.0190	0.7654
E7 Party floor between dwellings (in blocks of flats)	28.7550	0.0360	1.0352
E14 Flat roof	28.7580	0.1600	4.6013
E16 Corner (normal)	7.2000	0.0370	0.2664
E18 Party wall between dwellings	4.8000	0.0310	0.1488
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	9.8920	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	9.8920	0.2400	2.3741

Thermal bridges (Sum(L x Psi) calculated using Appendix K)
 Point Thermal bridges
 Total fabric heat loss

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	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520
Average = Sum(39)m / 12 =	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.1529 (42)
Hot water usage for mixer showers													
Hot water usage for baths													
Hot water usage for other uses													
Average daily hot water use (litres/day)													113.1158 (43)

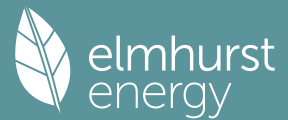
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	123.0552	120.4280	117.2284	112.3624	108.4112	104.1632	102.5303	105.7161	109.0761	113.5358	118.4767	122.7360 (44)
Energy content (annual)	194.8894	171.4879	180.1756	153.8186	145.9423	128.0808	124.0015	130.8986	134.5017	154.0670	168.7918	192.1749 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.0000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.5400 (55)
Total storage loss												
If cylinder contains dedicated solar storage												
Primary loss												
Combi loss												
Total heat required for water heating calculated for each month												
WWHRS												
PV diverter												
Solar input												
FGHRS												
Output from w/h												
Electric shower(s)												
Heat gains from water heating, kWh/month												

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	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	22.0167	19.5551	15.9033	12.0398	8.9999	7.5981	8.2100	10.6717	14.3235	18.1869	21.2268	22.6287 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	281.3365	284.2559	276.8991	261.2374	241.4673	222.8862	210.4729	207.5535	214.9103	230.5720	250.3421	268.9232 (68)
Pumps, fans	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702 (69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Water heating gains (Table 5)	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152 (71)
Total internal gains	130.1111	127.8641	123.5354	114.0476	108.2362	102.1618	98.4307	101.5131	105.1270	111.8672	120.9623	128.8980 (72)

6. Solar gains

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[Jan]	Area m2				Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
East	6.4140				19.6403	0.4700	0.0000	0.7700	45.5895 (76)			
South	6.3150				46.7521	0.4700	0.0000	0.7700	106.8471 (78)			
West	6.1200				19.6403	0.4700	0.0000	0.7700	43.4998 (80)			
Solar gains	195.9364	349.2656	509.9141	670.5171	775.5209	777.7871	746.8062	669.1806	566.6542	395.5360	237.7341	165.5884 (83)
Total gains	722.5285	874.0684	1019.3795	1150.9696	1227.3520	1203.5609	1157.0476	1082.0466	994.1427	849.2899	723.3931	679.1660 (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	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839
alpha	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923
util living area	0.9307	0.8821	0.8020	0.6799	0.5353	0.3933	0.2863	0.3188	0.4978	0.7444	0.8927	0.9416 (86)
Living	19.5726	19.9166	20.3178	20.6701	20.8788	20.9672	20.9915	20.9876	20.9278	20.6201	20.0172	19.4758
Non living	18.7025	19.0290	19.4007	19.7118	19.8819	19.9452	19.9589	19.9573	19.9219	19.6812	19.1329	18.6095
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.2698	19.9166	20.3178	20.6701	20.8788	20.9672	20.9915	20.9876	20.9278	20.6201	20.0172	19.6890 (87)
Th 2	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618 (88)
util rest of house	0.9189	0.8640	0.7743	0.6404	0.4850	0.3333	0.2201	0.2488	0.4319	0.7004	0.8727	0.9314 (89)
MIT 2	19.3176	19.0290	19.4007	19.7118	19.8819	19.9452	19.9589	19.9573	19.9219	19.6812	19.1329	18.7987 (90)
Living area fraction										FLA = Living area / (4) =		0.3660 (91)
MIT	19.6661	19.3538	19.7363	20.0625	20.2467	20.3192	20.3368	20.3344	20.2900	20.0248	19.4565	19.1245 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6661	19.3538	19.7363	20.0625	20.2467	20.3192	20.3368	20.3344	20.2900	20.0248	19.4565	19.1245 (93)

8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9152	0.8519	0.7677	0.6444	0.4992	0.3543	0.2442	0.2742	0.4533	0.7033	0.8615	0.9216 (94)
Useful gains	661.2268	744.6194	782.6236	741.7290	612.6812	426.3666	282.5662	296.6614	450.6703	597.3054	623.1950	625.8935 (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	1169.5063	1100.0779	1007.4120	849.5761	650.4875	435.2897	284.4072	299.4444	471.1203	717.3181	940.4520	1135.8992 (97)
Space heating kWh	378.1599	238.8682	167.2426	77.6499	28.1279	0.0000	0.0000	0.0000	0.0000	89.2895	228.4250	379.4443 (98a)
Space heating requirement - total per year (kWh/year)												1587.2072
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	378.1599	238.8682	167.2426	77.6499	28.1279	0.0000	0.0000	0.0000	0.0000	89.2895	228.4250	379.4443 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1587.2072
Space heating per m2										(98c) / (4) =		23.9423 (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 %)												243.2803 (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	378.1599	238.8682	167.2426	77.6499	28.1279	0.0000	0.0000	0.0000	0.0000	89.2895	228.4250	379.4443 (98)
Space heating efficiency (main heating system 1)	243.2803	243.2803	243.2803	243.2803	243.2803	0.0000	0.0000	0.0000	0.0000	243.2803	243.2803	243.2803 (210)
Space heating fuel (main heating system)	155.4420	98.1864	68.7448	31.9179	11.5619	0.0000	0.0000	0.0000	0.0000	36.7023	93.8937	155.9700 (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	234.8918	207.6191	220.1780	192.5306	185.9447	166.7928	164.0039	170.9010	173.2137	194.0694	207.5038	232.1773 (64)
Efficiency of water heater (217)m	266.5596	266.5596	266.5596	266.5596	266.5596	266.5596	266.5596	266.5596	266.5596	266.5596	266.5596	266.5596 (216)
Fuel for water heating, kWh/month	88.1198	77.8884	82.5999	72.2280	69.7573	62.5724	61.5262	64.1136	64.9812	72.8053	77.8452	87.1015 (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	1.8370	1.6592	1.8370	1.7777	1.8370	1.7777	1.8370	1.8370	1.7777	1.8370	1.7777	1.8370 (231)
Lighting	19.2711	15.4600	13.9200	10.1984	7.8775	6.4360	7.1862	9.3408	12.1328	15.9189	17.9804	19.8067 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	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)												

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(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												652.4190	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												266.5596	
Water heating fuel used												881.5388	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.3400, total flow = 21.0000, SFP = 0.1114)													
mechanical ventilation fans (SFP = 0.1114)												21.6289	(230a)
Total electricity for the above, kWh/year												21.6289	(231)
Electricity for lighting (calculated in Appendix L)												155.5290	(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												1711.1158	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	652.4190	16.4900	107.5839	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	881.5388	16.4900	145.3657	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	21.6289	16.4900	3.5666	(249)
Energy for lighting	155.5290	16.4900	25.6467	(250)
Additional standing charges			0.0000	(251)
Total energy cost			282.1630	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.9127	(257)
SAP value		85.2049	
SAP rating (Section 12)		85	(258)
SAP band		B	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	652.4190	0.1567	102.2478	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	881.5388	0.1410	124.3002	(264)
Space and water heating			226.5481	(265)
Pumps, fans and electric keep-hot	21.6289	0.1387	3.0002	(267)
Energy for lighting	155.5290	0.1443	22.4476	(268)
Total CO2, kg/year			251.9959	(272)
CO2 emissions per m2			3.8000	(273)
EI value			96.9659	
EI rating			97	(274)
EI band			A	

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

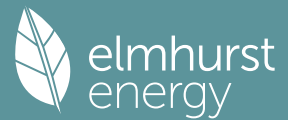
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	66.2930	(1b)	x	2.4000 (2b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.2930		=	159.1032 (1b) - (3b)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	159.1032 (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)

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Number of blocked chimneys 0 * 20 = 0.0000 (6f)
Number of intermittent extract fans 0 * 10 = 0.0000 (7a)
Number of passive vents 0 * 10 = 0.0000 (7b)
Number of flueless gas fires 0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 0.0000 / (5) = 0.0000 (8)
Pressure Test Yes
Pressure Test Method Blower Door
Measured/design AP50 3.0000 (17)
Infiltration rate 0.1500 (18)
Number of sides sheltered 1 (19)
Shelter factor (20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1388 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000	(22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500	(22a)
Adj infilt rate	0.1457	0.1388	0.1388	0.1283	0.1283	0.1145	0.1179	0.1110	0.1145	0.1214	0.1214	0.1318	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(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	
Solid Door			2.1000	1.0000	2.1000			(26)
Windows (Uw = 1.30)			18.8490	1.2357	23.2937			(27)
W1 - 1	65.3810	18.8490	46.5320	0.1800	8.3758	60.0000	2791.9198	(29a)
W1 - 3	3.6360	2.1000	1.5360	0.2400	0.3686	60.0000	92.1600	(29a)
Rf - Ins Joist	66.2930		66.2930	0.0900	5.9664	9.0000	596.6370	(30)
Total net area of external elements Aum(A, m2)			135.3110					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 40.1045			(33)
Party Wall			23.7400	0.0000	0.0000	110.0000	2611.4000	(32)
Party Floor 1			66.2930			40.0000	2651.7200	(32d)
Stud			120.9072			9.0000	1088.1648	(32c)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K (28)...(30) + (32) + (32a)...(32e) = 9832.0016 (34)
List of Thermal Bridges 148.3113 (35)

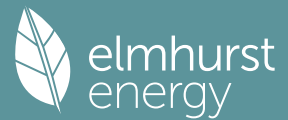
	Length	Psi-value	Total	
K1 Element	10.3180	0.0500	0.5159	
E2 Other lintels (including other steel lintels)	1.9210	0.0240	0.0461	
E3 Sill	40.2860	0.0190	0.7654	
E4 Jamb	28.7550	0.0360	1.0352	
E7 Party floor between dwellings (in blocks of flats)	28.7580	0.1600	4.6013	
E14 Flat roof	7.2000	0.0370	0.2664	
E16 Corner (normal)	4.8000	0.0310	0.1488	
E18 Party wall between dwellings	9.8920	0.0000	0.0000	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	9.8920	0.2400	2.3741	
P4 Party wall - Roof (insulation at ceiling level)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			9.7532	(36)
Point Thermal bridges			(36a) = 0.0000	
Total fabric heat loss			(33) + (36) + (36a) = 49.8577	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
Jan 26.2520 Feb 26.2520 Mar 26.2520 Apr 26.2520 May 26.2520 Jun 26.2520 Jul 26.2520 Aug 26.2520 Sep 26.2520 Oct 26.2520 Nov 26.2520 Dec 26.2520 (38)
Heat transfer coeff 76.1097 76.1097 76.1097 76.1097 76.1097 76.1097 76.1097 76.1097 76.1097 76.1097 76.1097 76.1097 (39)
Average = Sum(39)m / 12 = 76.1097
Jan 1.1481 Feb 1.1481 Mar 1.1481 Apr 1.1481 May 1.1481 Jun 1.1481 Jul 1.1481 Aug 1.1481 Sep 1.1481 Oct 1.1481 Nov 1.1481 Dec 1.1481 (40)
HLP (average) 1.1481
Days in month 31 28 31 30 31 30 31 31 30 31 30 31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1529 (42)
Hot water usage for mixer showers 60.3163 59.4099 58.0890 55.5618 53.6968 51.6169 50.4347 51.7456 53.1826 55.4157 57.9972 60.0852 (42a)
Hot water usage for baths 26.0612 25.6742 25.1291 24.1242 23.3717 22.5373 22.0866 22.6278 23.2171 24.1099 25.1356 25.9731 (42b)
Hot water usage for other uses 36.6776 35.3439 34.0102 32.6764 31.3427 30.0090 30.0090 31.3427 32.6764 34.0102 35.3439 36.6776 (42c)
Average daily hot water use (litres/day) 113.1158 (43)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Daily hot water use 123.0552 120.4280 117.2284 112.3624 108.4112 104.1632 102.5303 105.7161 109.0761 113.5358 118.4767 122.7360 (44)
Energy content 194.8894 171.4879 180.1756 153.8186 145.9423 128.0808 124.0015 130.8986 134.5017 154.0670 168.7918 192.1749 (45)
Energy content (annual) Total = Sum(45)m = 1878.8301
Distribution loss (46)m = 0.15 x (45)m 29.2334 25.7232 27.0263 23.0728 21.8913 19.2121 18.6002 19.6348 20.1753 23.1101 25.3188 28.8262 (46)
Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.0000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.5400 (55)
Total storage loss 16.7400 15.1200 16.7400 16.2000 16.7400 16.2000 16.7400 16.7400 16.2000 16.7400 16.2000 16.7400 (56)
If cylinder contains dedicated solar storage 16.7400 15.1200 16.7400 16.2000 16.7400 16.2000 16.7400 16.7400 16.2000 16.7400 16.2000 16.7400 (57)
Primary loss 23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 23.2624 23.2624 22.5120 23.2624 22.5120 23.2624 (59)
Combi loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (61)
Total heat required for water heating calculated for each month 234.8918 207.6191 220.1780 192.5306 185.9447 166.7928 164.0039 170.9010 173.2137 194.0694 207.5038 232.1773 (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)

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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	234.8918	207.6191	220.1780	192.5306	185.9447	166.7928	164.0039	170.9010	173.2137	194.0694	207.5038	232.1773	(64)
Total per year (kWh/year) = Sum(64)m =													2349.8261 (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	96.8026	85.9247	91.9103	82.1143	80.5277	73.5565	73.2324	75.5257	75.6914	83.2292	87.0929	95.9001	(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	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.0167	19.5551	15.9033	12.0398	8.9999	7.5981	8.2100	10.6717	14.3235	18.1869	21.2268	22.6287	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	281.3365	284.2559	276.8991	261.2374	241.4673	222.8862	210.4729	207.5535	214.9103	230.5720	250.3421	268.9232	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	(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)	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	(71)
Water heating gains (Table 5)	130.1111	127.8641	123.5354	114.0476	108.2362	102.1618	98.4307	101.5131	105.1270	111.8672	120.9623	128.8980	(72)
Total internal gains	526.5920	524.8028	509.4655	480.4525	451.8312	425.7738	410.2413	412.8660	427.4885	453.7539	485.6590	513.5775	(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	
East					6.4140	22.3313		0.4700	0.0000	0.7700		51.8360 (76)	
South					6.3150	50.9848		0.4700	0.0000	0.7700		116.5206 (78)	
West					6.1200	22.3313		0.4700	0.0000	0.7700		49.4600 (80)	
Solar gains	217.8167	349.5042	504.5830	685.2415	773.9169	831.6290	789.4539	721.9383	608.2462	422.7328	270.7714	182.2921	(83)
Total gains	744.4088	874.3070	1014.0485	1165.6941	1225.7480	1257.4028	1199.6952	1134.8043	1035.7347	876.4868	756.4304	695.8697	(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	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	
alpha	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	
util living area	0.9160	0.8702	0.7802	0.6363	0.4723	0.2990	0.1960	0.2137	0.4123	0.6886	0.8632	0.9287	(86)
Living	19.7403	20.0192	20.4183	20.7542	20.9286	20.9890	20.9982	20.9975	20.9657	20.7332	20.1977	19.6553	
Non living	18.8650	19.1271	19.4933	19.7829	19.9190	19.9574	19.9614	19.9613	19.9457	19.7758	19.3024	18.7845	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.3556	20.0192	20.4183	20.7542	20.9286	20.9890	20.9982	20.9975	20.9657	20.7332	20.1977	19.8434	(87)
Th 2	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	(88)
util rest of house	0.9016	0.8499	0.7491	0.5926	0.4176	0.2384	0.1307	0.1448	0.3434	0.6371	0.8380	0.9160	(89)
MIT 2	19.4007	19.1271	19.4933	19.7829	19.9190	19.9574	19.9614	19.9613	19.9457	19.7758	19.3024	18.9491	(90)
Living area fraction	19.7502	19.4536	19.8318	20.1383	20.2885	20.3349	20.3408	20.3405	20.3190	20.1262	19.6300	19.2764	(91)
MIT	19.7502	19.4536	19.8318	20.1383	20.2885	20.3349	20.3408	20.3405	20.3190	20.1262	19.6300	19.2764	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7502	19.4536	19.8318	20.1383	20.2885	20.3349	20.3408	20.3405	20.3190	20.1262	19.6300	19.2764	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	668.7448	733.2243	755.3393	699.8016	533.4460	327.3231	185.4917	192.9612	380.6654	566.0150	626.9582	630.5493	(94)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Heat loss rate W	1115.0186	1054.3919	946.1796	779.2369	554.7242	329.9316	185.7722	193.3577	389.6030	648.9259	885.1574	1078.9617	(97)
Space heating kWh	332.0277	215.8246	141.9852	57.1934	15.8310	0.0000	0.0000	0.0000	0.0000	61.6857	185.9035	333.6188	(98a)
Space heating requirement - total per year (kWh/year)												1344.0699	
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	332.0277	215.8246	141.9852	57.1934	15.8310	0.0000	0.0000	0.0000	0.0000	61.6857	185.9035	333.6188	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1344.0699	
Space heating per m2										(98c) / (4) =		20.2747	(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 %)													243.2803 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)

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Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	332.0277	215.8246	141.9852	57.1934	15.8310	0.0000	0.0000	0.0000	0.0000	61.6857	185.9035	333.6188 (98)
Space heating efficiency (main heating system 1)	243.2803	243.2803	243.2803	243.2803	243.2803	0.0000	0.0000	0.0000	0.0000	243.2803	243.2803	243.2803 (210)
Space heating fuel (main heating system)	136.4795	88.7144	58.3628	23.5093	6.5073	0.0000	0.0000	0.0000	0.0000	25.3558	76.4153	137.1335 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	234.8918	207.6191	220.1780	192.5306	185.9447	166.7928	164.0039	170.9010	173.2137	194.0694	207.5038	232.1773 (64)
Efficiency of water heater (217)m	266.5596	266.5596	266.5596	266.5596	266.5596	266.5596	266.5596	266.5596	266.5596	266.5596	266.5596	266.5596 (216)
Fuel for water heating, kWh/month	88.1198	77.8884	82.5999	72.2280	69.7573	62.5724	61.5262	64.1136	64.9812	72.8053	77.8452	87.1015 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	1.8370	1.6592	1.8370	1.7777	1.8370	1.7777	1.8370	1.8370	1.7777	1.8370	1.7777	1.8370 (231)
Lighting	19.2711	15.4600	13.9200	10.1984	7.8775	6.4360	7.1862	9.3408	12.1328	15.9189	17.9804	19.8067 (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												552.4778 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												266.5596
Water heating fuel used												881.5388 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(MEV)Decentralised, Database: total watage = 2.3400, total flow = 21.0000, SFP = 0.1114)												
mechanical ventilation fans (SFP = 0.1114)												21.6289 (230a)
Total electricity for the above, kWh/year												21.6289 (231)
Electricity for lighting (calculated in Appendix L)												155.5290 (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												1611.1746 (238)

10a. Fuel costs - using BEDF prices (552)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	552.4778	26.0600	143.9757 (240)	
Total CO2 associated with community systems			0.0000 (473)	
Water heating (other fuel)	881.5388	26.0600	229.7290 (247)	
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)	
Pumps, fans and electric keep-hot	21.6289	26.0600	5.6365 (249)	
Energy for lighting	155.5290	26.0600	40.5309 (250)	
Additional standing charges			0.0000 (251)	
Total energy cost			419.8721 (255)	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	552.4778	0.1573	86.9306 (261)	
Total CO2 associated with community systems			0.0000 (373)	
Water heating (other fuel)	881.5388	0.1410	124.3002 (264)	
Space and water heating			211.2309 (265)	
Pumps, fans and electric keep-hot	21.6289	0.1387	3.0002 (267)	
Energy for lighting	155.5290	0.1443	22.4476 (268)	
Total CO2, kg/year			236.6787 (272)	

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	552.4778	1.5825	874.2729 (275)	
Total CO2 associated with community systems			0.0000 (473)	
Water heating (other fuel)	881.5388	1.5214	1341.1606 (278)	
Space and water heating			2215.4334 (279)	
Pumps, fans and electric keep-hot	21.6289	1.5128	32.7203 (281)	
Energy for lighting	155.5290	1.5338	238.5556 (282)	

Total Primary energy kWh/year

2486.7092 (286)

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Property Reference	004 TF				Issued on Date	10/09/2024
Assessment Reference	004 TF Flat Elec, DWHP		Prop Type Ref	004 TF		
Property	004 TF, 004 TF, 0					
SAP Rating	79 C	DER	5.76	TER	12.92	
Environmental	96 A	% DER < TER				55.42
CO ₂ Emissions (t/year)	0.33	DFEE	34.75	TFEE	35.15	
Compliance Check	See BREL	% DFEE < TFEE				1.12
% DPER < TPER	12.87	DPER	59.27	TPER	68.03	
Assessor Details	Mr. Scott Binstead				Assessor ID	U903-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	66.2930 (1b)	2.4000 (2b)	159.1032 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.2930		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	159.1032 (5)

2. Ventilation rate

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

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		1	(19)

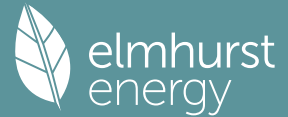
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1388	(21)

	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	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
Solid Door			2.1000	1.0000	2.1000		(26)
Windows (Uw = 1.30)			18.8490	1.2357	23.2937		(27)
Wl - 1	65.3810	18.8490	46.5320	0.1800	8.3758	60.0000	2791.9198 (29a)
Wl - 3	3.6360	2.1000	1.5360	0.2400	0.3686	60.0000	92.1600 (29a)
Rf - Ins Joist	66.2930		66.2930	0.0900	5.9664	9.0000	596.6370 (30)
Total net area of external elements Aum(A, m ²)			135.3110				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.1045		(33)
Party Wall			23.7400	0.0000	0.0000	110.0000	2611.4000 (32)
Party Floor 1			66.2930			40.0000	2651.7200 (32d)
Stud			120.9072			9.0000	1088.1648 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		9832.0016 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							148.3113 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				10.3180	0.0500	0.5159	

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E3 Sill	1.9210	0.0240	0.0461
E4 Jamb	40.2860	0.0190	0.7654
E7 Party floor between dwellings (in blocks of flats)	28.7550	0.0360	1.0352
E14 Flat roof	28.7580	0.1600	4.6013
E16 Corner (normal)	7.2000	0.0370	0.2664
E18 Party wall between dwellings	4.8000	0.0310	0.1488
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	9.8920	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	9.8920	0.2400	2.3741
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			9.7532 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	49.8577 (37)

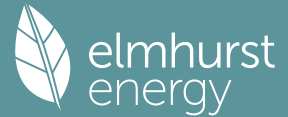
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520 (38)
Average = Sum(39)m / 12 =	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481 (40)
HLP (average)												1.1481
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.1529 (42)
Hot water usage for mixer showers												
	60.3163	59.4099	58.0890	55.5618	53.6968	51.6169	50.4347	51.7456	53.1826	55.4157	57.9972	60.0852 (42a)
Hot water usage for baths												
	26.0612	25.6742	25.1291	24.1242	23.3717	22.5373	22.0866	22.6278	23.2171	24.1099	25.1356	25.9731 (42b)
Hot water usage for other uses												
	36.6776	35.3439	34.0102	32.6764	31.3427	30.0090	30.0090	31.3427	32.6764	34.0102	35.3439	36.6776 (42c)
Average daily hot water use (litres/day)												113.1158 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	123.0552	120.4280	117.2284	112.3624	108.4112	104.1632	102.5303	105.7161	109.0761	113.5358	118.4767	122.7360 (44)
Energy conte	194.8894	171.4879	180.1756	153.8186	145.9423	128.0808	124.0015	130.8986	134.5017	154.0670	168.7918	192.1749 (45)
Energy content (annual)										Total = Sum(45)m =		1878.8301
Distribution loss (46)m = 0.15 x (45)m												
	29.2334	25.7232	27.0263	23.0728	21.8913	19.2121	18.6002	19.6348	20.1753	23.1101	25.3188	28.8262 (46)
Water storage loss:												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8694 (55)
Total storage loss												
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage												
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (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												
	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263 (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												
	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263 (64)
								Total per year (kWh/year) = Sum(64)m =				2196.1611 (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												
	64.8007	57.0197	59.9084	51.1447	48.5258	42.5869	41.2305	43.5238	44.7218	51.2273	56.1233	63.8982 (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	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728 (66)
	22.0167	19.5551	15.9033	12.0398	8.9999	7.5981	8.2100	10.6717	14.3235	18.1869	21.2268	22.6287 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	281.3365	284.2559	276.8991	261.2374	241.4673	222.8862	210.4729	207.5535	214.9103	230.5720	250.3421	268.9232 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702 (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)												
	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152 (71)
Water heating gains (Table 5)												
	87.0977	84.8508	80.5220	71.0343	65.2229	59.1484	55.4173	58.4997	62.1136	68.8539	77.9490	85.8846 (72)
Total internal gains												
	483.5787	481.7895	466.4521	437.4392	408.8178	382.7605	367.2280	369.8527	384.4752	410.7406	442.6457	470.5642 (73)

6. Solar gains												
[Jan]												
	Area											
	m2											
	Solar flux											
	Table 6a											
	W/m2											
	Specific data											
	or Table 6b											
	Specific data											
	or Table 6c											
	Access											
	factor											
	Table 6d											
	Gains											
	W											
East	6.4140											45.5895 (76)
South	6.3150											106.8471 (78)
West	6.1200											43.4998 (80)
Solar gains	195.9364	349.2656	509.9141	670.5171	775.5209	777.7871	746.8062	669.1806	566.6542	395.5360	237.7341	165.5884 (83)
Total gains	679.5151	831.0551	976.3662	1107.9563	1184.3387	1160.5476	1114.0342	1039.0333	951.1293	806.2766	680.3798	636.1527 (84)

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7. Mean internal temperature (heating season)

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

21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	
alpha	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	
util living area	0.9406	0.8947	0.8171	0.6964	0.5508	0.4066	0.2970	0.3313	0.5165	0.7652	0.9067	0.9506 (86)	
MIT	19.4932	19.8509	20.2708	20.6439	20.8677	20.9637	20.9905	20.9861	20.9193	20.5836	19.9484	19.3930 (87)	
Th 2	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618 (88)	
util rest of house	0.9302	0.8779	0.7906	0.6573	0.4999	0.3450	0.2285	0.2589	0.4492	0.7225	0.8887	0.9418 (89)	
MIT 2	18.2484	18.6865	19.1885	19.6139	19.8494	19.9382	19.9577	19.9553	19.9041	19.5639	18.8166	18.1243 (90)	
Living area fraction									fLA = Living area / (4) =				0.3660 (91)
MIT	18.7039	19.1126	19.5846	19.9909	20.2221	20.3135	20.3356	20.3325	20.2756	19.9371	19.2308	18.5886 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.7039	19.1126	19.5846	19.9909	20.2221	20.3135	20.3356	20.3325	20.2756	19.9371	19.2308	18.5886 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9145	0.8618	0.7799	0.6584	0.5131	0.3662	0.2534	0.2850	0.4702	0.7214	0.8735	0.9269 (94)
Useful gains	621.4115	716.2334	761.4706	729.5216	607.6492	424.9869	282.2526	296.1647	447.2323	581.6106	594.3158	589.6394 (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	1096.2798	1081.7195	995.8676	844.1237	648.6142	434.8520	284.3179	299.3039	470.0246	710.6426	923.2702	1095.1110 (97)
Space heating kWh	353.3020	245.6066	174.3914	82.5135	30.4779	0.0000	0.0000	0.0000	0.0000	95.9998	236.8471	376.0709 (98a)
Space heating requirement - total per year (kWh/year)												1595.2093
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	353.3020	245.6066	174.3914	82.5135	30.4779	0.0000	0.0000	0.0000	0.0000	95.9998	236.8471	376.0709 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1595.2093
Space heating per m2										(98c) / (4) =		24.0630 (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)

Fraction of main heating from main system 2

0.0000 (203)

Fraction of total heating from main system 1

1.0000 (204)

Fraction of total heating from main system 2

0.0000 (205)

Efficiency of main space heating system 1 (in %)

100.0000 (206)

Efficiency of main space heating system 2 (in %)

0.0000 (207)

Efficiency of secondary/supplementary heating system, %

0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	353.3020	245.6066	174.3914	82.5135	30.4779	0.0000	0.0000	0.0000	0.0000	95.9998	236.8471	376.0709 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	353.3020	245.6066	174.3914	82.5135	30.4779	0.0000	0.0000	0.0000	0.0000	95.9998	236.8471	376.0709 (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)
Space heating fuel used, main system 2												0.0000 (213)
Water heating												
Water heating requirement	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263 (64)
Efficiency of water heater (217)m	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200 (216)
Fuel for water heating, kWh/month	64.2421	56.7100	59.9812	52.0968	50.0677	44.6435	43.7139	45.7112	46.5029	52.4205	56.4328	63.4560 (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	1.8370	1.6592	1.8370	1.7777	1.8370	1.7777	1.8370	1.8370	1.7777	1.8370	1.7777	1.8370 (231)
Lighting	19.2711	15.4600	13.9200	10.1984	7.8775	6.4360	7.1862	9.3408	12.1328	15.9189	17.9804	19.8067 (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												1595.2093 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												345.3200
Water heating fuel used												635.9785 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:

(MEVDecentralised, Database: total watage = 2.3400, total flow = 21.0000, SFP = 0.1114)

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mechanical ventilation fans (SFP = 0.1114) 21.6289 (230a)
 Total electricity for the above, kWh/year 21.6289 (231)
 Electricity for lighting (calculated in Appendix L) 155.5290 (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 2408.3458 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1595.2093	16.4900	263.0500 (240)
Space heating - main system 2	0.0000	16.4900	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	635.9785	16.4900	104.8729 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	21.6289	16.4900	3.5666 (249)
Energy for lighting	155.5290	16.4900	25.6467 (250)
Additional standing charges			0.0000 (251)
Total energy cost			397.1362 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12): 0.3600 (256)
 Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] = 1.2846 (257)
 SAP value 79.1763
 SAP rating (Section 12) 79 (258)
 SAP band C

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1595.2093	0.1564	249.5091 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	635.9785	0.1412	89.7773 (264)
Space and water heating			339.2864 (265)
Pumps, fans and electric keep-hot	21.6289	0.1387	3.0002 (267)
Energy for lighting	155.5290	0.1443	22.4476 (268)
Total CO2, kg/year			364.7343 (272)
CO2 emissions per m2			5.5000 (273)
EI value			95.6085
EI rating			96 (274)
EI band			A

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

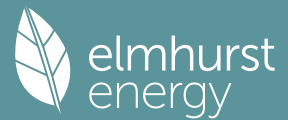
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	66.2930 (1b)	2.4000 (2b)	159.1032 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.2930		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	159.1032 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	1 (19)

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Shelter factor											(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =		0.1388 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)	
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)	
Adj infilt rate													
	0.1457	0.1388	0.1388	0.1283	0.1283	0.1145	0.1179	0.1110	0.1145	0.1214	0.1214	0.1318 (22b)	
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000 (23a)	
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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	
Solid Door			2.1000	1.0000	2.1000			(26)
Windows (Uw = 1.30)			18.8490	1.2357	23.2937			(27)
W1 - 1	65.3810	18.8490	46.5320	0.1800	8.3758	60.0000	2791.9198	(29a)
W1 - 3	3.6360	2.1000	1.5360	0.2400	0.3686	60.0000	92.1600	(29a)
Rf - Ins Joist	66.2930		66.2930	0.0900	5.9664	9.0000	596.6370	(30)
Total net area of external elements Aum(A, m2)			135.3110					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	40.1045		(33)
Party Wall			23.7400	0.0000	0.0000	110.0000	2611.4000	(32)
Party Floor 1			66.2930			40.0000	2651.7200	(32d)
Stud			120.9072			9.0000	1088.1648	(32c)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
(28)...(30) + (32) + (32a)...(32e) = 9832.0016 (34)
148.3113 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.3180	0.0500	0.5159
E3 Sill	1.9210	0.0240	0.0461
E4 Jamb	40.2860	0.0190	0.7654
E7 Party floor between dwellings (in blocks of flats)	28.7550	0.0360	1.0352
E14 Flat roof	28.7580	0.1600	4.6013
E16 Corner (normal)	7.2000	0.0370	0.2664
E18 Party wall between dwellings	4.8000	0.0310	0.1488
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	9.8920	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	9.8920	0.2400	2.3741

Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Point Thermal Bridges
Total fabric heat loss
(33a) = 0.0000
(33) + (36) + (36a) = 49.8577 (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	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	(38)
Heat transfer coeff	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	(39)
Average = Sum(39)m / 12 =													

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	(40)
HLP (average)												1.1481	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1529 (42)
Hot water usage for mixer showers	60.3163	59.4099	58.0890	55.5618	53.6968	51.6169	50.4347	51.7456	53.1826	55.4157	57.9972	60.0852 (42a)
Hot water usage for baths	26.0612	25.6742	25.1291	24.1242	23.3717	22.5373	22.0866	22.6278	23.2171	24.1099	25.1356	25.9731 (42b)
Hot water usage for other uses	36.6776	35.3439	34.0102	32.6764	31.3427	30.0090	30.0090	31.3427	32.6764	34.0102	35.3439	36.6776 (42c)
Average daily hot water use (litres/day)												113.1158 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	123.0552	120.4280	117.2284	112.3624	108.4112	104.1632	102.5303	105.7161	109.0761	113.5358	118.4767	122.7360 (44)
Energy content (annual)	194.8894	171.4879	180.1756	153.8186	145.9423	128.0808	124.0015	130.8986	134.5017	154.0670	168.7918	192.1749 (45)
Distribution loss (46)m = 0.15 x (45)m	29.2334	25.7232	27.0263	23.0728	21.8913	19.2121	18.6002	19.6348	20.1753	23.1101	25.3188	28.8262 (46)
										Total = Sum(45)m =		1878.8301

Water storage loss:
Store volume
a) If manufacturer declared loss factor is known (kWh/day):
Temperature factor from Table 2b
Enter (49) or (54) in (55)
Total storage loss
201.0000 (47)
1.6100 (48)
0.5400 (49)
0.8694 (55)

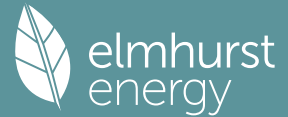
26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514 (56)
26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263 (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 (64a)

Output from w/h
221.8408 195.8311 207.1270 179.9006 172.8937 154.1628 150.9529 157.8500 160.5837 181.0184 194.8738 219.1263 (64)
Total per year (kWh/year) = Sum(64)m = 2196.1611 (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
64.8007 57.0197 59.9084 51.1447 48.5258 42.5869 41.2305 43.5238 44.7218 51.2273 56.1233 63.8982 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.0167	19.5551	15.9033	12.0398	8.9999	7.5981	8.2100	10.6717	14.3235	18.1869	21.2268	22.6287	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	281.3365	284.2559	276.8991	261.2374	241.4673	222.8862	210.4729	207.5535	214.9103	230.5720	250.3421	268.9232	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	(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)	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	(71)
Water heating gains (Table 5)	87.0977	84.8508	80.5220	71.0343	65.2229	59.1484	55.4173	58.4997	62.1136	68.8539	77.9490	85.8846	(72)
Total internal gains	483.5787	481.7895	466.4521	437.4392	408.8178	382.7605	367.2280	369.8527	384.4752	410.7406	442.6457	470.5642	(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			
East				6.4140	22.3313	0.4700	0.0000	0.7700	51.8360 (76)			
South				6.3150	50.9848	0.4700	0.0000	0.7700	116.5206 (78)			
West				6.1200	22.3313	0.4700	0.0000	0.7700	49.4600 (80)			
Solar gains	217.8167	349.5042	504.5830	685.2415	773.9169	831.6290	789.4539	721.9383	608.2462	422.7328	270.7714	182.2921 (83)
Total gains	701.3954	831.2936	971.0352	1122.6807	1182.7347	1214.3895	1156.6819	1091.7910	992.7214	833.4734	713.4170	652.8563 (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	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	
alpha	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	
util living area	0.9273	0.8836	0.7963	0.6530	0.4870	0.3091	0.2032	0.2220	0.4284	0.7102	0.8793	0.9392	(86)
MIT	19.6652	19.9566	20.3757	20.7335	20.9217	20.9878	20.9980	20.9972	20.9615	20.7055	20.1365	19.5764	(87)
Th 2	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	(88)
util rest of house	0.9144	0.8647	0.7663	0.6093	0.4313	0.2466	0.1355	0.1505	0.3574	0.6594	0.8560	0.9280	(89)
MIT 2	18.4631	18.8167	19.3131	19.7117	19.9013	19.9556	19.9613	19.9611	19.9384	19.6961	19.0447	18.3545	(90)
Living area fraction	18.9030	19.2339	19.7020	20.0857	20.2747	20.3333	20.3407	20.3403	20.3128	20.0655	19.4443	18.8017	(91)
MIT	18.9030	19.2339	19.7020	20.0857	20.2747	20.3333	20.3407	20.3403	20.3128	20.0655	19.4443	18.8017	(92)
Temperature adjustment	18.9030	19.2339	19.7020	20.0857	20.2747	20.3333	20.3407	20.3403	20.3128	20.0655	19.4443	18.8017	(93)
adjusted MIT	18.9030	19.2339	19.7020	20.0857	20.2747	20.3333	20.3407	20.3403	20.3128	20.0655	19.4443	18.8017	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8983	0.8494	0.7581	0.6148	0.4485	0.2692	0.1603	0.1767	0.3819	0.6648	0.8425	0.9125	(94)
Useful gains	630.0964	706.1009	736.1040	690.1967	530.4139	326.9135	185.4437	192.8902	379.1021	554.1330	601.0791	595.6998	(95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Heat loss rate W	1050.5450	1037.6687	936.2999	775.2274	553.6750	329.8089	185.7590	193.3384	389.1356	644.3085	871.0214	1042.8308	(97)
Space heating kWh	312.8137	222.8135	148.9458	61.2221	17.3063	0.0000	0.0000	0.0000	0.0000	67.0906	194.3585	332.6655	(98a)
Space heating requirement - total per year (kWh/year)												1357.2159	
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	312.8137	222.8135	148.9458	61.2221	17.3063	0.0000	0.0000	0.0000	0.0000	67.0906	194.3585	332.6655	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1357.2159	
Space heating per m ²										(98c) / (4) =		20.4730	(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)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	312.8137	222.8135	148.9458	61.2221	17.3063	0.0000	0.0000	0.0000	0.0000	67.0906	194.3585	332.6655	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	312.8137	222.8135	148.9458	61.2221	17.3063	0.0000	0.0000	0.0000	0.0000	67.0906	194.3585	332.6655	(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)

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energy

0.0000 (213)

10a. Fuel costs - using BEDF prices (552)			
	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1357.2159	26.0600	353.6905 (240)
Space heating - main system 2	0.0000	26.0600	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	635.9785	26.0600	165.7360 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Pumps, fans and electric keep-hot	21.6289	26.0600	5.6365 (249)
Energy for lighting	155.5290	26.0600	40.5309 (250)
Additional standing charges			0.0000 (251)
Total energy cost			565.5938 (255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP			
	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Space heating - main system 1	1357.2159	0.1571	213.1636 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO ₂ associated with community systems			0.0000 (373)
Water heating (other fuel)	635.9785	0.1412	89.7773 (264)
Space and water heating			302.9409 (265)
Pumps, fans and electric keep-hot	21.6289	0.1387	3.0002 (267)
Energy for lighting	155.5290	0.1443	22.4476 (268)
Total CO ₂ , kg/year			328.3887 (272)

13a. Primary energy - Individual heating systems including micro-CHP			
	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Space heating - main system 1	1357.2159	1.5814	2146.3309 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	635.9785	1.5220	967.9508 (278)
Space and water heating			3114.2816 (279)
Pumps, fans and electric keep-hot	21.6289	1.5128	32.7203 (281)
Energy for lighting	155.5290	1.5338	238.5556 (282)
Total Primary energy kWh/year			3385.5574 (286)

004 TF Flat Elec. DWHP

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Current energy efficiency rating: C 79
Current environmental impact rating: A 96

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

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

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

Potential energy efficiency rating: C 79
Potential environmental impact rating: A 96

Fuel prices for cost data on this page from database revision number 552 TEST (30 Aug 2024)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current £566	Potential £566	£0	Saving
Electricity				
Space heating	£359	£359	£0	
Water heating	£166	£166	£0	
Lighting	£41	£41	£0	
Total cost of fuels	£566	£566	£0	
Total cost of uses	£566	£566	£0	
Delivered energy	33 kWh/m ²	33 kWh/m ²	0 kWh/m ²	
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes	
CO2 emissions per m ²	5 kg/m ²	5 kg/m ²	0 kg/m ²	
Primary energy	51 kWh/m ²	51 kWh/m ²	0 kWh/m ²	

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	66.2930 (1b)	x 2.4000 (2b)	= 159.1032 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.2930		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 159.1032 (5)

2. Ventilation rate

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

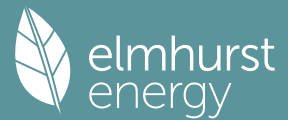
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1388 (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	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K
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	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Solid Door			2.1000	1.0000	2.1000			(26)
Windows (Uw = 1.30)			18.8490	1.2357	23.2937			(27)
W1 - 1	65.3810	18.8490	46.5320	0.1800	8.3758	60.0000	2791.9198	(29a)
W1 - 3	3.6360	2.1000	1.5360	0.2400	0.3686	60.0000	92.1600	(29a)
Rf - Ins Joist	66.2930		66.2930	0.0900	5.9664	9.0000	596.6370	(30)
Total net area of external elements Aum(A, m2)			135.3110					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.1045			(33)
Party Wall			23.7400	0.0000	0.0000	110.0000	2611.4000	(32)
Party Floor 1			66.2930			40.0000	2651.7200	(32d)
Stud			120.9072			9.0000	1088.1648	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9832.0016 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 148.3113 (35)

List of Thermal Bridges	Length	Psi-value	Total	
K1 Element	10.3180	0.0500	0.5159	
E2 Other lintels (including other steel lintels)	1.9210	0.0240	0.0461	
E3 Sill	40.2860	0.0190	0.7654	
E4 Jamb	28.7550	0.0360	1.0352	
E7 Party floor between dwellings (in blocks of flats)	28.7580	0.1600	4.6013	
E14 Flat roof	7.2000	0.0370	0.2664	
E16 Corner (normal)	4.8000	0.0310	0.1488	
E18 Party wall between dwellings	9.8920	0.0000	0.0000	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	9.8920	0.2400	2.3741	
P4 Party wall - Roof (insulation at ceiling level)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				9.7532 (36)
Point Thermal bridges				0.0000
Total fabric heat loss			(33) + (36) + (36a) =	49.8577 (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	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	(38)
Average = Sum(39)m / 12 =	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	(39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

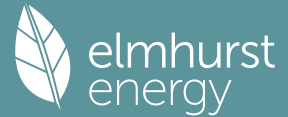
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.1529 (42)
Hot water usage for mixer showers													
60.3163	59.4099	58.0890	55.5618	53.6968	51.6169	50.4347	51.7456	53.1826	55.4157	57.9972	60.0852	(42a)	
Hot water usage for baths													
26.0612	25.6742	25.1291	24.1242	23.3717	22.5373	22.0866	22.6278	23.2171	24.1099	25.1356	25.9731	(42b)	
Hot water usage for other uses													
36.6776	35.3439	34.0102	32.6764	31.3427	30.0090	30.0090	31.3427	32.6764	34.0102	35.3439	36.6776	(42c)	
Average daily hot water use (litres/day)													113.1158 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
123.0552	120.4280	117.2284	112.3624	108.4112	104.1632	102.5303	105.7161	109.0761	113.5358	118.4767	122.7360	(44)	
Energy content (annual)	194.8894	171.4879	180.1756	153.8186	145.9423	128.0808	124.0015	130.8986	134.5017	154.0670	168.7918	192.1749	(45)
Distribution loss (46)m = 0.15 x (45)m													
29.2334	25.7232	27.0263	23.0728	21.8913	19.2121	18.6002	19.6348	20.1753	23.1101	25.3188	28.8262	(46)	
Water storage loss:													
Store volume													201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6100 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8694 (55)
Total storage loss													
26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)	
If cylinder contains dedicated solar storage													
26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(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													
221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263	(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	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263	(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)
Heat gains from water heating, kWh/month	64.8007	57.0197	59.9084	51.1447	48.5258	42.5869	41.2305	43.5238	44.7218	51.2273	56.1233	63.8982	(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	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.0167	19.5551	15.9033	12.0398	8.9999	7.5981	8.2100	10.6717	14.3235	18.1869	21.2268	22.6287 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	281.3365	284.2559	276.8991	261.2374	241.4673	222.8862	210.4729	207.5535	214.9103	230.5720	250.3421	268.9232 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702 (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)	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152 (71)
Water heating gains (Table 5)	87.0977	84.8508	80.5220	71.0343	65.2229	59.1484	55.4173	58.4997	62.1136	68.8539	77.9490	85.8846 (72)
Total internal gains	483.5787	481.7895	466.4521	437.4392	408.8178	382.7605	367.2280	369.8527	384.4752	410.7406	442.6457	470.5642 (73)

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6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
East					6.4140	19.6403	0.4700	0.0000	0.7700	45.5895 (76)		
South					6.3150	46.7521	0.4700	0.0000	0.7700	106.8471 (78)		
West					6.1200	19.6403	0.4700	0.0000	0.7700	43.4998 (80)		
Solar gains	195.9364	349.2656	509.9141	670.5171	775.5209	777.7871	746.8062	669.1806	566.6542	395.5360	237.7341	165.5884 (83)
Total gains	679.5151	831.0551	976.3662	1107.9563	1184.3387	1160.5476	1114.0342	1039.0333	951.1293	806.2766	680.3798	636.1527 (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	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839
alpha	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923
util living area	0.9406	0.8947	0.8171	0.6964	0.5508	0.4066	0.2970	0.3313	0.5165	0.7652	0.9067	0.9506 (86)
MIT	19.4932	19.8509	20.2708	20.6439	20.8677	20.9637	20.9905	20.9861	20.9193	20.5836	19.9484	19.3930 (87)
Th 2	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618 (88)
util rest of house	0.9302	0.8779	0.7906	0.6573	0.4999	0.3450	0.2285	0.2589	0.4492	0.7225	0.8887	0.9418 (89)
MIT 2	18.2484	18.6865	19.1885	19.6139	19.8494	19.9382	19.9577	19.9553	19.9041	19.5639	18.8166	18.1243 (90)
Living area fraction	fLA = Living area / (4) = 0.3660 (91)											
MIT	18.7039	19.1126	19.5846	19.9909	20.2221	20.3135	20.3356	20.3325	20.2756	19.9371	19.2308	18.5886 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.7039	19.1126	19.5846	19.9909	20.2221	20.3135	20.3356	20.3325	20.2756	19.9371	19.2308	18.5886 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9145	0.8618	0.7799	0.6584	0.5131	0.3662	0.2534	0.2850	0.4702	0.7214	0.8735	0.9269	(94)
Useful gains	621.4115	716.2334	761.4706	729.5216	607.6492	424.9869	282.2526	296.1647	447.2323	581.6106	594.3158	589.6394	(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	1096.2798	1081.7195	995.8676	844.1237	648.6142	434.8520	284.3179	299.3039	470.0246	710.6426	923.2702	1095.1110	(97)
Space heating kWh	353.3020	245.6066	174.3914	82.5135	30.4779	0.0000	0.0000	0.0000	0.0000	95.9998	236.8471	376.0709	(98a)
Space heating requirement - total per year (kWh/year)	1595.2093												
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	353.3020	245.6066	174.3914	82.5135	30.4779	0.0000	0.0000	0.0000	0.0000	95.9998	236.8471	376.0709	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1595.2093												
Space heating per m2	(98c) / (4) =												24.0630 (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)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	353.3020	245.6066	174.3914	82.5135	30.4779	0.0000	0.0000	0.0000	0.0000	95.9998	236.8471	376.0709	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	353.3020	245.6066	174.3914	82.5135	30.4779	0.0000	0.0000	0.0000	0.0000	95.9998	236.8471	376.0709	(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)
Space heating fuel used, main system 2													0.0000 (213)
Water heating													
Water heating requirement	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263	(64)
Efficiency of water heater													345.3200 (216)
(217)m	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	(217)
Fuel for water heating, kWh/month	64.2421	56.7100	59.9812	52.0968	50.0677	44.6435	43.7139	45.7112	46.5029	52.4205	56.4328	63.4560	(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	1.8370	1.6592	1.8370	1.7777	1.8370	1.7777	1.8370	1.8370	1.7777	1.8370	1.7777	1.8370	(231)
Lighting	19.2711	15.4600	13.9200	10.1984	7.8775	6.4360	7.1862	9.3408	12.1328	15.9189	17.9804	19.8067	(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)													

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(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												1595.2093	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												345.3200	
Water heating fuel used												635.9785	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 2.3400, total flow = 21.0000, SFP = 0.1114)													
mechanical ventilation fans (SFP = 0.1114)													
Total electricity for the above, kWh/year												21.6289	(230a)
Electricity for lighting (calculated in Appendix L)												21.6289	(231)
												155.5290	(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												2408.3458	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1595.2093	16.4900	263.0500	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	635.9785	16.4900	104.8729	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	21.6289	16.4900	3.5666	(249)
Energy for lighting	155.5290	16.4900	25.6467	(250)
Additional standing charges			0.0000	(251)
Total energy cost			397.1362	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):				0.3600	(256)
Energy cost factor (ECF)				1.2846	(257)
SAP value				79.1763	
SAP rating (Section 12)				79	(258)
SAP band				C	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1595.2093	0.1564	249.5091	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	635.9785	0.1412	89.7773	(264)
Space and water heating			339.2864	(265)
Pumps, fans and electric keep-hot	21.6289	0.1387	3.0002	(267)
Energy for lighting	155.5290	0.1443	22.4476	(268)
Total CO2, kg/year			364.7343	(272)
CO2 emissions per m2			5.5000	(273)
EI value			95.6085	
EI rating			96	(274)
EI band			A	

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

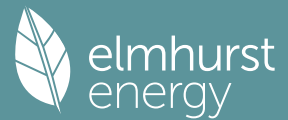
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	66.2930	2.4000	159.1032	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.2930			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	159.1032	(5)

2. Ventilation rate

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

0 * 20 = 0.0000 (6b)
0 * 10 = 0.0000 (6c)
0 * 20 = 0.0000 (6d)
0 * 35 = 0.0000 (6e)
0 * 20 = 0.0000 (6f)
0 * 10 = 0.0000 (7a)
0 * 10 = 0.0000 (7b)
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
Pressure Test Method
Measured/design AP50
Infiltration rate
Number of sides sheltered
Blower Door
3.0000 (17)
0.1500 (18)
1 (19)
Shelter factor (20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1388 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000	(22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500	(22a)
Adj infilt rate	0.1457	0.1388	0.1388	0.1283	0.1283	0.1145	0.1179	0.1110	0.1145	0.1214	0.1214	0.1318	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

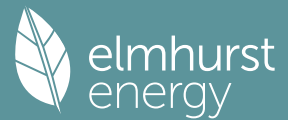
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Solid Door			2.1000	1.0000	2.1000			(26)
Windows (Uw = 1.30)			18.8490	1.2357	23.2937			(27)
W1 - 1	65.3810	18.8490	46.5320	0.1800	8.3758	60.0000	2791.9198	(29a)
W1 - 3	3.6360	2.1000	1.5360	0.2400	0.3686	60.0000	92.1600	(29a)
Rf - Ins Joist	66.2930		66.2930	0.0900	5.9664	9.0000	596.6370	(30)
Total net area of external elements Aum(A, m2)			135.3110					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.1045			(33)
Party Wall			23.7400	0.0000	0.0000	110.0000	2611.4000	(32)
Party Floor 1			66.2930			40.0000	2651.7200	(32d)
Stud			120.9072			9.0000	1088.1648	(32c)
Heat capacity Cm = Sum(A x k)							9832.0016	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							148.3113	(35)
List of Thermal Bridges								
K1 Element				Length	Psi-value	Total		
E2 Other lintels (including other steel lintels)				10.3180	0.0500	0.5159		
E3 Sill				1.9210	0.0240	0.0461		
E4 Jamb				40.2860	0.0190	0.7654		
E7 Party floor between dwellings (in blocks of flats)				28.7550	0.0360	1.0352		
E14 Flat roof				28.7580	0.1600	4.6013		
E16 Corner (normal)				7.2000	0.0370	0.2664		
E18 Party wall between dwellings				4.8000	0.0310	0.1488		
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				9.8920	0.0000	0.0000		
P4 Party wall - Roof (insulation at ceiling level)				9.8920	0.2400	2.3741		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.7532	(36)
Point Thermal Bridges							0.0000	
Total fabric heat loss							(33) + (36) + (36a) =	49.8577 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)								
(38)m	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520 (38)
Heat transfer coeff	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097	76.1097 (39)
Average = Sum(39)m / 12 =								76.1097
HLP	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481	1.1481 (40)
HLP (average)								1.1481
Days in mont	31	28	31	30	31	30	31	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1529 (42)
Hot water usage for mixer showers
60.3163 59.4099 58.0890 55.5618 53.6968 51.6169 50.4347 51.7456 53.1826 55.4157 57.9972 60.0852 (42a)
Hot water usage for baths
26.0612 25.6742 25.1291 24.1242 23.3717 22.5373 22.0866 22.6278 23.2171 24.1099 25.1356 25.9731 (42b)
Hot water usage for other uses
36.6776 35.3439 34.0102 32.6764 31.3427 30.0090 30.0090 31.3427 32.6764 34.0102 35.3439 36.6776 (42c)
Average daily hot water use (litres/day) 113.1158 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.0552	120.4280	117.2284	112.3624	108.4112	104.1632	102.5303	105.7161	109.0761	113.5358	118.4767	122.7360	(44)
Energy conte	194.8894	171.4879	180.1756	153.8186	145.9423	128.0808	124.0015	130.8986	134.5017	154.0670	168.7918	192.1749	(45)
Energy content (annual)										Total = Sum(45)m =		1878.8301	
Distribution loss (46)m = 0.15 x (45)m	29.2334	25.7232	27.0263	23.0728	21.8913	19.2121	18.6002	19.6348	20.1753	23.1101	25.3188	28.8262	(46)
Water storage loss:													
Store volume												201.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(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)

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Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263 (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	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263 (64)
	Total per year (kWh/year) = Sum(64)m =											2196.1611 (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	64.8007	57.0197	59.9084	51.1447	48.5258	42.5869	41.2305	43.5238	44.7218	51.2273	56.1233	63.8982 (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	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.0167	19.5551	15.9033	12.0398	8.9999	7.5981	8.2100	10.6717	14.3235	18.1869	21.2268	22.6287	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	281.3365	284.2559	276.8991	261.2374	241.4673	222.8862	210.4729	207.5535	214.9103	230.5720	250.3421	268.9232	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	(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)	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	(71)
Water heating gains (Table 5)	87.0977	84.8508	80.5220	71.0343	65.2229	59.1484	55.4173	58.4997	62.1136	68.8539	77.9490	85.8846	(72)
Total internal gains	483.5787	481.7895	466.4521	437.4392	408.8178	382.7605	367.2280	369.8527	384.4752	410.7406	442.6457	470.5642	(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			
East				6.4140	22.3313	0.4700	0.0000	0.7700	51.8360 (76)			
South				6.3150	50.9848	0.4700	0.0000	0.7700	116.5206 (78)			
West				6.1200	22.3313	0.4700	0.0000	0.7700	49.4600 (80)			
Solar gains	217.8167	349.5042	504.5830	685.2415	773.9169	831.6290	789.4539	721.9383	608.2462	422.7328	270.7714	182.2921 (83)
Total gains	701.3954	831.2936	971.0352	1122.6807	1182.7347	1214.3895	1156.6819	1091.7910	992.7214	833.4734	713.4170	652.8563 (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	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	35.8839	
alpha	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	3.3923	
util living area	0.9273	0.8836	0.7963	0.6530	0.4870	0.3091	0.2032	0.2220	0.4284	0.7102	0.8793	0.9392	(86)
MIT	19.6652	19.9566	20.3757	20.7335	20.9217	20.9878	20.9980	20.9972	20.9615	20.7055	20.1365	19.5764	(87)
Th 2	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	19.9618	(88)
util rest of house	0.9144	0.8647	0.7663	0.6093	0.4313	0.2466	0.1355	0.1505	0.3574	0.6594	0.8560	0.9280	(89)
MIT 2	18.4631	18.8167	19.3131	19.7117	19.9013	19.9556	19.9613	19.9611	19.9384	19.6961	19.0447	18.3545	(90)
Living area fraction									fLA = Living area / (4) =			0.3660	(91)
MIT	18.9030	19.2339	19.7020	20.0857	20.2747	20.3333	20.3407	20.3403	20.3128	20.0655	19.4443	18.8017	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9030	19.2339	19.7020	20.0857	20.2747	20.3333	20.3407	20.3403	20.3128	20.0655	19.4443	18.8017	(93)

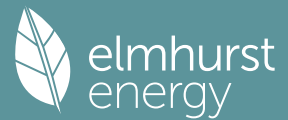
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.8983	0.8494	0.7581	0.6148	0.4485	0.2692	0.1603	0.1767	0.3819	0.6648	0.8425	0.9125	(94)
Useful gains	630.0964	706.1009	736.1040	690.1967	530.4139	326.9135	185.4437	192.8902	379.1021	554.1330	601.0791	595.6998	(95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Heat loss rate W	1050.5450	1037.6687	936.2999	775.2274	553.6750	329.8089	185.7590	193.3384	389.1356	644.3085	871.0214	1042.8308	(97)
Space heating kWh	312.8137	222.8135	148.9458	61.2221	17.3063	0.0000	0.0000	0.0000	0.0000	67.0906	194.3585	332.6655	(98a)
Space heating requirement - total per year (kWh/year)												1357.2159	
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	312.8137	222.8135	148.9458	61.2221	17.3063	0.0000	0.0000	0.0000	0.0000	67.0906	194.3585	332.6655	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1357.2159	
Space heating per m2										(98c) / (4) =		20.4730	(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)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)

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Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	312.8137	222.8135	148.9458	61.2221	17.3063	0.0000	0.0000	0.0000	0.0000	67.0906	194.3585	332.6655	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	312.8137	222.8135	148.9458	61.2221	17.3063	0.0000	0.0000	0.0000	0.0000	67.0906	194.3585	332.6655	(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)
Space heating fuel used, main system 2												0.0000	(213)
Water heating requirement	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263	(64)
Efficiency of water heater	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	(216)
Fuel for water heating, kWh/month	64.2421	56.7100	59.9812	52.0968	50.0677	44.6435	43.7139	45.7112	46.5029	52.4205	56.4328	63.4560	(217)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(219)
(221)m	1.8370	1.6592	1.8370	1.7777	1.8370	1.7777	1.8370	1.8370	1.7777	1.8370	1.7777	1.8370	(221)
Pumps and Fa	19.2711	15.4600	13.9200	10.1984	7.8775	6.4360	7.1862	9.3408	12.1328	15.9189	17.9804	19.8067	(221)
Lighting	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
(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	(234a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
(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	(235a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
(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	(234b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
(235d)m													
Annual totals kWh/year													
Space heating fuel - main system 1												1357.2159	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												345.3200	
Water heating fuel used												635.9785	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 2.3400, total flow = 21.0000, SFP = 0.1114)													
mechanical ventilation fans (SFP = 0.1114)												21.6289	(230a)
Total electricity for the above, kWh/year												21.6289	(231)
Electricity for lighting (calculated in Appendix L)												155.5290	(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												2170.3524	(238)

10a. Fuel costs - using BEDF prices (552)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1357.2159	26.0600	353.6905	(240)
Space heating - main system 2	0.0000	26.0600	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	635.9785	26.0600	165.7360	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	21.6289	26.0600	5.6365	(249)
Energy for lighting	155.5290	26.0600	40.5309	(250)
Additional standing charges			0.0000	(251)
Total energy cost			565.5938	(255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1357.2159	0.1571	213.1636	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	635.9785	0.1412	89.7773	(264)
Space and water heating			302.9409	(265)
Pumps, fans and electric keep-hot	21.6289	0.1387	3.0002	(267)
Energy for lighting	155.5290	0.1443	22.4476	(268)
Total CO2, kg/year			328.3887	(272)

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

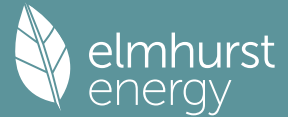
	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1357.2159	1.5814	2146.3309	(275)

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Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	635.9785	1.5220	967.9508 (278)
Space and water heating			3114.2816 (279)
Pumps, fans and electric keep-hot	21.6289	1.5128	32.7203 (281)
Energy for lighting	155.5290	1.5338	238.5556 (282)
Total Primary energy kWh/year			3385.5574 (286)

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Property Reference	005 MT				Issued on Date	10/09/2024
Assessment Reference	005 MT Flat ASHP	Prop Type Ref	005 MT			
Property	005 MT, 005 MT, 0					
SAP Rating	87 B	DER	3.38	TER	11.58	
Environmental	97 A	% DER < TER				70.81
CO ₂ Emissions (t/year)	0.21	DFEE	27.55	TFEE	29.02	
Compliance Check	See BREL	% DFEE < TFEE				5.07
% DPER < TPER	41.46	DPER	35.59	TPER	60.80	
Assessor Details	Mr. Scott Binstead				Assessor ID	U903-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	66.2930 (1b)	2.4000 (2b)	159.1032 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.2930		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	159.1032 (5)

2. Ventilation rate

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

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	1	(19)

Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1388 (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	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

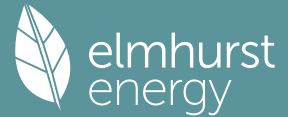
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Solid Door			2.1000	1.0000	2.1000		(26)
Windows (Uw = 1.30)			18.8490	1.2357	23.2937		(27)
W1 - 1	65.3810	18.8490	46.5320	0.1800	8.3758	60.0000	2791.9198 (29a)
W1 - 3	3.6360	2.1000	1.5360	0.2400	0.3686	60.0000	92.1600 (29a)
Total net area of external elements Aum(A, m ²)			69.0180				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	34.1381			(33)
Party Wall			23.7400	0.0000	0.0000	110.0000	2611.4000 (32)
Party Floor 1			66.2930			40.0000	2651.7200 (32a)
Party Ceiling 1			66.2930			30.0000	1988.7900 (32b)
Stud			120.9072			9.0000	1088.1648 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11224.1546 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		169.3113 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.3180	0.2210	2.2803

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E3 Sill	1.9210	0.0240	0.0461	
E4 Jamb	40.2860	0.0190	0.7654	
E5 Ground floor (normal)	8.3970	0.0450	0.3779	
E7 Party floor between dwellings (in blocks of flats)	49.1160	0.0360	1.7682	
E16 Corner (normal)	7.2000	0.0370	0.2664	
E18 Party wall between dwellings	4.8000	0.0310	0.1488	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	19.7840	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.6531	(36)
Point Thermal Bridges			0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	39.7912	(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	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520
Average = Sum(39)m / 12 =	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432
	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432
HLP	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962
HLP (average)												0.9962
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.1529	(42)
Hot water usage for mixer showers														
Hot water usage for baths	60.3163	59.4099	58.0890	55.5618	53.6968	51.6169	50.4347	51.7456	53.1826	55.4157	57.9972	60.0852	60.0852	(42a)
Hot water usage for other uses	26.0612	25.6742	25.1291	24.1242	23.3717	22.5373	22.0866	22.6278	23.2171	24.1099	25.1356	25.9731	25.9731	(42b)
Average daily hot water use (litres/day)	36.6776	35.3439	34.0102	32.6764	31.3427	30.0090	30.0090	31.3427	32.6764	34.0102	35.3439	36.6776	36.6776	(42c)
	113.1158												113.1158	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use	123.0552	120.4280	117.2284	112.3624	108.4112	104.1632	102.5303	105.7161	109.0761	113.5358	118.4767	122.7360	122.7360	(44)
Energy content (annual)	194.8894	171.4879	180.1756	153.8186	145.9423	128.0808	124.0015	130.8986	134.5017	154.0670	168.7918	192.1749	192.1749	(45)
Distribution loss (46)m = 0.15 x (45)m	29.2334	25.7232	27.0263	23.0728	21.8913	19.2121	18.6002	19.6348	20.1753	23.1101	25.3188	28.8262	28.8262	(46)
Water storage loss:														
Store volume													150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):													1.0000	(48)
Temperature factor from Table 2b													0.5400	(49)
Enter (49) or (54) in (55)													0.5400	(55)
Total storage loss	16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	(56)
If cylinder contains dedicated solar storage														
Primary loss	16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	(57)
Combi loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	(59)
Total heat required for water heating calculated for each month	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)
WWHRS	234.8918	207.6191	220.1780	192.5306	185.9447	166.7928	164.0039	170.9010	173.2137	194.0694	207.5038	232.1773	232.1773	(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	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	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	0.0000	(63c)
Output from w/h	234.8918	207.6191	220.1780	192.5306	185.9447	166.7928	164.0039	170.9010	173.2137	194.0694	207.5038	232.1773	232.1773	(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)
Heat gains from water heating, kWh/month	96.8026	85.9247	91.9103	82.1143	80.5277	73.5565	73.2324	75.5257	75.6914	83.2292	87.0929	95.9001	95.9001	(65)

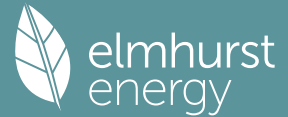
5. Internal gains (see Table 5 and 5a)

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	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	22.0167	19.5551	15.9033	12.0398	8.9999	7.5981	8.2100	10.6717	14.3235	18.1869	21.2268	22.6287	22.6287	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	281.3365	284.2559	276.8991	261.2374	241.4673	222.8862	210.4729	207.5535	214.9103	230.5720	250.3421	268.9232	268.9232	(68)
Pumps, fans	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	(69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Water heating gains (Table 5)	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	(71)
Total internal gains	130.1111	127.8641	123.5354	114.0476	108.2362	102.1618	98.4307	101.5131	105.1270	111.8672	120.9623	128.8980	128.8980	(72)
	526.5920	524.8028	509.4655	480.4525	451.8312	425.7738	410.2413	412.8660	427.4885	453.7539	485.6590	513.5775	513.5775	(73)

6. Solar gains

[Jan]														
	Area				Solar flux		g		FF		Access		Gains	
	m2				Table 6a		Specific data		Specific data		factor		W	
					W/m2		or Table 6b		or Table 6c		Table 6d			
East	6.4140				19.6403		0.4700		0.0000		0.7700		45.5895 (76)	
South	6.3150				46.7521		0.4700		0.0000		0.7700		106.8471 (78)	
West	6.1200				19.6403		0.4700		0.0000		0.7700		43.4998 (80)	
Solar gains	195.9364	349.2656	509.9141	670.5171	775.5209	777.7871	746.8062	669.1806	566.6542	395.5360	237.7341	165.5884	(83)	
Total gains	722.5285	874.0684	1019.3795	1150.9696	1227.3520	1203.5609	1157.0476	1082.0466	994.1427	849.2899	723.3931	679.1660	(84)	

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088
alpha	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473
util living area	0.9327	0.8757	0.7798	0.6391	0.4859	0.3482	0.2505	0.2797	0.4484	0.7122	0.8883	0.9449 (86)
Living	20.0322	20.3281	20.6329	20.8567	20.9597	20.9919	20.9984	20.9975	20.9777	20.8151	20.3788	19.9449
Non living	19.2356	19.5134	19.7898	19.9808	20.0608	20.0825	20.0860	20.0856	20.0746	19.9538	19.5676	19.1522
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.5049	20.3281	20.6329	20.8567	20.9597	20.9919	20.9984	20.9975	20.9777	20.8151	20.3788	20.0925 (87)
Th 2	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865 (88)
util rest of house	0.9209	0.8568	0.7512	0.6012	0.4420	0.2996	0.1988	0.2246	0.3924	0.6684	0.8676	0.9350 (89)
MIT 2	19.6512	19.5134	19.7898	19.9808	20.0608	20.0825	20.0860	20.0856	20.0746	19.9538	19.5676	19.2829 (90)
Living area fraction									fLA = Living area /			0.3660 (91)
MIT	19.9636	19.8116	20.0983	20.3013	20.3897	20.4153	20.4199	20.4193	20.4051	20.2690	19.8644	19.5791 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9636	19.8116	20.0983	20.3013	20.3897	20.4153	20.4199	20.4193	20.4051	20.2690	19.8644	19.5791 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9192	0.8506	0.7516	0.6103	0.4567	0.3172	0.2177	0.2448	0.4122	0.6776	0.8620	0.9286 (94)
Useful gains	664.1418	743.4515	766.1711	702.4913	560.5714	381.7649	251.9210	264.8576	409.7825	575.4790	623.5657	630.6553 (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	1034.4773	984.8087	898.0771	752.9816	573.8973	384.0631	252.2774	265.4480	416.4107	638.5727	843.0046	1015.6884 (97)
Space heating kWh	275.5296	162.1920	98.1381	36.3530	9.9144	0.0000	0.0000	0.0000	0.0000	46.9417	157.9960	286.4647 (98a)
Space heating requirement - total per year (kWh/year)												1073.5296
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	275.5296	162.1920	98.1381	36.3530	9.9144	0.0000	0.0000	0.0000	0.0000	46.9417	157.9960	286.4647 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1073.5296
Space heating per m2										(98c) / (4) =		16.1937 (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 %)												247.4933 (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	275.5296	162.1920	98.1381	36.3530	9.9144	0.0000	0.0000	0.0000	0.0000	46.9417	157.9960	286.4647 (98)
Space heating efficiency (main heating system 1)	247.4933	247.4933	247.4933	247.4933	247.4933	0.0000	0.0000	0.0000	0.0000	247.4933	247.4933	247.4933 (210)
Space heating fuel (main heating system)	111.3281	65.5339	39.6528	14.6885	4.0059	0.0000	0.0000	0.0000	0.0000	18.9669	63.8385	115.7464 (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	234.8918	207.6191	220.1780	192.5306	185.9447	166.7928	164.0039	170.9010	173.2137	194.0694	207.5038	232.1773 (64)
Efficiency of water heater	268.1107	268.1107	268.1107	268.1107	268.1107	268.1107	268.1107	268.1107	268.1107	268.1107	268.1107	268.1107 (216)
Fuel for water heating, kWh/month	87.6100	77.4378	82.1221	71.8101	69.3537	62.2104	61.1702	63.7427	64.6053	72.3841	77.3948	86.5976 (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	1.8370	1.6592	1.8370	1.7777	1.8370	1.7777	1.8370	1.8370	1.7777	1.8370	1.7777	1.8370 (231)
Lighting	19.2711	15.4600	13.9200	10.1984	7.8775	6.4360	7.1862	9.3408	12.1328	15.9189	17.9804	19.8067 (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												433.7610 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												268.1107
Water heating fuel used												876.4388 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:
(MEVDcentralised, Database: total watage = 2.3400, total flow = 21.0000, SFP = 0.1114)

Full SAP Calculation Printout



mechanical ventilation fans (SFP = 0.1114) 21.6289 (230a)
 Total electricity for the above, kWh/year 21.6289 (231)
 Electricity for lighting (calculated in Appendix L) 155.5290 (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 1487.3577 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	433.7610	16.4900	71.5272 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	876.4388	16.4900	144.5248 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	21.6289	16.4900	3.5666 (249)
Energy for lighting	155.5290	16.4900	25.6467 (250)
Additional standing charges			0.0000 (251)
Total energy cost			245.2653 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12): 0.3600 (256)
 Energy cost factor (ECF) 0.7934 (257)

$$[(255) \times (256)] / [(4) + 45.0] =$$

 SAP value 87.1396
 SAP rating (Section 12) 87 (258)
 SAP band B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	433.7610	0.1577	68.4138 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	876.4388	0.1410	123.5811 (264)
Space and water heating			191.9949 (265)
Pumps, fans and electric keep-hot	21.6289	0.1387	3.0002 (267)
Energy for lighting	155.5290	0.1443	22.4476 (268)
Total CO2, kg/year			217.4428 (272)
CO2 emissions per m2			3.2800 (273)
EI value			97.3819
EI rating			97 (274)
EI band			A

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

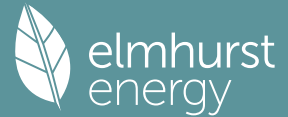
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	66.2930 (1b)	2.4000 (2b)	159.1032 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.2930		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	159.1032 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1388 (21)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000	(22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500	(22a)
Adj infilt rate													
	0.1457	0.1388	0.1388	0.1283	0.1283	0.1145	0.1179	0.1110	0.1145	0.1214	0.1214	0.1318	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation													
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(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	
Solid Door			2.1000	1.0000	2.1000			(26)
Windows (Uw = 1.30)			18.8490	1.2357	23.2937			(27)
W1 - 1	65.3810	18.8490	46.5320	0.1800	8.3758	60.0000	2791.9198	(29a)
W1 - 3	3.6360	2.1000	1.5360	0.2400	0.3686	60.0000	92.1600	(29a)
Total net area of external elements Aum(A, m2)			69.0180					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.1381			(33)
Party Wall			23.7400	0.0000	0.0000	110.0000	2611.4000	(32)
Party Floor 1			66.2930			40.0000	2651.7200	(32d)
Party Ceiling 1			66.2930			30.0000	1988.7900	(32b)
Stud			120.9072			9.0000	1088.1648	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 11224.1546 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 169.3113 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	10.3180	0.2210	2.2803	
E3 Sill	1.9210	0.0240	0.0461	
E4 Jamb	40.2860	0.0190	0.7654	
E5 Ground floor (normal)	8.3970	0.0450	0.3779	
E7 Party floor between dwellings (in blocks of flats)	49.1160	0.0360	1.7682	
E16 Corner (normal)	7.2000	0.0370	0.2664	
E18 Party wall between dwellings	4.8000	0.0310	0.1488	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	19.7840	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				5.6531 (36)
Point Thermal bridges				0.0000
Total fabric heat loss			(33) + (36) + (36a) =	39.7912 (37)

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

(38)m	Jan 26.2520	Feb 26.2520	Mar 26.2520	Apr 26.2520	May 26.2520	Jun 26.2520	Jul 26.2520	Aug 26.2520	Sep 26.2520	Oct 26.2520	Nov 26.2520	Dec 26.2520	(38)
Heat transfer coeff	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	(39)
Average = Sum(39)m / 12 =													66.0432

HLP	Jan 0.9962	Feb 0.9962	Mar 0.9962	Apr 0.9962	May 0.9962	Jun 0.9962	Jul 0.9962	Aug 0.9962	Sep 0.9962	Oct 0.9962	Nov 0.9962	Dec 0.9962	(40)
HLP (average)													0.9962
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.1529 (42)
Hot water usage for mixer showers	60.3163	59.4099	58.0890	55.5618	53.6968	51.6169	50.4347	51.7456	53.1826	55.4157	57.9972	60.0852 (42a)	
Hot water usage for baths	26.0612	25.6742	25.1291	24.1242	23.3717	22.5373	22.0866	22.6278	23.2171	24.1099	25.1356	25.9731 (42b)	
Hot water usage for other uses	36.6776	35.3439	34.0102	32.6764	31.3427	30.0090	30.0090	31.3427	32.6764	34.0102	35.3439	36.6776 (42c)	
Average daily hot water use (litres/day)												113.1158 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.0552	120.4280	117.2284	112.3624	108.4112	104.1632	102.5303	105.7161	109.0761	113.5358	118.4767	122.7360 (44)	
Energy content (annual)	194.8894	171.4879	180.1756	153.8186	145.9423	128.0808	124.0015	130.8986	134.5017	154.0670	168.7918	192.1749 (45)	
Distribution loss (46)m = 0.15 x (45)m	29.2334	25.7232	27.0263	23.0728	21.8913	19.2121	18.6002	19.6348	20.1753	23.1101	25.3188	28.8262 (46)	
Water storage loss:													
Store volume												150.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.0000 (48)	
Temperature factor from Table 2b												0.5400 (49)	
Enter (49) or (54) in (55)												0.5400 (55)	
Total storage loss	16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400 (56)	
If cylinder contains dedicated solar storage	16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400 (57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)	
Total heat required for water heating calculated for each month	234.8918	207.6191	220.1780	192.5306	185.9447	166.7928	164.0039	170.9010	173.2137	194.0694	207.5038	232.1773 (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	234.8918	207.6191	220.1780	192.5306	185.9447	166.7928	164.0039	170.9010	173.2137	194.0694	207.5038	232.1773 (64)	
												Total per year (kWh/year) = Sum(64)m = 2349.8261 (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													
	96.8026	85.9247	91.9103	82.1143	80.5277	73.5565	73.2324	75.5257	75.6914	83.2292	87.0929	95.9001 (65)	

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

elmhurst
energy

6. Solar gains

Solar gains	217.8167	349.5042	504.5830	685.2415	773.9169	831.6290	789.4539	721.9383	608.2462	422.7328	270.7714	182.2921 (83)
Total gains	744.4088	874.3070	1014.0485	1165.6941	1225.7480	1257.4028	1199.6952	1134.8043	1035.7347	876.4868	756.4304	695.8697 (84)

Temperature during heating periods in the living area from Table 9, T_{h1} (C)	21.0000 (85)
Utilisation factor for gains for living area, $n_{l,m}$ (see Table 9a)	

8. Space heating requirement

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

Page 6 of 15

elmhurst
energy

Current energy efficiency rating: B 87
Current environmental impact rating: A 97

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

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

Recommended measures Typical annual savings Energy Environmental
 (none) efficiency impact

Total Savings £0 0.00 kg/m²

Potential energy efficiency rating: B 87
 Potential environmental impact rating: A 97

Fuel prices for cost data on this page from database revision number 552 TEST (30 Aug 2024)
 Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

Electricity	Current £368	Potential £368	Saving £0
Space heating	£99	£99	£0
Water heating	£228	£228	£0
Lighting	£41	£41	£0
Total cost of fuels	£368	£368	£0
Total cost of uses	£368	£368	£0
Delivered energy	21 kWh/m²	21 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m²	3 kg/m²	3 kg/m²	0 kg/m²
Primary energy	33 kWh/m²	33 kWh/m²	0 kWh/m²

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

1. Overall dwelling characteristics

	Area (m²)	Storey height (m)	Volume (m³)
Ground floor	66.2930 (1b)	x 2.4000 (2b)	= 159.1032 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.2930		(4)
Dwelling volume		(3a) + (3b) + (3c) + (3d) + (3e) ... (3n) =	159.1032 (5)

2. Ventilation rate

	m³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

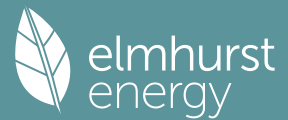
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1388 (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	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
Solid Door			2.1000	1.0000	2.1000		(26)
Windows (Uw = 1.30)			18.8490	1.2357	23.2937		(27)
W1 - 1	65.3810	18.8490	46.5320	0.1800	8.3758	60.0000	2791.9198 (29a)
W1 - 3	3.6360	2.1000	1.5360	0.2400	0.3686	60.0000	92.1600 (29a)

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Total net area of external elements Aum(A, m2)	69.0180					(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	34.1381				(33)
Party Wall	23.7400	0.0000	0.0000	110.0000	2611.4000	(32)
Party Floor 1	66.2930			40.0000	2651.7200	(32d)
Party Ceiling 1	66.2930			30.0000	1988.7900	(32b)
Stud	120.9072			9.0000	1088.1648	(32c)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
(28)...(30) + (32) + (32a)...(32e) = 11224.1546 (34)
169.3113 (35)

List of Thermal Bridges						
K1 Element	Length	Psi-value	Total			
E2 Other lintels (including other steel lintels)	10.3180	0.2210	2.2803			
E3 Sill	1.9210	0.0240	0.0461			
E4 Jamb	40.2860	0.0190	0.7654			
E5 Ground floor (normal)	8.3970	0.0450	0.3779			
E7 Party floor between dwellings (in blocks of flats)	49.1160	0.0360	1.7682			
E16 Corner (normal)	7.2000	0.0370	0.2664			
E18 Party wall between dwellings	4.8000	0.0310	0.1488			
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	19.7840	0.0000	0.0000			

Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Point Thermal bridges (36a) = 5.6531 (36)
Total fabric heat loss (33) + (36) + (36a) = 39.7912 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(38)
Heat transfer coeff	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	
Average = Sum(39)m / 12 =	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	(39)
	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(40)
HLP (average)	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.1529 (42)
Hot water usage for mixer showers													
60.3163	59.4099	58.0890	55.5618	53.6968	51.6169	50.4347	51.7456	53.1826	55.4157	57.9972	60.0852	(42a)	
Hot water usage for baths													
26.0612	25.6742	25.1291	24.1242	23.3717	22.5373	22.0866	22.6278	23.2171	24.1099	25.1356	25.9731	(42b)	
Hot water usage for other uses													
36.6776	35.3439	34.0102	32.6764	31.3427	30.0090	30.0090	31.3427	32.6764	34.0102	35.3439	36.6776	(42c)	
Average daily hot water use (litres/day)												113.1158 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.0552	120.4280	117.2284	112.3624	108.4112	104.1632	102.5303	105.7161	109.0761	113.5358	118.4767	122.7360	(44)
Energy content (annual)	194.8894	171.4879	180.1756	153.8186	145.9423	128.0808	124.0015	130.8986	134.5017	154.0670	168.7918	192.1749	(45)
Distribution loss (46)m = 0.15 x (45)m										Total =	Sum(45)m =	1878.8301	
29.2334	25.7232	27.0263	23.0728	21.8913	19.2121	18.6002	19.6348	20.1753	23.1101	25.3188	28.8262	(46)	
Water storage loss:													
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.0000 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.5400 (55)
Total storage loss													
16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	(56)
If cylinder contains dedicated solar storage													
16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
234.8918	207.6191	220.1780	192.5306	185.9447	166.7928	164.0039	170.9010	173.2137	194.0694	207.5038	232.1773	(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	234.8918	207.6191	220.1780	192.5306	185.9447	166.7928	164.0039	170.9010	173.2137	194.0694	207.5038	232.1773	(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													
96.8026	85.9247	91.9103	82.1143	80.5277	73.5565	73.2324	75.5257	75.6914	83.2292	87.0929	95.9001	(65)	

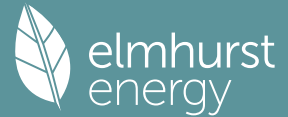
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.0167	19.5551	15.9033	12.0398	8.9999	7.5981	8.2100	10.6717	14.3235	18.1869	21.2268	22.6287 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	281.3365	284.2559	276.8991	261.2374	241.4673	222.8862	210.4729	207.5535	214.9103	230.5720	250.3421	268.9232 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702 (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)	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152 (71)
Water heating gains (Table 5)	130.1111	127.8641	123.5354	114.0476	108.2362	102.1618	98.4307	101.5131	105.1270	111.8672	120.9623	128.8980 (72)
Total internal gains	526.5920	524.8028	509.4655	480.4525	451.8312	425.7738	410.2413	412.8660	427.4885	453.7539	485.6590	513.5775 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
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	m2				Table 6a W/m2	Specific data or Table 6b		Specific data or Table 6c		factor Table 6d	W	
East				6.4140	19.6403	0.4700	0.0000		0.7700		45.5895	(76)
South				6.3150	46.7521	0.4700	0.0000		0.7700		106.8471	(78)
West				6.1200	19.6403	0.4700	0.0000		0.7700		43.4998	(80)

Solar gains	195.9364	349.2656	509.9141	670.5171	775.5209	777.7871	746.8062	669.1806	566.6542	395.5360	237.7341	165.5884	(83)
Total gains	722.5285	874.0684	1019.3795	1150.9696	1227.3520	1203.5609	1157.0476	1082.0466	994.1427	849.2899	723.3931	679.1660	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	
alpha	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	
util living area	0.9327	0.8757	0.7798	0.6391	0.4859	0.3482	0.2505	0.2797	0.4484	0.7122	0.8883	0.9449	(86)
Living	20.0322	20.3281	20.6329	20.8567	20.9597	20.9919	20.9984	20.9975	20.9777	20.8151	20.3788	19.9449	
Non living	19.2356	19.5134	19.7898	19.9808	20.0608	20.0825	20.0860	20.0856	20.0746	19.9538	19.5676	19.1522	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.5049	20.3281	20.6329	20.8567	20.9597	20.9919	20.9984	20.9975	20.9777	20.8151	20.3788	20.0925	(87)
Th 2	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	(88)
util rest of house	0.9209	0.8568	0.7512	0.6012	0.4420	0.2996	0.1988	0.2246	0.3924	0.6684	0.8676	0.9350	(89)
MIT 2	19.6512	19.5134	19.7898	19.9808	20.0608	20.0825	20.0860	20.0856	20.0746	19.9538	19.5676	19.2829	(90)
Living area fraction									fLA =	Living area /	(4) =	0.3660	(91)
MIT	19.9636	19.8116	20.0983	20.3013	20.3897	20.4153	20.4199	20.4193	20.4051	20.2690	19.8644	19.5791	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9636	19.8116	20.0983	20.3013	20.3897	20.4153	20.4199	20.4193	20.4051	20.2690	19.8644	19.5791	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9192	0.8506	0.7516	0.6103	0.4567	0.3172	0.2177	0.2448	0.4122	0.6776	0.8620	0.9286	(94)
Useful gains	664.1418	743.4515	766.1711	702.4913	560.5714	381.7649	251.9210	264.8576	409.7825	575.4790	623.5657	630.6553	(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	1034.4773	984.8087	898.0771	752.9816	573.8973	384.0631	252.2774	265.4480	416.4107	638.5727	843.0046	1015.6884	(97)
Space heating kWh	275.5296	162.1920	98.1381	36.3530	9.9144	0.0000	0.0000	0.0000	0.0000	46.9417	157.9960	286.4647	(98a)
Space heating requirement - total per year (kWh/year)												1073.5296	
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	275.5296	162.1920	98.1381	36.3530	9.9144	0.0000	0.0000	0.0000	0.0000	46.9417	157.9960	286.4647	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1073.5296	
Space heating per m2										(98c) / (4) =		16.1937	(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 %)												247.4933	(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	275.5296	162.1920	98.1381	36.3530	9.9144	0.0000	0.0000	0.0000	0.0000	46.9417	157.9960	286.4647	(98)
Space heating efficiency (main heating system 1)	247.4933	247.4933	247.4933	247.4933	247.4933	0.0000	0.0000	0.0000	0.0000	247.4933	247.4933	247.4933	(210)
Space heating fuel (main heating system)	111.3281	65.5339	39.6528	14.6885	4.0059	0.0000	0.0000	0.0000	0.0000	18.9669	63.8385	115.7464	(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	234.8918	207.6191	220.1780	192.5306	185.9447	166.7928	164.0039	170.9010	173.2137	194.0694	207.5038	232.1773	(64)
Efficiency of water heater	268.1107	268.1107	268.1107	268.1107	268.1107	268.1107	268.1107	268.1107	268.1107	268.1107	268.1107	268.1107	(216)
Fuel for water heating, kWh/month	87.6100	77.4378	82.1221	71.8101	69.3537	62.2104	61.1702	63.7427	64.6053	72.3841	77.3948	86.5976	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	1.8370	1.6592	1.8370	1.7777	1.8370	1.7777	1.8370	1.8370	1.7777	1.8370	1.7777	1.8370	(231)
Lighting	19.2711	15.4600	13.9200	10.1984	7.8775	6.4360	7.1862	9.3408	12.1328	15.9189	17.9804	19.8067	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

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Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												433.7610	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												268.1107	
Water heating fuel used												876.4388	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.3400, total flow = 21.0000, SFP = 0.1114)													
mechanical ventilation fans (SFP = 0.1114)												21.6289	(230a)
Total electricity for the above, kWh/year												21.6289	(231)
Electricity for lighting (calculated in Appendix L)												155.5290	(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												1487.3577	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	433.7610	16.4900	71.5272	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	876.4388	16.4900	144.5248	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	21.6289	16.4900	3.5666	(249)
Energy for lighting	155.5290	16.4900	25.6467	(250)
Additional standing charges			0.0000	(251)
Total energy cost			245.2653	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)		0.7934	(257)
SAP value		87.1396	
SAP rating (Section 12)		87	(258)
SAP band		B	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	433.7610	0.1577	68.4138	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	876.4388	0.1410	123.5811	(264)
Space and water heating			191.9949	(265)
Pumps, fans and electric keep-hot	21.6289	0.1387	3.0002	(267)
Energy for lighting	155.5290	0.1443	22.4476	(268)
Total CO2, kg/year			217.4428	(272)
CO2 emissions per m2			3.2800	(273)
EI value			97.3819	
EI rating			97	(274)
EI band			A	

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

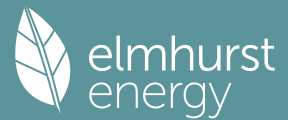
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	66.2930	2.4000	159.1032	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.2930			(4)
Dwelling volume			159.1032	(5)

2. Ventilation rate

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

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Number of flueless gas fires	0 * 40 = 0.0000 (7c)											
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											
Pressure test	0.0000 / (5) = 0.0000 (8)											
Pressure Test Method	Yes											
Measured/design AP50	Blower Door											
Infiltration rate	3.0000 (17)											
Number of sides sheltered	0.1500 (18)											
	1 (19)											
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)											
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1388 (21)											

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.1457	0.1388	0.1388	0.1283	0.1283	0.1145	0.1179	0.1110	0.1145	0.1214	0.1214	0.1318 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation	0.5000 (23a)											
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)											
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
Solid Door			2.1000	1.0000	2.1000		(26)
Windows (Uw = 1.30)			18.8490	1.2357	23.2937		(27)
W1 - 1	65.3810	18.8490	46.5320	0.1800	8.3758	60.0000	2791.9198 (29a)
W1 - 3	3.6360	2.1000	1.5360	0.2400	0.3686	60.0000	92.1600 (29a)
Total net area of external elements Aum(A, m2)			69.0180				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.1381		(33)
Party Wall			23.7400	0.0000	0.0000	110.0000	2611.4000 (32)
Party Floor 1			66.2930			40.0000	2651.7200 (32d)
Party Ceiling 1			66.2930			30.0000	1988.7900 (32b)
Stud			120.9072			9.0000	1088.1648 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11224.1546 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		169.3113 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.3180	0.2210	2.2803
E3 Sill	1.9210	0.0240	0.0461
E4 Jamb	40.2860	0.0190	0.7654
E5 Ground floor (normal)	8.3970	0.0450	0.3779
E7 Party floor between dwellings (in blocks of flats)	49.1160	0.0360	1.7682
E16 Corner (normal)	7.2000	0.0370	0.2664
E18 Party wall between dwellings	4.8000	0.0310	0.1488
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	19.7840	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		5.6531 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	39.7912 (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	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520 (38)
Average = Sum(39)m / 12 =	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432 (39)

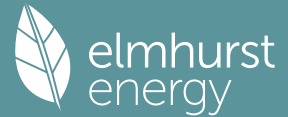
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.1529 (42)											
Hot water usage for mixer showers												
Hot water usage for baths	60.3163	59.4099	58.0890	55.5618	53.6968	51.6169	50.4347	51.7456	53.1826	55.4157	57.9972	60.0852 (42a)
Hot water usage for other uses	26.0612	25.6742	25.1291	24.1242	23.3717	22.5373	22.0866	22.6278	23.2171	24.1099	25.1356	25.9731 (42b)
Average daily hot water use (litres/day)	36.6776	35.3439	34.0102	32.6764	31.3427	30.0090	30.0090	31.3427	32.6764	34.0102	35.3439	36.6776 (42c)
	113.1158 (43)											

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	123.0552	120.4280	117.2284	112.3624	108.4112	104.1632	102.5303	105.7161	109.0761	113.5358	118.4767	122.7360 (44)
Energy conte	194.8894	171.4879	180.1756	153.8186	145.9423	128.0808	124.0015	130.8986	134.5017	154.0670	168.7918	192.1749 (45)
Energy content (annual)	Total = Sum(45)m = 1878.8301											
Distribution loss (46)m = 0.15 x (45)m	29.2334	25.7232	27.0263	23.0728	21.8913	19.2121	18.6002	19.6348	20.1753	23.1101	25.3188	28.8262 (46)
Water storage loss:												
Store volume	150.0000 (47)											
a) If manufacturer declared loss factor is known (kWh/day):	1.0000 (48)											
Temperature factor from Table 2b	0.5400 (49)											
Enter (49) or (54) in (55)	0.5400 (55)											
Total storage loss	16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400 (56)
If cylinder contains dedicated solar storage	16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	234.8918	207.6191	220.1780	192.5306	185.9447	166.7928	164.0039	170.9010	173.2137	194.0694	207.5038	232.1773 (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												

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	234.8918	207.6191	220.1780	192.5306	185.9447	166.7928	164.0039	170.9010	173.2137	194.0694	207.5038	232.1773 (64)
	Total per year (kWh/year) = Sum(64)m =											2349.8261 (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	96.8026	85.9247	91.9103	82.1143	80.5277	73.5565	73.2324	75.5257	75.6914	83.2292	87.0929	95.9001 (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	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.0167	19.5551	15.9033	12.0398	8.9999	7.5981	8.2100	10.6717	14.3235	18.1869	21.2268	22.6287 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	281.3365	284.2559	276.8991	261.2374	241.4673	222.8862	210.4729	207.5535	214.9103	230.5720	250.3421	268.9232 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702 (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)	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152 (71)
Water heating gains (Table 5)	130.1111	127.8641	123.5354	114.0476	108.2362	102.1618	98.4307	101.5131	105.1270	111.8672	120.9623	128.8980 (72)
Total internal gains	526.5920	524.8028	509.4655	480.4525	451.8312	425.7738	410.2413	412.8660	427.4885	453.7539	485.6590	513.5775 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
East	6.4140	22.3313	0.4700	0.0000	0.7700	51.8360 (76)
South	6.3150	50.9848	0.4700	0.0000	0.7700	116.5206 (78)
West	6.1200	22.3313	0.4700	0.0000	0.7700	49.4600 (80)

Solar gains	217.8167	349.5042	504.5830	685.2415	773.9169	831.6290	789.4539	721.9383	608.2462	422.7328	270.7714	182.2921 (83)
Total gains	744.4088	874.3070	1014.0485	1165.6941	1225.7480	1257.4028	1199.6952	1134.8043	1035.7347	876.4868	756.4304	695.8697 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088
alpha	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473
util living area	0.9158	0.8614	0.7540	0.5913	0.4235	0.2619	0.1706	0.1861	0.3660	0.6488	0.8531	0.9304 (86)
Living	20.1690	20.4046	20.6987	20.9013	20.9790	20.9979	20.9997	20.9996	20.9911	20.8823	20.5190	20.0917
Non living	19.3670	19.5854	19.8486	20.0167	20.0744	20.0857	20.0864	20.0864	20.0825	20.0072	19.6966	19.2943
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.5749	20.4046	20.6987	20.9013	20.9790	20.9979	20.9997	20.9996	20.9911	20.8823	20.5190	20.2188 (87)
Th 2	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865 (88)
util rest of house	0.9011	0.8402	0.7223	0.5506	0.3774	0.2144	0.1203	0.1330	0.3099	0.5993	0.8268	0.9177 (89)
MIT 2	19.7184	19.5854	19.8486	20.0167	20.0744	20.0857	20.0864	20.0864	20.0825	20.0072	19.6966	19.4051 (90)
Living area fraction	fLA = Living area / (4) =											0.3660 (91)
MIT	20.0319	19.8852	20.1597	20.3404	20.4054	20.4195	20.4207	20.4206	20.4150	20.3275	19.9975	19.7029 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0319	19.8852	20.1597	20.3404	20.4054	20.4195	20.4207	20.4206	20.4150	20.3275	19.9975	19.7029 (93)

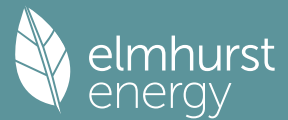
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9002	0.8351	0.7249	0.5622	0.3936	0.2317	0.1387	0.1525	0.3302	0.6128	0.8239	0.9116 (94)
Ext temp.	670.0831	730.1338	735.1170	655.3114	482.5136	291.3525	166.4337	173.0138	342.0185	537.1544	623.2582	634.3454 (95)
Heat loss rate W	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Space heating kWh	986.1483	943.4416	842.6915	689.5192	489.0790	291.8776	166.4734	173.0740	344.4171	576.3894	792.3566	964.4227 (97)
Space heating requirement - total per year (kWh/year)	235.1525	143.3428	80.0354	24.6296	4.8846	0.0000	0.0000	0.0000	0.0000	29.1909	121.7508	245.5775 (98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Space heating contribution - total per year (kWh/year)	235.1525	143.3428	80.0354	24.6296	4.8846	0.0000	0.0000	0.0000	0.0000	29.1909	121.7508	245.5775 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												884.5642
Space heating per m ²												(98c) / (4) = 13.3433 (99)

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

-----												0.0000 (201)
Fraction of space heat from secondary/supplementary system (Table 11)												
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												247.4933 (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												

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Space heating efficiency (main heating system 1)	235.1525	143.3428	80.0354	24.6296	4.8846	0.0000	0.0000	0.0000	0.0000	29.1909	121.7508	245.5775	(98)
Space heating fuel (main heating system)	247.4933	247.4933	247.4933	247.4933	247.4933	0.0000	0.0000	0.0000	0.0000	247.4933	247.4933	247.4933	(210)
Space heating efficiency (main heating system 2)	95.0137	57.9179	32.3384	9.9516	1.9736	0.0000	0.0000	0.0000	0.0000	11.7946	49.1936	99.2259	(211)
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	(212)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	234.8918	207.6191	220.1780	192.5306	185.9447	166.7928	164.0039	170.9010	173.2137	194.0694	207.5038	232.1773	(64)
Efficiency of water heater (217)m	268.1107	268.1107	268.1107	268.1107	268.1107	268.1107	268.1107	268.1107	268.1107	268.1107	268.1107	268.1107	(216)
Fuel for water heating, kWh/month	87.6100	77.4378	82.1221	71.8101	69.3537	62.2104	61.1702	63.7427	64.6053	72.3841	77.3948	86.5976	(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	1.8370	1.6592	1.8370	1.7777	1.8370	1.7777	1.8370	1.8370	1.7777	1.8370	1.7777	1.8370	(231)
Lighting	19.2711	15.4600	13.9200	10.1984	7.8775	6.4360	7.1862	9.3408	12.1328	15.9189	17.9804	19.8067	(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												357.4093	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												268.1107	
Water heating fuel used												876.4388	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.3400, total flow = 21.0000, SFP = 0.1114)													
mechanical ventilation fans (SFP = 0.1114)												21.6289	(230a)
Total electricity for the above, kWh/year												21.6289	(231)
Electricity for lighting (calculated in Appendix L)												155.5290	(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												1411.0060	(238)

10a. Fuel costs - using BEDF prices (552)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	357.4093	26.0600	93.1409	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	876.4388	26.0600	228.3999	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	21.6289	26.0600	5.6365	(249)
Energy for lighting	155.5290	26.0600	40.5309	(250)
Additional standing charges			0.0000	(251)
Total energy cost			367.7082	(255)

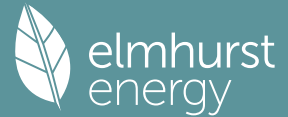
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	357.4093	0.1583	56.5916	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	876.4388	0.1410	123.5811	(264)
Space and water heating			180.1727	(265)
Pumps, fans and electric keep-hot	21.6289	0.1387	3.0002	(267)
Energy for lighting	155.5290	0.1443	22.4476	(268)
Total CO2, kg/year			205.6205	(272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	357.4093	1.5861	566.8836	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	876.4388	1.5214	1333.4015	(278)
Space and water heating			1900.2850	(279)
Pumps, fans and electric keep-hot	21.6289	1.5128	32.7203	(281)
Energy for lighting	155.5290	1.5338	238.5556	(282)
Total Primary energy kWh/year			2171.5609	(286)

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Property Reference	005 MT				Issued on Date	10/09/2024
Assessment Reference	005 MT Flat Elec DWHP PV	Prop Type Ref	005 MT			
Property	005 MT, 005 MT, 0					
SAP Rating	88 B	DER	3.24	TER	11.58	
Environmental	98 A	% DER < TER				72.02
CO ₂ Emissions (t/year)	0.16	DFEE	27.55	TFEE	29.02	
Compliance Check	See BREL	% DFEE < TFEE				5.07
% DPER < TPER	40.31	DPER	36.29	TPER	60.80	
Assessor Details	Mr. Scott Binstead				Assessor ID	U903-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	66.2930 (1b)	2.4000 (2b)	159.1032 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.2930		159.1032 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	159.1032 (5)

2. Ventilation rate

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

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	1	(19)

Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1388 (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	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

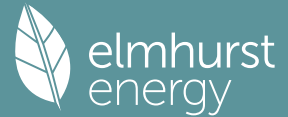
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Solid Door			2.1000	1.0000	2.1000		(26)
Windows (Uw = 1.30)			18.8490	1.2357	23.2937		(27)
W1 - 1	65.3810	18.8490	46.5320	0.1800	8.3758	60.0000	2791.9198 (29a)
W1 - 3	3.6360	2.1000	1.5360	0.2400	0.3686	60.0000	92.1600 (29a)
Total net area of external elements Aum(A, m ²)			69.0180				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.1381		(33)
Party Wall			23.7400	0.0000	0.0000	110.0000	2611.4000 (32)
Party Floor 1			66.2930			40.0000	2651.7200 (32a)
Party Ceiling 1			66.2930			30.0000	1988.7900 (32b)
Stud			120.9072			9.0000	1088.1648 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11224.1546 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		169.3113 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.3180	0.2210	2.2803

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E3 Sill	1.9210	0.0240	0.0461
E4 Jamb	40.2860	0.0190	0.7654
E5 Ground floor (normal)	8.3970	0.0450	0.3779
E7 Party floor between dwellings (in blocks of flats)	49.1160	0.0360	1.7682
E16 Corner (normal)	7.2000	0.0370	0.2664
E18 Party wall between dwellings	4.8000	0.0310	0.1488
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	19.7840	0.0000	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.6531 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	39.7912 (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	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520 (38)
Average = Sum(39)m / 12 =	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432 (39)
HLP	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962 (40)
HLP (average)												0.9962
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.1529 (42)
Hot water usage for mixer showers	60.3163	59.4099	58.0890	55.5618	53.6968	51.6169	50.4347	51.7456	53.1826	55.4157	57.9972	60.0852 (42a)	
Hot water usage for baths	26.0612	25.6742	25.1291	24.1242	23.3717	22.5373	22.0866	22.6278	23.2171	24.1099	25.1356	25.9731 (42b)	
Hot water usage for other uses	36.6776	35.3439	34.0102	32.6764	31.3427	30.0090	30.0090	31.3427	32.6764	34.0102	35.3439	36.6776 (42c)	
Average daily hot water use (litres/day)												113.1158 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	123.0552	120.4280	117.2284	112.3624	108.4112	104.1632	102.5303	105.7161	109.0761	113.5358	118.4767	122.7360 (44)	
Energy content (annual)	194.8894	171.4879	180.1756	153.8186	145.9423	128.0808	124.0015	130.8986	134.5017	154.0670	168.7918	192.1749 (45)	
Distribution loss (46)m = 0.15 x (45)m	29.2334	25.7232	27.0263	23.0728	21.8913	19.2121	18.6002	19.6348	20.1753	23.1101	25.3188	28.8262 (46)	
Water storage loss:													
Store volume												201.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.6100 (48)	
Temperature factor from Table 2b												0.5400 (49)	
Enter (49) or (54) in (55)												0.8694 (55)	
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)	
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (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	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263 (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	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263 (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	64.8007	57.0197	59.9084	51.1447	48.5258	42.5869	41.2305	43.5238	44.7218	51.2273	56.1233	63.8982 (65)	
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)	

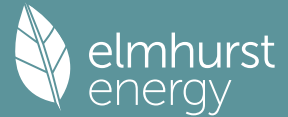
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.0167	19.5551	15.9033	12.0398	8.9999	7.5981	8.2100	10.6717	14.3235	18.1869	21.2268	22.6287 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	281.3365	284.2559	276.8991	261.2374	241.4673	222.8862	210.4729	207.5535	214.9103	230.5720	250.3421	268.9232 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702 (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)	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152 (71)
Water heating gains (Table 5)	87.0977	84.8508	80.5220	71.0343	65.2229	59.1484	55.4173	58.4997	62.1136	68.8539	77.9490	85.8846 (72)
Total internal gains	483.5787	481.7895	466.4521	437.4392	408.8178	382.7605	367.2280	369.8527	384.4752	410.7406	442.6457	470.5642 (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
East				6.4140	19.6403		0.4700		0.0000		0.7700		45.5895 (76)
South				6.3150	46.7521		0.4700		0.0000		0.7700		106.8471 (78)
West				6.1200	19.6403		0.4700		0.0000		0.7700		43.4998 (80)
Solar gains	195.9364	349.2656	509.9141	670.5171	775.5209	777.7871	746.8062	669.1806	566.6542	395.5360	237.7341	165.5884	(83)
Total gains	679.5151	831.0551	976.3662	1107.9563	1184.3387	1160.5476	1114.0342	1039.0333	951.1293	806.2766	680.3798	636.1527	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	
alpha	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	
util living area	0.9439	0.8906	0.7978	0.6576	0.5016	0.3607	0.2601	0.2911	0.4670	0.7364	0.9049	0.9549 (86)	
MIT	19.9588	20.2711	20.5970	20.8408	20.9547	20.9908	20.9982	20.9970	20.9741	20.7899	20.3181	19.8675 (87)	
Th 2	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865 (88)	
util rest of house	0.9337	0.8733	0.7703	0.6196	0.4568	0.3105	0.2065	0.2339	0.4092	0.6933	0.8864	0.9465 (89)	
MIT 2	18.9051	19.2840	19.6661	19.9350	20.0492	20.0807	20.0857	20.0852	20.0687	19.8911	19.3495	18.7924 (90)	
Living area fraction									fLA = Living area / (4) =				0.3660 (91)
MIT	19.2907	19.6452	20.0068	20.2665	20.3806	20.4137	20.4196	20.4189	20.4001	20.2200	19.7040	19.1859 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.2907	19.6452	20.0068	20.2665	20.3806	20.4137	20.4196	20.4189	20.4001	20.2200	19.7040	19.1859 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9231	0.8638	0.7677	0.6273	0.4714	0.3286	0.2261	0.2548	0.4294	0.7000	0.8775	0.9363 (94)
Useful gains	627.2344	717.8787	749.5721	695.0027	558.3424	381.3337	251.8485	264.7306	408.3784	564.3815	597.0181	595.6421 (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	990.0356	973.8233	892.0329	750.6776	573.2937	383.9581	252.2609	265.4195	416.0767	635.3384	832.4080	989.7143 (97)
Space heating kWh	269.9241	171.9948	105.9909	40.0859	11.1238	0.0000	0.0000	0.0000	0.0000	52.7920	169.4807	293.1897 (98a)
Space heating requirement - total per year (kWh/year)												1114.5818
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	269.9241	171.9948	105.9909	40.0859	11.1238	0.0000	0.0000	0.0000	0.0000	52.7920	169.4807	293.1897 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1114.5818
Space heating per m2										(98c) / (4) =		16.8130 (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)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	269.9241	171.9948	105.9909	40.0859	11.1238	0.0000	0.0000	0.0000	0.0000	52.7920	169.4807	293.1897	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	269.9241	171.9948	105.9909	40.0859	11.1238	0.0000	0.0000	0.0000	0.0000	52.7920	169.4807	293.1897	(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)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263	(64)
Efficiency of water heater												345.3200	(216)
(217)m	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	(217)
Fuel for water heating, kWh/month	64.2421	56.7100	59.9812	52.0968	50.0677	44.6435	43.7139	45.7112	46.5029	52.4205	56.4328	63.4560	(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	1.8370	1.6592	1.8370	1.7777	1.8370	1.7777	1.8370	1.8370	1.7777	1.8370	1.7777	1.8370	(231)
Lighting	19.2711	15.4600	13.9200	10.1984	7.8775	6.4360	7.1862	9.3408	12.1328	15.9189	17.9804	19.8067	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-13.4555	-22.4755	-38.1511	-48.6794	-56.4343	-53.7464	-52.6823	-46.9323	-37.3831	-27.1481	-15.6784	-11.1628	(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	-2.3811	-6.4432	-17.1705	-33.3664	-51.1266	-54.3820	-53.0238	-41.4140	-26.1705	-11.5234	-3.6109	-1.7419	(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												1114.5818	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												345.3200	
Water heating fuel used												635.9785	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 2.3400, total flow = 21.0000, SFP = 0.1114)													
mechanical ventilation fans (SFP = 0.1114)												21.6289	(230a)

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Total electricity for the above, kWh/year 21.6289 (231)
Electricity for lighting (calculated in Appendix L) 155.5290 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation -726.2834 (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 1201.4349 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1114.5818	16.4900	183.7945 (240)
Space heating - main system 2	0.0000	16.4900	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	635.9785	16.4900	104.8729 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	21.6289	16.4900	3.5666 (249)
Energy for lighting	155.5290	16.4900	25.6467 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-423.9292	16.4900	-69.9059
PV Unit electricity exported	-302.3542	5.5900	-16.9016
Total			-86.8075 (252)
Total energy cost			231.0732 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12): 0.3600 (256)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] = 0.7475 (257)
SAP value 87.8838
SAP rating (Section 12) 88 (258)
SAP band B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1114.5818	0.1575	175.4952 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	635.9785	0.1412	89.7773 (264)
Space and water heating			265.2725 (265)
Pumps, fans and electric keep-hot	21.6289	0.1387	3.0002 (267)
Energy for lighting	155.5290	0.1443	22.4476 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-423.9292	0.1322	-56.0305
PV Unit electricity exported	-302.3542	0.1201	-36.3127
Total			-92.3432 (269)
Total CO2, kg/year			198.3772 (272)
CO2 emissions per m2			2.9900 (273)
EI value			97.6115
EI rating			98 (274)
EI band			A

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

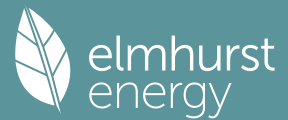
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	66.2930 (1b)	x 2.4000 (2b)	= 159.1032 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.2930		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 159.1032 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

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Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											Air changes per hour	
Pressure test												0.0000 / (5) =	0.0000 (8)
Pressure Test Method												Yes	
Measured/design AP50												Blower Door	
Infiltration rate												3.0000	(17)
Number of sides sheltered												0.1500	(18)
												1	(19)
Shelter factor												(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) =	0.1388 (21)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000	(22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500	(22a)
Adj infilt rate	0.1457	0.1388	0.1388	0.1283	0.1283	0.1145	0.1179	0.1110	0.1145	0.1214	0.1214	0.1318	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(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	
Solid Door			2.1000	1.0000	2.1000			(26)
Windows (Uw = 1.30)			18.8490	1.2357	23.2937			(27)
W1 - 1	65.3810	18.8490	46.5320	0.1800	8.3758	60.0000	2791.9198	(29a)
W1 - 3	3.6360	2.1000	1.5360	0.2400	0.3686	60.0000	92.1600	(29a)
Total net area of external elements Aum(A, m ²)			69.0180					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.1381			(33)
Party Wall			23.7400	0.0000	0.0000	110.0000	2611.4000	(32)
Party Floor 1			66.2930			40.0000	2651.7200	(32d)
Party Ceiling 1			66.2930			30.0000	1988.7900	(32b)
Stud			120.9072			9.0000	1088.1648	(32c)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
(28)...(30) + (32) + (32a)...(32e) = 11224.1546 (34)
169.3113 (35)

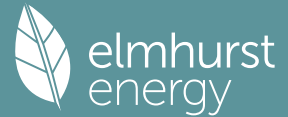
List of Thermal Bridges	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	10.3180	0.2210	2.2803	
E3 Sill	1.9210	0.0240	0.0461	
E4 Jamb	40.2860	0.0190	0.7654	
E5 Ground floor (normal)	8.3970	0.0450	0.3779	
E7 Party floor between dwellings (in blocks of flats)	49.1160	0.0360	1.7682	
E16 Corner (normal)	7.2000	0.0370	0.2664	
E18 Party wall between dwellings	4.8000	0.0310	0.1488	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	19.7840	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				5.6531 (36)
Point Thermal bridges				(36a) = 0.0000
Total fabric heat loss				(33) + (36) + (36a) = 39.7912 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(38)
Heat transfer coeff	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	
Average = Sum(39)m / 12 =	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	(39)
													66.0432
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1529	(42)
Hot water usage for mixer showers													
Hot water usage for baths	60.3163	59.4099	58.0890	55.5618	53.6968	51.6169	50.4347	51.7456	53.1826	55.4157	57.9972	60.0852	(42a)
Hot water usage for other uses	26.0612	25.6742	25.1291	24.1242	23.3717	22.5373	22.0866	22.6278	23.2171	24.1099	25.1356	25.9731	(42b)
Average daily hot water use (litres/day)	36.6776	35.3439	34.0102	32.6764	31.3427	30.0090	30.0090	31.3427	32.6764	34.0102	35.3439	36.6776	(42c)
												113.1158	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	123.0552	120.4280	117.2284	112.3624	108.4112	104.1632	102.5303	105.7161	109.0761	113.5358	118.4767	122.7360	(44)
Energy content (annual)	194.8894	171.4879	180.1756	153.8186	145.9423	128.0808	124.0015	130.8986	134.5017	154.0670	168.7918	192.1749	(45)
Distribution loss (46)m = 0.15 x (45)m	29.2334	25.7232	27.0263	23.0728	21.8913	19.2121	18.6002	19.6348	20.1753	23.1101	25.3188	28.8262	(46)
Water storage loss:													
Store volume												201.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(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	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263	(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	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263	(64)

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Total per year (kWh/year) = Sum(64)m =											2196.1611 (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 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											0.0000 (64a)
Heat gains from water heating, kWh/month	64.8007	57.0197	59.9084	51.1447	48.5258	42.5869	41.2305	43.5238	44.7218	51.2273	56.1233 (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	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.0167	19.5551	15.9033	12.0398	8.9999	7.5981	8.2100	10.6717	14.3235	18.1869	21.2268	22.6287 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	281.3365	284.2559	276.8991	261.2374	241.4673	222.8862	210.4729	207.5535	214.9103	230.5720	250.3421	268.9232 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702 (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)	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152 (71)
Water heating gains (Table 5)	87.0977	84.8508	80.5220	71.0343	65.2229	59.1484	55.4173	58.4997	62.1136	68.8539	77.9490	85.8846 (72)
Total internal gains	483.5787	481.7895	466.4521	437.4392	408.8178	382.7605	367.2280	369.8527	384.4752	410.7406	442.6457	470.5642 (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	
East	6.4140				22.3313		0.4700		0.0000		0.7700		51.8360 (76)	
South	6.3150				50.9848		0.4700		0.0000		0.7700		116.5206 (78)	
West	6.1200				22.3313		0.4700		0.0000		0.7700		49.4600 (80)	
Solar gains	217.8167	349.5042	504.5830	685.2415	773.9169	831.6290	789.4539	721.9383	608.2462	422.7328	270.7714	182.2921 (83)		
Total gains	701.3954	831.2936	971.0352	1122.6807	1182.7347	1214.3895	1156.6819	1091.7910	992.7214	833.4734	713.4170	652.8563 (84)		

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088
alpha	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473
util living area	0.9288	0.8775	0.7731	0.6094	0.4378	0.2710	0.1769	0.1934	0.3813	0.6731	0.8724	0.9423 (86)
MIT	20.1008	20.3512	20.6673	20.8897	20.9763	20.9975	20.9997	20.9996	20.9897	20.8651	20.4672	20.0190 (87)
Th 2	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865 (88)
util rest of house	0.9159	0.8578	0.7422	0.5683	0.3905	0.2219	0.1248	0.1383	0.3230	0.6236	0.8481	0.9313 (89)
MIT 2	19.0810	19.3813	19.7474	19.9860	20.0688	20.0853	20.0864	20.0864	20.0805	19.9687	19.5274	18.9815 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	19.4542	19.7363	20.0840	20.3167	20.4009	20.4191	20.4206	20.4206	20.4132	20.2967	19.8713	19.3612 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4542	19.7363	20.0840	20.3167	20.4009	20.4191	20.4206	20.4206	20.4132	20.2967	19.8713	19.3612 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9054	0.8494	0.7421	0.5789	0.4070	0.2398	0.1439	0.1585	0.3440	0.6355	0.8418	0.9209 (94)
Useful gains	635.0166	706.1366	720.6170	649.9509	481.3580	291.2545	166.4256	173.0010	341.5023	529.6668	600.5198	601.2111 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	947.9974	933.6038	837.6942	687.9527	488.7809	291.8544	166.4716	173.0711	344.2984	574.3611	784.0200	941.8557 (97)
Space heating kWh	232.8577	152.8580	87.1055	27.3613	5.5226	0.0000	0.0000	0.0000	0.0000	33.2525	132.1201	253.4396 (98a)
Space heating requirement - total per year (kWh/year)												924.5172
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	232.8577	152.8580	87.1055	27.3613	5.5226	0.0000	0.0000	0.0000	0.0000	33.2525	132.1201	253.4396 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												924.5172
Space heating per m2										(98c) / (4) =		13.9459 (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)
Fraction of main heating from main system 2												0.0000 (203)
Fraction of total heating from main system 1												1.0000 (204)
Fraction of total heating from main system 2												0.0000 (205)
Efficiency of main space heating system 1 (in %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	232.8577	152.8580	87.1055	27.3613	5.5226	0.0000	0.0000	0.0000	0.0000	33.2525	132.1201	253.4396 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)

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Space heating fuel (main heating system)	232.8577	152.8580	87.1055	27.3613	5.5226	0.0000	0.0000	0.0000	0.0000	33.2525	132.1201	253.4396	(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)
Space heating fuel used, main system 2												0.0000	(213)
Water heating requirement	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263	(64)
Efficiency of water heater (217)m	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	(216)
Fuel for water heating, kWh/month	64.2421	56.7100	59.9812	52.0968	50.0677	44.6435	43.7139	45.7112	46.5029	52.4205	56.4328	63.4560	(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	1.8370	1.6592	1.8370	1.7777	1.8370	1.7777	1.8370	1.7777	1.8370	1.7777	1.8370	1.7777	(231)
Lighting	19.2711	15.4600	13.9200	10.1984	7.8775	6.4360	7.1862	9.3408	12.1328	15.9189	17.9804	19.8067	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-15.1470	-22.9522	-38.3146	-49.6649	-56.5712	-56.5703	-55.0990	-50.0182	-40.0685	-28.9874	-17.8973	-12.4730	(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	-2.9991	-6.8679	-17.9408	-36.0152	-52.5257	-60.6342	-58.3097	-47.1541	-29.8938	-13.5729	-4.7492	-2.1675	(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												924.5172	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												345.3200	
Water heating fuel used												635.9785	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 2.3400, total flow = 21.0000, SFP = 0.1114)													
mechanical ventilation fans (SFP = 0.1114)												21.6289	(230a)
Total electricity for the above, kWh/year												21.6289	(231)
Electricity for lighting (calculated in Appendix L)												155.5290	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-776.5937	(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												961.0599	(238)

10a. Fuel costs - using BEDF prices (552)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	924.5172	26.0600	240.9292 (240)
Space heating - main system 2	0.0000	26.0600	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	635.9785	26.0600	165.7360 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Pumps, fans and electric keep-hot	21.6289	26.0600	5.6365 (249)
Energy for lighting	155.5290	26.0600	40.5309 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-443.7636	26.0600	-115.6448
PV Unit electricity exported	-332.8301	5.8100	-19.3374
Total			-134.9822 (252)
Total energy cost			317.8503 (255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	924.5172	0.1581	146.1650 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	635.9785	0.1412	89.7773 (264)
Space and water heating			235.9423 (265)
Pumps, fans and electric keep-hot	21.6289	0.1387	3.0002 (267)
Energy for lighting	155.5290	0.1443	22.4476 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-443.7636	0.1322	-58.6456
PV Unit electricity exported	-332.8301	0.1198	-39.8865
Total			-98.5322 (269)
Total CO2, kg/year			162.8580 (272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
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Space heating - main system 1	924.5172	1.5852	1465.5690 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	635.9785	1.5220	967.9508 (278)
Space and water heating			2433.5197 (279)
Pumps, fans and electric keep-hot	21.6289	1.5128	32.7203 (281)
Energy for lighting	155.5290	1.5338	238.5556 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-443.7636	1.4883	-660.4444
PV Unit electricity exported	-332.8301	0.4395	-146.2886
Total			-806.7330 (283)
Total Primary energy kWh/year			1898.0625 (286)

SAP 10 EPC IMPROVEMENTS

005 MT Flat Elec DWHP PV

Current energy efficiency rating: B 88
Current environmental impact rating: A 98

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

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

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

Potential energy efficiency rating: B 88
Potential environmental impact rating: A 98

Fuel prices for cost data on this page from database revision number 552 TEST (30 Aug 2024)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£453	£453	£0
Space heating	£247	£247	£0
Water heating	£166	£166	£0
Lighting	£41	£41	£0
Generated (PV)	-£135	-£135	£0
Total cost of fuels	£318	£318	£0
Total cost of uses	£319	£319	£0
Delivered energy	14 kWh/m²	14 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m²	2 kg/m²	2 kg/m²	0 kg/m²
Primary energy	29 kWh/m²	29 kWh/m²	0 kWh/m²

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

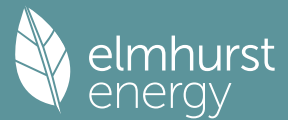
1. Overall dwelling characteristics

	Area (m²)	Storey height (m)	Volume (m³)
Ground floor	66.2930 (1b)	x 2.4000 (2b)	= 159.1032 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.2930		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 159.1032 (5)

2. Ventilation rate

	m³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour
Pressure test	0.0000 / (5) = 0.0000 (8)
Pressure Test Method	Yes
Measured/design AP50	Blower Door
Infiltration rate	3.0000 (17)
	0.1500 (18)

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Number of sides sheltered

1 (19)

Shelter factor

$$(20) = 1 - [0.075 \times (19)] = 0.9250 \quad (20)$$

Infiltration rate adjusted to include shelter factor

$$(21) = (18) \times (20) = 0.1388 \quad (21)$$

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation													0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(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	
Solid Door			2.1000	1.0000	2.1000			(26)
Windows (Uw = 1.30)			18.8490	1.2357	23.2937			(27)
W1 - 1	65.3810	18.8490	46.5320	0.1800	8.3758	60.0000	2791.9198	(29a)
W1 - 3	3.6360	2.1000	1.5360	0.2400	0.3686	60.0000	92.1600	(29a)
Total net area of external elements Aum(A, m2)			69.0180					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	34.1381		(33)
Party Wall			23.7400	0.0000	0.0000	110.0000	2611.4000	(32)
Party Floor 1			66.2930			40.0000	2651.7200	(32d)
Party Ceiling 1			66.2930			30.0000	1988.7900	(32b)
Stud			120.9072			9.0000	1088.1648	(32c)

Heat capacity Cm = Sum(A x k)

$$(28)...(30) + (32) + (32a)...(32e) = 11224.1546 \quad (34)$$

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

$$169.3113 \quad (35)$$

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	10.3180	0.2210	2.2803	
E3 Sill	1.9210	0.0240	0.0461	
E4 Jamb	40.2860	0.0190	0.7654	
E5 Ground floor (normal)	8.3970	0.0450	0.3779	
E7 Party floor between dwellings (in blocks of flats)	49.1160	0.0360	1.7682	
E16 Corner (normal)	7.2000	0.0370	0.2664	
E18 Party wall between dwellings	4.8000	0.0310	0.1488	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	19.7840	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				5.6531 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	39.7912 (37)

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

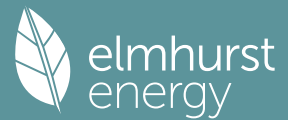
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	(38)
Heat transfer coeff	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	(39)
Average = Sum(39)m / 12 =													66.0432 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	(40)
HLP (average)													0.9962
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	(40)

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.1529 (42)
Hot water usage for mixer showers													
60.3163	59.4099	58.0890	55.5618	53.6968	51.6169	50.4347	51.7456	53.1826	55.4157	57.9972	60.0852		(42a)
Hot water usage for baths													
26.0612	25.6742	25.1291	24.1242	23.3717	22.5373	22.0866	22.6278	23.2171	24.1099	25.1356	25.9731		(42b)
Hot water usage for other uses													
36.6776	35.3439	34.0102	32.6764	31.3427	30.0090	30.0090	31.3427	32.6764	34.0102	35.3439	36.6776		(42c)
Average daily hot water use (litres/day)													113.1158 (43)
Daily hot water use													
123.0552	120.4280	117.2284	112.3624	108.4112	104.1632	102.5303	105.7161	109.0761	113.5358	118.4767	122.7360		(44)
Energy conte	194.8894	171.4879	180.1756	153.8186	145.9423	128.0808	124.0015	130.8986	134.5017	154.0670	168.7918	192.1749	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													1878.8301
29.2334	25.7232	27.0263	23.0728	21.8913	19.2121	18.6002	19.6348	20.1753	23.1101	25.3188	28.8262		(46)
Water storage loss:													
Store volume													201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6100 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8694 (55)
Total storage loss													
26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514		(56)
If cylinder contains dedicated solar storage													
26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514		(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(61)
Total heat required for water heating calculated for each month													
221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263		(62)
WWHRS	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		(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(63d)
Output from w/h													
221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263		(64)
Total per year (kWh/year) = Sum(64)m =													2196.1611 (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													
64.8007	57.0197	59.9084	51.1447	48.5258	42.5869	41.2305	43.5238	44.7218	51.2273	56.1233	63.8982		(65)

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.0167	19.5551	15.9033	12.0398	8.9999	7.5981	8.2100	10.6717	14.3235	18.1869	21.2268	22.6287 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	281.3365	284.2559	276.8991	261.2374	241.4673	222.8862	210.4729	207.5535	214.9103	230.5720	250.3421	268.9232 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702 (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)	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152 (71)
Water heating gains (Table 5)	87.0977	84.8508	80.5220	71.0343	65.2229	59.1484	55.4173	58.4997	62.1136	68.8539	77.9490	85.8846 (72)
Total internal gains	483.5787	481.7895	466.4521	437.4392	408.8178	382.7605	367.2280	369.8527	384.4752	410.7406	442.6457	470.5642 (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
East					6.4140	19.6403	0.4700	0.0000			0.7700	45.5895 (76)
South					6.3150	46.7521	0.4700	0.0000			0.7700	106.8471 (78)
West					6.1200	19.6403	0.4700	0.0000			0.7700	43.4998 (80)
Solar gains	195.9364	349.2656	509.9141	670.5171	775.5209	777.7871	746.8062	669.1806	566.6542	395.5360	237.7341	165.5884 (83)
Total gains	679.5151	831.0551	976.3662	1107.9563	1184.3387	1160.5476	1114.0342	1039.0333	951.1293	806.2766	680.3798	636.1527 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088
alpha	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473
util living area	0.9439	0.8906	0.7978	0.6576	0.5016	0.3607	0.2601	0.2911	0.4670	0.7364	0.9049	0.9549 (86)
MIT	19.9588	20.2711	20.5970	20.8408	20.9547	20.9908	20.9982	20.9970	20.9741	20.7899	20.3181	19.8675 (87)
Th 2	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865 (88)
util rest of house	0.9337	0.8733	0.7703	0.6196	0.4568	0.3105	0.2065	0.2339	0.4092	0.6933	0.8864	0.9465 (89)
MIT 2	18.9051	19.2840	19.6661	19.9350	20.0492	20.0807	20.0857	20.0852	20.0687	19.8911	19.3495	18.7924 (90)
Living area fraction	19.2907	19.6452	20.0068	20.2665	20.3806	20.4137	20.4196	20.4189	20.4001	20.2200	19.7040	19.1859 (92)
MIT	19.2907	19.6452	20.0068	20.2665	20.3806	20.4137	20.4196	20.4189	20.4001	20.2200	19.7040	19.1859 (93)
Temperature adjustment												0.0000
adjusted MIT	19.2907	19.6452	20.0068	20.2665	20.3806	20.4137	20.4196	20.4189	20.4001	20.2200	19.7040	19.1859 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9231	0.8638	0.7677	0.6273	0.4714	0.3286	0.2261	0.2548	0.4294	0.7000	0.8775	0.9363 (94)
Useful gains	627.2344	717.8787	749.5721	695.0027	558.3424	381.3337	251.8485	264.7306	408.3784	564.3815	597.0181	595.6421 (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	990.0356	973.8233	892.0329	750.6776	573.2937	383.9581	252.2609	265.4195	416.0767	635.3384	832.4080	989.7143 (97)
Space heating kWh	269.9241	171.9948	105.9909	40.0859	11.1238	0.0000	0.0000	0.0000	0.0000	52.7920	169.4807	293.1897 (98a)
Space heating requirement - total per year (kWh/year)												1114.5818
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	269.9241	171.9948	105.9909	40.0859	11.1238	0.0000	0.0000	0.0000	0.0000	52.7920	169.4807	293.1897 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1114.5818
Space heating per m ²										(98c) / (4) =		16.8130 (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)
Fraction of main heating from main system 2												0.0000 (203)
Fraction of total heating from main system 1												1.0000 (204)
Fraction of total heating from main system 2												0.0000 (205)
Efficiency of main space heating system 1 (in %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	269.9241	171.9948	105.9909	40.0859	11.1238	0.0000	0.0000	0.0000	0.0000	52.7920	169.4807	293.1897 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	269.9241	171.9948	105.9909	40.0859	11.1238	0.0000	0.0000	0.0000	0.0000	52.7920	169.4807	293.1897 (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)												

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Space heating fuel used, main 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	(215)
													(213)
Water heating													
Water heating requirement	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263	(64)
Efficiency of water heater												345.3200	(216)
(217)m	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	(217)
Fuel for water heating, kWh/month	64.2421	56.7100	59.9812	52.0968	50.0677	44.6435	43.7139	45.7112	46.5029	52.4205	56.4328	63.4560	(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	1.8370	1.6592	1.8370	1.7777	1.8370	1.7777	1.8370	1.7777	1.8370	1.7777	1.8370	1.7777	(231)
Lighting	19.2711	15.4600	13.9200	10.1984	7.8775	6.4360	7.1862	9.3408	12.1328	15.9189	17.9804	19.8067	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-13.4555	-22.4755	-38.1511	-48.6794	-56.4343	-53.7464	-52.6823	-46.9323	-37.3831	-27.1481	-15.6784	-11.1628	(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	-2.3811	-6.4432	-17.1705	-33.3664	-51.1266	-54.3820	-53.0238	-41.4140	-26.1705	-11.5234	-3.6109	-1.7419	(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												1114.5818	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												345.3200	
Water heating fuel used												635.9785	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.3400, total flow = 21.0000, SFP = 0.1114)													
mechanical ventilation fans (SFP = 0.1114)												21.6289	(230a)
Total electricity for the above, kWh/year												21.6289	(231)
Electricity for lighting (calculated in Appendix L)												155.5290	(232)

Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-726.2834	(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												1201.4349	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1114.5818	16.4900	183.7945	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	635.9785	16.4900	104.8729	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	21.6289	16.4900	3.5666	(249)
Energy for lighting	155.5290	16.4900	25.6467	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-423.9292	16.4900	-69.9059	
PV Unit electricity exported	-302.3542	5.5900	-16.9016	
Total			-86.8075	(252)
Total energy cost			231.0732	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)		0.7475	(257)
SAP value	$[(255) \times (256)] / [(4) + 45.0] =$	87.8838	
SAP rating (Section 12)		88	(258)
SAP band		B	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1114.5818	0.1575	175.4952	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	635.9785	0.1412	89.7773	(264)
Space and water heating			265.2725	(265)
Pumps, fans and electric keep-hot	21.6289	0.1387	3.0002	(267)
Energy for lighting	155.5290	0.1443	22.4476	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-423.9292	0.1322	-56.0305	
PV Unit electricity exported	-302.3542	0.1201	-36.3127	
Total			-92.3432	(269)
Total CO2, kg/year			198.3772	(272)
CO2 emissions per m2			2.9900	(273)
EI value			97.6115	
EI rating			98	(274)
EI band			A	

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	66.2930 (1b)	x 2.4000 (2b)	= 159.1032 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.2930		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 159.1032 (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)	Air changes per hour 0.0000 / (5) = 0.0000 (8)
Pressure Test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1388 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.1457	0.1388	0.1388	0.1283	0.1283	0.1145	0.1179	0.1110	0.1145	0.1214	0.1214	0.1318 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

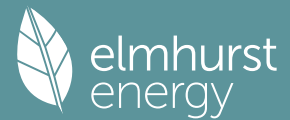
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Solid Door			2.1000	1.0000	2.1000		(26)
Windows (Uw = 1.30)			18.8490	1.2357	23.2937		(27)
W1 - 1	65.3810	18.8490	46.5320	0.1800	8.3758	60.0000	2791.9198 (29a)
W1 - 3	3.6360	2.1000	1.5360	0.2400	0.3686	60.0000	92.1600 (29a)
Total net area of external elements Aum(A, m ²)			69.0180				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	34.1381			(33)
Party Wall			23.7400	0.0000	0.0000	110.0000	2611.4000 (32)
Party Floor 1			66.2930			40.0000	2651.7200 (32d)
Party Ceiling 1			66.2930			30.0000	1988.7900 (32b)
Stud			120.9072			9.0000	1088.1648 (32c)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	10.3180	0.2210	2.2803
E2 Other lintels (including other steel lintels)	1.9210	0.0240	0.0461
E3 Sill	40.2860	0.0190	0.7654
E4 Jamb	8.3970	0.0450	0.3779
E5 Ground floor (normal)	49.1160	0.0360	1.7682
E7 Party floor between dwellings (in blocks of flats)	7.2000	0.0370	0.2664
E16 Corner (normal)	4.8000	0.0310	0.1488
E18 Party wall between dwellings	19.7840	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.6531 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 39.7912 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520 (38)
Heat transfer coeff	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432 (39)
Average = Sum(39)m / 12 =												66.0432
HLP	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962 (40)
HLP (average)												0.9962
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1529 (42)
Hot water usage for mixer showers												
60.3163	59.4099	58.0890	55.5618	53.6968	51.6169	50.4347	51.7456	53.1826	55.4157	57.9972	60.0852 (42a)	
Hot water usage for baths												
26.0612	25.6742	25.1291	24.1242	23.3717	22.5373	22.0866	22.6278	23.2171	24.1099	25.1356	25.9731 (42b)	
Hot water usage for other uses												
36.6776	35.3439	34.0102	32.6764	31.3427	30.0090	30.0090	31.3427	32.6764	34.0102	35.3439	36.6776 (42c)	
Average daily hot water use (litres/day)												113.1158 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	123.0552	120.4280	117.2284	112.3624	108.4112	104.1632	102.5303	105.7161	109.0761	113.5358	118.4767	122.7360 (44)
Energy content	194.8894	171.4879	180.1756	153.8186	145.9423	128.0808	124.0015	130.8986	134.5017	154.0670	168.7918	192.1749 (45)
Energy content (annual)												Total = Sum(45)m = 1878.8301
Distribution loss (46)m = 0.15 x (45)m												
29.2334	25.7232	27.0263	23.0728	21.8913	19.2121	18.6002	19.6348	20.1753	23.1101	25.3188	28.8262 (46)	
Water storage loss:												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8694 (55)
Total storage loss												
26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)	
If cylinder contains dedicated solar storage												
26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)	
Total heat required for water heating calculated for each month												
221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263 (62)	
WWHRS	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 (63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)	
Output from w/h	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263 (64)
Electric shower(s)												Total per year (kWh/year) = Sum(64)m = 2196.1611 (64)
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												Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
64.8007	57.0197	59.9084	51.1447	48.5258	42.5869	41.2305	43.5238	44.7218	51.2273	56.1233	63.8982 (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	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.0167	19.5551	15.9033	12.0398	8.9999	7.5981	8.2100	10.6717	14.3235	18.1869	21.2268	22.6287 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	281.3365	284.2559	276.8991	261.2374	241.4673	222.8862	210.4729	207.5535	214.9103	230.5720	250.3421	268.9232 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702 (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)	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152 (71)
Water heating gains (Table 5)	87.0977	84.8508	80.5220	71.0343	65.2229	59.1484	55.4173	58.4997	62.1136	68.8539	77.9490	85.8846 (72)
Total internal gains	483.5787	481.7895	466.4521	437.4392	408.8178	382.7605	367.2280	369.8527	384.4752	410.7406	442.6457	470.5642 (73)

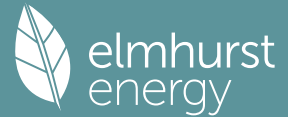
6. Solar gains

[Jan]					Area m2	Solar flux Table 6a		g	FF		Access		Gains	
						W/m2		Specific data or Table 6b	Specific data or Table 6c		factor Table 6d		W	
East					6.4140	22.3313		0.4700	0.0000		0.7700		51.8360 (76)	
South					6.3150	50.9848		0.4700	0.0000		0.7700		116.5206 (78)	
West					6.1200	22.3313		0.4700	0.0000		0.7700		49.4600 (80)	
Solar gains	217.8167	349.5042	504.5830	685.2415	773.9169	831.6290	789.4539	721.9383	608.2462	422.7328	270.7714	182.2921 (83)		
Total gains	701.3954	831.2936	971.0352	1122.6807	1182.7347	1214.3895	1156.6819	1091.7910	992.7214	833.4734	713.4170	652.8563 (84)		

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088
alpha	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473
util living area	0.9288	0.8775	0.7731	0.6094	0.4378	0.2710	0.1769	0.1934	0.3813	0.6731	0.8724	0.9423 (86)
MIT	20.1008	20.3512	20.6673	20.8897	20.9763	20.9975	20.9997	20.9996	20.9897	20.8651	20.4672	20.0190 (87)
Th 2	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865 (88)
util rest of house	0.9159	0.8578	0.7422	0.5683	0.3905	0.2219	0.1248	0.1383	0.3230	0.6236	0.8481	0.9313 (89)
MIT 2	19.0810	19.3813	19.7474	19.9860	20.0688	20.0853	20.0864	20.0864	20.0805	19.9687	19.5274	18.9815 (90)
Living area fraction												fLA = Living area / (4) = 0.3660 (91)
MIT	19.4542	19.7363	20.0840	20.3167	20.4009	20.4191	20.4206	20.4206	20.4132	20.2967	19.8713	19.3612 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4542	19.7363	20.0840	20.3167	20.4009	20.4191	20.4206	20.4206	20.4132	20.2967	19.8713	19.3612 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9054	0.8494	0.7421	0.5789	0.4070	0.2398	0.1439	0.1585	0.3440	0.6355	0.8418	0.9209	(94)
Useful gains	635.0166	706.1366	720.6170	649.9509	481.3580	291.2545	166.4256	173.0010	341.5023	529.6668	600.5198	601.2111	(95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Heat loss rate W	947.9974	933.6038	837.6942	687.9527	488.7809	291.8544	166.4716	173.0711	344.2984	574.3611	784.0200	941.8557	(97)
Space heating kWh	232.8577	152.8580	87.1055	27.3613	5.5226	0.0000	0.0000	0.0000	0.0000	33.2525	132.1201	253.4396	(98a)
Space heating requirement - total per year (kWh/year)												924.5172	
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	232.8577	152.8580	87.1055	27.3613	5.5226	0.0000	0.0000	0.0000	0.0000	33.2525	132.1201	253.4396	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												924.5172	
Space heating per m2										(98c) / (4) =		13.9459	(99)

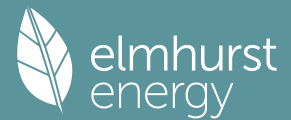
9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Fraction of main heating from main system 2													0.0000	(203)
Fraction of total heating from main system 1													1.0000	(204)
Fraction of total heating from main system 2													0.0000	(205)
Efficiency of main space heating system 1 (in %)													100.0000	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement	232.8577	152.8580	87.1055	27.3613	5.5226	0.0000	0.0000	0.0000	0.0000	33.2525	132.1201	253.4396	(98)	
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)	
Space heating fuel (main heating system)	232.8577	152.8580	87.1055	27.3613	5.5226	0.0000	0.0000	0.0000	0.0000	33.2525	132.1201	253.4396	(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)	
Space heating fuel used, main system 2												0.0000	(213)	
Water heating requirement	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263	(64)	
Efficiency of water heater	(217)m	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	(216)	
Fuel for water heating, kWh/month	64.2421	56.7100	59.9812	52.0968	50.0677	44.6435	43.7139	45.7112	46.5029	52.4205	56.4328	63.4560	(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	(221)	
Pumps and Fa	1.8370	1.6592	1.8370	1.7777	1.8370	1.7777	1.8370	1.7777	1.7777	1.8370	1.7777	1.8370	(231)	
Lighting	19.2711	15.4600	13.9200	10.1984	7.8775	6.4360	7.1862	9.3408	12.1328	15.9189	17.9804	19.8067	(232)	
Electricity generated by PVs (Appendix M) (negative quantity)	(233a)m	-15.1470	-22.9522	-38.3146	-49.6649	-56.5712	-56.5703	-55.0990	-50.0182	-40.0685	-28.9874	-17.8973	-12.4730	(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	(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	(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	(235c)	
Electricity generated by PVs (Appendix M) (negative quantity)	(233b)m	-2.9991	-6.8679	-17.9408	-36.0152	-52.5257	-60.6342	-58.3097	-47.1541	-29.8938	-13.5729	-4.7492	-2.1675	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)	
Annual totals kWh/year														
Space heating fuel - main system 1													924.5172	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													345.3200	
Water heating fuel used													635.9785	(219)
Space cooling fuel													0.0000	(221)
Electricity for pumps and fans:														
(MEV)Decentralised, Database: total watage = 2.3400, total flow = 21.0000, SFP = 0.1114)														
mechanical ventilation fans (SFP = 0.1114)													21.6289	(230a)
Total electricity for the above, kWh/year													21.6289	(231)
Electricity for lighting (calculated in Appendix L)													155.5290	(232)
Energy saving/generation technologies (Appendices M, N and Q)														
PV generation													-776.5937	(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													961.0599	(238)

10a. Fuel costs - using BEDF prices (552)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	924.5172	26.0600	240.9292 (240)
Space heating - main system 2	0.0000	26.0600	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)

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Water heating (other fuel)	635.9785	26.0600	165.7360 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Pumps, fans and electric keep-hot	21.6289	26.0600	5.6365 (249)
Energy for lighting	155.5290	26.0600	40.5309 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-443.7636	26.0600	-115.6448
PV Unit electricity exported	-332.8301	5.8100	-19.3374
Total			-134.9822 (252)
Total energy cost			317.8503 (255)

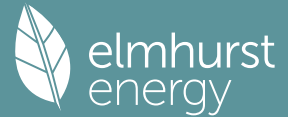
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	924.5172	0.1581	146.1650 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	635.9785	0.1412	89.7773 (264)
Space and water heating			235.9423 (265)
Pumps, fans and electric keep-hot	21.6289	0.1387	3.0002 (267)
Energy for lighting	155.5290	0.1443	22.4476 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-443.7636	0.1322	-58.6456
PV Unit electricity exported	-332.8301	0.1198	-39.8865
Total			-98.5322 (269)
Total CO2, kg/year			162.8580 (272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	924.5172	1.5852	1465.5690 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	635.9785	1.5220	967.9508 (278)
Space and water heating			2433.5197 (279)
Pumps, fans and electric keep-hot	21.6289	1.5128	32.7203 (281)
Energy for lighting	155.5290	1.5338	238.5556 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-443.7636	1.4883	-660.4444
PV Unit electricity exported	-332.8301	0.4395	-146.2886
Total			-806.7330 (283)
Total Primary energy kWh/year			1898.0625 (286)

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Property Reference	005 MT				Issued on Date	10/09/2024
Assessment Reference	005 MT Flat Elec DWHP	Prop Type Ref	005 MT			
Property	005 MT, 005 MT, 0					
SAP Rating	83 B	DER	4.64	TER	11.58	
Environmental	96 A	% DER < TER				59.93
CO ₂ Emissions (t/year)	0.26	DFEE	27.55	TFEE	29.02	
Compliance Check	See BREL	% DFEE < TFEE				5.07
% DPER < TPER	21.34	DPER	47.83	TPER	60.80	
Assessor Details	Mr. Scott Binstead				Assessor ID	U903-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	66.2930 (1b)	2.4000 (2b)	159.1032 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.2930		159.1032 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	159.1032 (5)

2. Ventilation rate

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

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	1	(19)

Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1388 (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	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

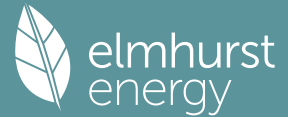
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Solid Door			2.1000	1.0000	2.1000		(26)
Windows (Uw = 1.30)			18.8490	1.2357	23.2937		(27)
W1 - 1	65.3810	18.8490	46.5320	0.1800	8.3758	60.0000	2791.9198 (29a)
W1 - 3	3.6360	2.1000	1.5360	0.2400	0.3686	60.0000	92.1600 (29a)
Total net area of external elements Aum(A, m ²)			69.0180				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.1381		(33)
Party Wall			23.7400	0.0000	0.0000	110.0000	2611.4000 (32)
Party Floor 1			66.2930			40.0000	2651.7200 (32a)
Party Ceiling 1			66.2930			30.0000	1988.7900 (32b)
Stud			120.9072			9.0000	1088.1648 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11224.1546 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		169.3113 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.3180	0.2210	2.2803

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E3 Sill	1.9210	0.0240	0.0461	
E4 Jamb	40.2860	0.0190	0.7654	
E5 Ground floor (normal)	8.3970	0.0450	0.3779	
E7 Party floor between dwellings (in blocks of flats)	49.1160	0.0360	1.7682	
E16 Corner (normal)	7.2000	0.0370	0.2664	
E18 Party wall between dwellings	4.8000	0.0310	0.1488	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	19.7840	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				5.6531 (36)
Point Thermal Bridges			(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =		39.7912 (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	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520 (38)
Average = Sum(39)m / 12 =	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432 (39)
												66.0432
HLP	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962 (40)
HLP (average)												0.9962
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1529 (42)
Hot water usage for mixer showers	60.3163	59.4099	58.0890	55.5618	53.6968	51.6169	50.4347	51.7456	53.1826	55.4157	57.9972	60.0852 (42a)
Hot water usage for baths	26.0612	25.6742	25.1291	24.1242	23.3717	22.5373	22.0866	22.6278	23.2171	24.1099	25.1356	25.9731 (42b)
Hot water usage for other uses	36.6776	35.3439	34.0102	32.6764	31.3427	30.0090	30.0090	31.3427	32.6764	34.0102	35.3439	36.6776 (42c)
Average daily hot water use (litres/day)												113.1158 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	123.0552	120.4280	117.2284	112.3624	108.4112	104.1632	102.5303	105.7161	109.0761	113.5358	118.4767	122.7360 (44)
Energy conte	194.8894	171.4879	180.1756	153.8186	145.9423	128.0808	124.0015	130.8986	134.5017	154.0670	168.7918	192.1749 (45)
Energy content (annual)										Total = Sum(45)m =		1878.8301
Distribution loss (46)m = 0.15 x (45)m	29.2334	25.7232	27.0263	23.0728	21.8913	19.2121	18.6002	19.6348	20.1753	23.1101	25.3188	28.8262 (46)
Water storage loss:												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8694 (55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (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	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263 (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	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263 (64)
								Total per year (kWh/year) = Sum(64)m =				2196.1611 (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	64.8007	57.0197	59.9084	51.1447	48.5258	42.5869	41.2305	43.5238	44.7218	51.2273	56.1233	63.8982 (65)

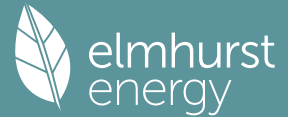
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.0167	19.5551	15.9033	12.0398	8.9999	7.5981	8.2100	10.6717	14.3235	18.1869	21.2268	22.6287 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	281.3365	284.2559	276.8991	261.2374	241.4673	222.8862	210.4729	207.5535	214.9103	230.5720	250.3421	268.9232 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702 (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)	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152 (71)
Water heating gains (Table 5)	87.0977	84.8508	80.5220	71.0343	65.2229	59.1484	55.4173	58.4997	62.1136	68.8539	77.9490	85.8846 (72)
Total internal gains	483.5787	481.7895	466.4521	437.4392	408.8178	382.7605	367.2280	369.8527	384.4752	410.7406	442.6457	470.5642 (73)

6. Solar gains

[Jan]														
					Area	Solar flux		g	FF		Access		Gains	
					m2	Table 6a		Specific data	Specific data		factor		W	
						W/m2		or Table 6b	or Table 6c		Table 6d			
East					6.4140	19.6403		0.4700	0.0000		0.7700		45.5895 (76)	
South					6.3150	46.7521		0.4700	0.0000		0.7700		106.8471 (78)	
West					6.1200	19.6403		0.4700	0.0000		0.7700		43.4998 (80)	
Solar gains	195.9364	349.2656	509.9141	670.5171	775.5209	777.7871	746.8062	669.1806	566.6542	395.5360	237.7341	165.5884	(83)	
Total gains	679.5151	831.0551	976.3662	1107.9563	1184.3387	1160.5476	1114.0342	1039.0333	951.1293	806.2766	680.3798	636.1527	(84)	

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	
alpha	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	
util living area	0.9439	0.8906	0.7978	0.6576	0.5016	0.3607	0.2601	0.2911	0.4670	0.7364	0.9049	0.9549 (86)	
MIT	19.9588	20.2711	20.5970	20.8408	20.9547	20.9908	20.9982	20.9970	20.9741	20.7899	20.3181	19.8675 (87)	
Th 2	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865 (88)	
util rest of house	0.9337	0.8733	0.7703	0.6196	0.4568	0.3105	0.2065	0.2339	0.4092	0.6933	0.8864	0.9465 (89)	
MIT 2	18.9051	19.2840	19.6661	19.9350	20.0492	20.0807	20.0857	20.0852	20.0687	19.8911	19.3495	18.7924 (90)	
Living area fraction									fLA = Living area / (4) =				0.3660 (91)
MIT	19.2907	19.6452	20.0068	20.2665	20.3806	20.4137	20.4196	20.4189	20.4001	20.2200	19.7040	19.1859 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.2907	19.6452	20.0068	20.2665	20.3806	20.4137	20.4196	20.4189	20.4001	20.2200	19.7040	19.1859 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9231	0.8638	0.7677	0.6273	0.4714	0.3286	0.2261	0.2548	0.4294	0.7000	0.8775	0.9363 (94)
Useful gains	627.2344	717.8787	749.5721	695.0027	558.3424	381.3337	251.8485	264.7306	408.3784	564.3815	597.0181	595.6421 (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	990.0356	973.8233	892.0329	750.6776	573.2937	383.9581	252.2609	265.4195	416.0767	635.3384	832.4080	989.7143 (97)
Space heating kWh	269.9241	171.9948	105.9909	40.0859	11.1238	0.0000	0.0000	0.0000	0.0000	52.7920	169.4807	293.1897 (98a)
Space heating requirement - total per year (kWh/year)												1114.5818
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	269.9241	171.9948	105.9909	40.0859	11.1238	0.0000	0.0000	0.0000	0.0000	52.7920	169.4807	293.1897 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1114.5818
Space heating per m2										(98c) / (4) =		16.8130 (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)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	269.9241	171.9948	105.9909	40.0859	11.1238	0.0000	0.0000	0.0000	0.0000	52.7920	169.4807	293.1897	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	269.9241	171.9948	105.9909	40.0859	11.1238	0.0000	0.0000	0.0000	0.0000	52.7920	169.4807	293.1897	(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)
Space heating fuel used, main system 2													(213)
Water heating													
Water heating requirement	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263	(64)
Efficiency of water heater													(216)
(217)m	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	(217)
Fuel for water heating, kWh/month	64.2421	56.7100	59.9812	52.0968	50.0677	44.6435	43.7139	45.7112	46.5029	52.4205	56.4328	63.4560	(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	1.8370	1.6592	1.8370	1.7777	1.8370	1.7777	1.8370	1.8370	1.7777	1.8370	1.7777	1.8370	(231)
Lighting	19.2711	15.4600	13.9200	10.1984	7.8775	6.4360	7.1862	9.3408	12.1328	15.9189	17.9804	19.8067	(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													1114.5818 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													345.3200
Water heating fuel used													635.9785 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 2.3400, total flow = 21.0000, SFP = 0.1114)													
mechanical ventilation fans (SFP = 0.1114)													21.6289 (230a)

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Total electricity for the above, kWh/year	21.6289 (231)
Electricity for lighting (calculated in Appendix L)	155.5290 (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	1927.7182 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1114.5818	16.4900	183.7945 (240)
Space heating - main system 2	0.0000	16.4900	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	635.9785	16.4900	104.8729 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	21.6289	16.4900	3.5666 (249)
Energy for lighting	155.5290	16.4900	25.6467 (250)
Additional standing charges			0.0000 (251)
Total energy cost			317.8807 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.0283 (257)
SAP value		83.3321
SAP rating (Section 12)		83 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1114.5818	0.1575	175.4952 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	635.9785	0.1412	89.7773 (264)
Space and water heating			265.2725 (265)
Pumps, fans and electric keep-hot	21.6289	0.1387	3.0002 (267)
Energy for lighting	155.5290	0.1443	22.4476 (268)
Total CO2, kg/year			290.7204 (272)
CO2 emissions per m2			4.3900 (273)
EI value			96.4996
EI rating			96 (274)
EI band			A

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

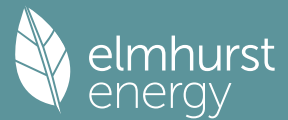
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	66.2930 (1b)	x 2.4000 (2b)	= 159.1032 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.2930		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 159.1032 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)

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Infiltration rate adjusted to include shelter factor

$$(21) = (18) \times (20) = 0.1388 \quad (21)$$

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000	(22)
Adj infilt rate	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500	(22a)
	0.1457	0.1388	0.1388	0.1283	0.1283	0.1145	0.1179	0.1110	0.1145	0.1214	0.1214	0.1318	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation													0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(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	
Solid Door			2.1000	1.0000	2.1000			(26)
Windows (Uw = 1.30)			18.8490	1.2357	23.2937			(27)
W1 - 1	65.3810	18.8490	46.5320	0.1800	8.3758	60.0000	2791.9198	(29a)
W1 - 3	3.6360	2.1000	1.5360	0.2400	0.3686	60.0000	92.1600	(29a)
Total net area of external elements Aum(A, m2)			69.0180					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.1381			(33)
Party Wall			23.7400	0.0000	0.0000	110.0000	2611.4000	(32)
Party Floor 1			66.2930			40.0000	2651.7200	(32d)
Party Ceiling 1			66.2930			30.0000	1988.7900	(32b)
Stud			120.9072			9.0000	1088.1648	(32c)

$$\text{Heat capacity } C_m = \text{Sum}(A \times k) \quad (28) \dots (30) + (32) + (32a) \dots (32e) = 11224.1546 \quad (34)$$
$$\text{Thermal mass parameter (TMP) = } C_m / \text{TFA} \text{ in kJ/m}^2\text{K} \quad 169.3113 \quad (35)$$

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	10.3180	0.2210	2.2803	
E3 Sill	1.9210	0.0240	0.0461	
E4 Jamb	40.2860	0.0190	0.7654	
E5 Ground floor (normal)	8.3970	0.0450	0.3779	
E7 Party floor between dwellings (in blocks of flats)	49.1160	0.0360	1.7682	
E16 Corner (normal)	7.2000	0.0370	0.2664	
E18 Party wall between dwellings	4.8000	0.0310	0.1488	
P3 Party wall - intermediate floor between dwellings (in blocks of flats)	19.7840	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				5.6531 (36)
Point Thermal Bridges				0.0000
Total fabric heat loss				(33) + (36) + (36a) = 39.7912 (37)

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

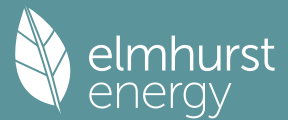
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	(38)
Average = Sum(39)m / 12 =	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	(39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.1529 (42)
Hot water usage for mixer showers													
	60.3163	59.4099	58.0890	55.5618	53.6968	51.6169	50.4347	51.7456	53.1826	55.4157	57.9972	60.0852	(42a)
Hot water usage for baths													
	26.0612	25.6742	25.1291	24.1242	23.3717	22.5373	22.0866	22.6278	23.2171	24.1099	25.1356	25.9731	(42b)
Hot water usage for other uses													
	36.6776	35.3439	34.0102	32.6764	31.3427	30.0090	30.0090	31.3427	32.6764	34.0102	35.3439	36.6776	(42c)
Average daily hot water use (litres/day)													113.1158 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	123.0552	120.4280	117.2284	112.3624	108.4112	104.1632	102.5303	105.7161	109.0761	113.5358	118.4767	122.7360	(44)
Energy conte	194.8894	171.4879	180.1756	153.8186	145.9423	128.0808	124.0015	130.8986	134.5017	154.0670	168.7918	192.1749	(45)
Energy content (annual)										Total = Sum(45)m =			1878.8301
Distribution loss (46)m = 0.15 x (45)m													
	29.2334	25.7232	27.0263	23.0728	21.8913	19.2121	18.6002	19.6348	20.1753	23.1101	25.3188	28.8262	(46)
Water storage loss:													
Store volume													201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6100 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8694 (55)
Total storage loss													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(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													
	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263	(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	(64a)
Output from w/h													
	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263	(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													
	64.8007	57.0197	59.9084	51.1447	48.5258	42.5869	41.2305	43.5238	44.7218	51.2273	56.1233	63.8982	(65)

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.0167	19.5551	15.9033	12.0398	8.9999	7.5981	8.2100	10.6717	14.3235	18.1869	21.2268	22.6287 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	281.3365	284.2559	276.8991	261.2374	241.4673	222.8862	210.4729	207.5535	214.9103	230.5720	250.3421	268.9232 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702 (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)	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152 (71)
Water heating gains (Table 5)	87.0977	84.8508	80.5220	71.0343	65.2229	59.1484	55.4173	58.4997	62.1136	68.8539	77.9490	85.8846 (72)
Total internal gains	483.5787	481.7895	466.4521	437.4392	408.8178	382.7605	367.2280	369.8527	384.4752	410.7406	442.6457	470.5642 (73)

6. Solar gains

[Jan]	Area m2		Solar flux Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
East	6.4140		22.3313		0.4700		0.0000		0.7700		51.8360 (76)	
South	6.3150		50.9848		0.4700		0.0000		0.7700		116.5206 (78)	
West	6.1200		22.3313		0.4700		0.0000		0.7700		49.4600 (80)	
Solar gains	217.8167	349.5042	504.5830	685.2415	773.9169	831.6290	789.4539	721.9383	608.2462	422.7328	270.7714	182.2921 (83)
Total gains	701.3954	831.2936	971.0352	1122.6807	1182.7347	1214.3895	1156.6819	1091.7910	992.7214	833.4734	713.4170	652.8563 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088
alpha	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473
util living area	0.9288	0.8775	0.7731	0.6094	0.4378	0.2710	0.1769	0.1934	0.3813	0.6731	0.8724	0.9423 (86)
MIT	20.1008	20.3512	20.6673	20.8897	20.9763	20.9975	20.9997	20.9996	20.9897	20.8651	20.4672	20.0190 (87)
Th 2	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865 (88)
util rest of house	0.9159	0.8578	0.7422	0.5683	0.3905	0.2219	0.1248	0.1383	0.3230	0.6236	0.8481	0.9313 (89)
MIT 2	19.0810	19.3813	19.7474	19.9860	20.0688	20.0853	20.0864	20.0864	20.0805	19.9687	19.5274	18.9815 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.4542	19.7363	20.0840	20.3167	20.4009	20.4191	20.4206	20.4206	20.4132	20.2967	19.8713	19.3612 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.4542	19.7363	20.0840	20.3167	20.4009	20.4191	20.4206	20.4206	20.4132	20.2967	19.8713	19.3612 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9054	0.8494	0.7421	0.5789	0.4070	0.2398	0.1439	0.1585	0.3440	0.6355	0.8418	0.9209 (94)
Useful gains	635.0166	706.1366	720.6170	649.9509	481.3580	291.2545	166.4256	173.0010	341.5023	529.6668	600.5198	601.2111 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	947.9974	933.6038	837.6942	687.9527	488.7809	291.8544	166.4716	173.0711	344.2984	574.3611	784.0200	941.8557 (97)
Space heating kWh	232.8577	152.8580	87.1055	27.3613	5.5226	0.0000	0.0000	0.0000	0.0000	33.2525	132.1201	253.4396 (98a)
Space heating requirement - total per year (kWh/year)	924.5172											
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	232.8577	152.8580	87.1055	27.3613	5.5226	0.0000	0.0000	0.0000	0.0000	33.2525	132.1201	253.4396 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	924.5172											
Space heating per m2	(98c) / (4) = 13.9459 (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)
Fraction of main heating from main system 2												0.0000 (203)
Fraction of total heating from main system 1												1.0000 (204)
Fraction of total heating from main system 2												0.0000 (205)
Efficiency of main space heating system 1 (in %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	232.8577	152.8580	87.1055	27.3613	5.5226	0.0000	0.0000	0.0000	0.0000	33.2525	132.1201	253.4396 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	232.8577	152.8580	87.1055	27.3613	5.5226	0.0000	0.0000	0.0000	0.0000	33.2525	132.1201	253.4396 (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)
Space heating fuel used, main system 2	0.0000 (213)											

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Water heating												
Water heating requirement												
	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263 (64)
Efficiency of water heater												345.3200 (216)
(217)m	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200 (217)
Fuel for water heating, kWh/month												
	64.2421	56.7100	59.9812	52.0968	50.0677	44.6435	43.7139	45.7112	46.5029	52.4205	56.4328	63.4560 (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	1.8370	1.6592	1.8370	1.7777	1.8370	1.7777	1.8370	1.7777	1.8370	1.7777	1.8370	1.8370 (231)
Lighting	19.2711	15.4600	13.9200	10.1984	7.8775	6.4360	7.1862	9.3408	12.1328	15.9189	17.9804	19.8067 (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												924.5172 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												345.3200
Water heating fuel used												635.9785 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(MEVDecentralised, Database: total watage = 2.3400, total flow = 21.0000, SFP = 0.1114)												
mechanical ventilation fans (SFP = 0.1114)												21.6289 (230a)
Total electricity for the above, kWh/year												21.6289 (231)
Electricity for lighting (calculated in Appendix L)												155.5290 (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												1737.6537 (238)

10a. Fuel costs - using BEDF prices (552)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	924.5172	26.0600	240.9292	(240)
Space heating - main system 2	0.0000	26.0600	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	635.9785	26.0600	165.7360	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	21.6289	26.0600	5.6365	(249)
Energy for lighting	155.5290	26.0600	40.5309	(250)
Additional standing charges			0.0000	(251)
Total energy cost			452.8325	(255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	924.5172	0.1581	146.1650	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	635.9785	0.1412	89.7773	(264)
Space and water heating			235.9423	(265)
Pumps, fans and electric keep-hot	21.6289	0.1387	3.0002	(267)
Energy for lighting	155.5290	0.1443	22.4476	(268)
Total CO2, kg/year			261.3901	(272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	924.5172	1.5852	1465.5690	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	635.9785	1.5220	967.9508	(278)
Space and water heating			2433.5197	(279)
Pumps, fans and electric keep-hot	21.6289	1.5128	32.7203	(281)
Energy for lighting	155.5290	1.5338	238.5556	(282)
Total Primary energy kWh/year			2704.7955	(286)

SAP 10 EPC IMPROVEMENTS

005 MT Flat Elec DWHP

Current energy efficiency rating:
Current environmental impact rating:

B 83
A 96

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

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

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

Potential energy efficiency rating: B 83
Potential environmental impact rating: A 96

Fuel prices for cost data on this page from database revision number 552 TEST (30 Aug 2024)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£453	£453	£0
Space heating	£247	£247	£0
Water heating	£166	£166	£0
Lighting	£41	£41	£0
Total cost of fuels	£453	£453	£0
Total cost of uses	£454	£454	£0
Delivered energy	26 kWh/m ²	26 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes
CO2 emissions per m ²	4 kg/m ²	4 kg/m ²	0 kg/m ²
Primary energy	41 kWh/m ²	41 kWh/m ²	0 kWh/m ²

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	66.2930 (1b)	x 2.4000 (2b)	= 159.1032 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.2930		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 159.1032 (5)

2. Ventilation rate

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

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1388 (21)

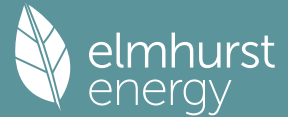
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
Solid Door			2.1000	1.0000	2.1000		(26)

Page 9 of 15

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[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c				Access factor Table 6d	Gains W		
East				6.4140	19.6403	0.4700	0.0000				0.7700	45.5895 (76)		
South				6.3150	46.7521	0.4700	0.0000				0.7700	106.8471 (78)		
West				6.1200	19.6403	0.4700	0.0000				0.7700	43.4998 (80)		
Solar gains	195.9364	349.2656	509.9141	670.5171	775.5209	777.7871	746.8062	669.1806	566.6542	395.5360	237.7341	165.5884	(83)	
Total gains	679.5151	831.0551	976.3662	1107.9563	1184.3387	1160.5476	1114.0342	1039.0333	951.1293	806.2766	680.3798	636.1527	(84)	
7. Mean internal temperature (heating season)														
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088		
alpha	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473		
util living area	0.9439	0.8906	0.7978	0.6576	0.5016	0.3607	0.2601	0.2911	0.4670	0.7364	0.9049	0.9549	(86)	
MIT	19.9588	20.2711	20.5970	20.8408	20.9547	20.9908	20.9982	20.9970	20.9741	20.7899	20.3181	19.8675	(87)	
Th 2	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	(88)	
util rest of house	0.9337	0.8733	0.7703	0.6196	0.4568	0.3105	0.2065	0.2339	0.4092	0.6933	0.8864	0.9465	(89)	
MIT 2	18.9051	19.2840	19.6661	19.9350	20.0492	20.0807	20.0857	20.0852	20.0687	19.8911	19.3495	18.7924	(90)	
Living area fraction									fLA =	Living area /	(4) =	0.3660	(91)	
MIT	19.2907	19.6452	20.0068	20.2665	20.3806	20.4137	20.4196	20.4189	20.4001	20.2200	19.7040	19.1859	(92)	
Temperature adjustment												0.0000		
adjusted MIT	19.2907	19.6452	20.0068	20.2665	20.3806	20.4137	20.4196	20.4189	20.4001	20.2200	19.7040	19.1859	(93)	
8. Space heating requirement														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation	0.9231	0.8638	0.7677	0.6273	0.4714	0.3286	0.2261	0.2548	0.4294	0.7000	0.8775	0.9363	(94)	
Useful gains	627.2344	717.8787	749.5721	695.0027	558.3424	381.3337	251.8485	264.7306	408.3784	564.3815	597.0181	595.6421	(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	990.0356	973.8233	892.0329	750.6776	573.2937	383.9581	252.2609	265.4195	416.0767	635.3384	832.4080	989.7143	(97)	
Space heating kWh	269.9241	171.9948	105.9909	40.0859	11.1238	0.0000	0.0000	0.0000	0.0000	52.7920	169.4807	293.1897	(98a)	
Space heating requirement - total per year (kWh/year)													1114.5818	
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	269.9241	171.9948	105.9909	40.0859	11.1238	0.0000	0.0000	0.0000	0.0000	52.7920	169.4807	293.1897	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)													1114.5818	
Space heating per m2	(98c) / (4) =											16.8130	(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)	
Fraction of main heating from main system 2												0.0000	(203)	
Fraction of total heating from main system 1												1.0000	(204)	
Fraction of total heating from main system 2												0.0000	(205)	
Efficiency of main space heating system 1 (in %)												100.0000	(206)	
Efficiency of main space heating system 2 (in %)												0.0000	(207)	
Efficiency of secondary/supplementary heating system, %												0.0000	(208)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	269.9241	171.9948	105.9909	40.0859	11.1238	0.0000	0.0000	0.0000	0.0000	52.7920	169.4807	293.1897	(98)	
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)	
Space heating fuel (main heating system)	269.9241	171.9948	105.9909	40.0859	11.1238	0.0000	0.0000	0.0000	0.0000	52.7920	169.4807	293.1897	(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)	
Space heating fuel used, main system 2													0.0000	(213)
Water heating														
Water heating requirement	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263	(64)	
Efficiency of water heater												345.3200	(216)	
(217)m	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	(217)	
Fuel for water heating, kWh/month	64.2421	56.7100	59.9812	52.0968	50.0677	44.6435	43.7139	45.7112	46.5029	52.4205	56.4328	63.4560	(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	1.8370	1.6592	1.8370	1.7777	1.8370	1.7777	1.8370	1.8370	1.7777	1.8370	1.7777	1.8370	(231)	
Lighting	19.2711	15.4600	13.9200	10.1984	7.8775	6.4360	7.1862	9.3408	12.1328	15.9189	17.9804	19.8067	(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)	

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Electricity generated by hydro-electric generators (Appendix M) (negative quantity)														
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)														
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year														
Space heating fuel - main system 1													1114.5818	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													345.3200	
Water heating fuel used													635.9785	(219)
Space cooling fuel													0.0000	(221)

Electricity for pumps and fans:														
(MEV)Decentralised, Database: total watage = 2.3400, total flow = 21.0000, SFP = 0.1114)														
mechanical ventilation fans (SFP = 0.1114)													21.6289	(230a)
Total electricity for the above, kWh/year													21.6289	(231)
Electricity for lighting (calculated in Appendix L)													155.5290	(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													1927.7182	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1114.5818	16.4900	183.7945	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	635.9785	16.4900	104.8729	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	21.6289	16.4900	3.5666	(249)
Energy for lighting	155.5290	16.4900	25.6467	(250)
Additional standing charges			0.0000	(251)
Total energy cost			317.8807	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.0283	(257)
SAP value		83.3321	
SAP rating (Section 12)		83	(258)
SAP band		B	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1114.5818	0.1575	175.4952	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	635.9785	0.1412	89.7773	(264)
Space and water heating			265.2725	(265)
Pumps, fans and electric keep-hot	21.6289	0.1387	3.0002	(267)
Energy for lighting	155.5290	0.1443	22.4476	(268)
Total CO2, kg/year			290.7204	(272)
CO2 emissions per m2			4.3900	(273)
EI value			96.4996	
EI rating			96	(274)
EI band			A	

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

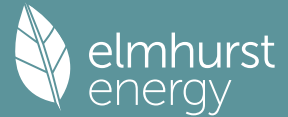
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	66.2930	2.4000	159.1032	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.2930			(4)
Dwelling volume			159.1032	(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)

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

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 0.0000 / (5) = 0.0000 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 3.0000 (17)
Infiltration rate 0.1500 (18)
Number of sides sheltered 1 (19)
Shelter factor (20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1388 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate												
	0.1457	0.1388	0.1388	0.1283	0.1283	0.1145	0.1179	0.1110	0.1145	0.1214	0.1214	0.1318 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
Solid Door			2.1000	1.0000	2.1000		
Windows (Uw = 1.30)			18.8490	1.2357	23.2937		
W1 - 1	65.3810	18.8490	46.5320	0.1800	8.3758	60.0000	2791.9198 (29a)
W1 - 3	3.6360	2.1000	1.5360	0.2400	0.3686	60.0000	92.1600 (29a)
Total net area of external elements Aum(A, m2)			69.0180				
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.1381		
Party Wall			23.7400	0.0000	0.0000	110.0000	2611.4000 (32)
Party Floor 1			66.2930			40.0000	2651.7200 (32d)
Party Ceiling 1			66.2930			30.0000	1988.7900 (32b)
Stud			120.9072			9.0000	1088.1648 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 11224.1546 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 169.3113 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.3180	0.2210	2.2803
E3 Sill	1.9210	0.0240	0.0461
E4 Jamb	40.2860	0.0190	0.7654
E5 Ground floor (normal)	8.3970	0.0450	0.3779
E7 Party floor between dwellings (in blocks of flats)	49.1160	0.0360	1.7682
E16 Corner (normal)	7.2000	0.0370	0.2664
E18 Party wall between dwellings	4.8000	0.0310	0.1488
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	19.7840	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.6531 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 39.7912 (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	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520 (38)
Heat transfer coeff	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432	66.0432 (39)
Average = Sum(39)m / 12 =												66.0432

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962 (40)
HLP (average)												0.9962
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1529 (42)

Hot water usage for mixer showers

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
60.3163	59.4099	58.0890	55.5618	53.6968	51.6169	50.4347	51.7456	53.1826	55.4157	57.9972	60.0852 (42a)	

Hot water usage for baths

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
26.0612	25.6742	25.1291	24.1242	23.3717	22.5373	22.0866	22.6278	23.2171	24.1099	25.1356	25.9731 (42b)	

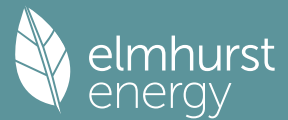
Hot water usage for other uses

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
36.6776	35.3439	34.0102	32.6764	31.3427	30.0090	30.0090	31.3427	32.6764	34.0102	35.3439	36.6776 (42c)	

Average daily hot water use (litres/day) 113.1158 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	123.0552	120.4280	117.2284	112.3624	108.4112	104.1632	102.5303	105.7161	109.0761	113.5358	118.4767	122.7360 (44)
Energy conte	194.8894	171.4879	180.1756	153.8186	145.9423	128.0808	124.0015	130.8986	134.5017	154.0670	168.7918	192.1749 (45)
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m	29.2334	25.7232	27.0263	23.0728	21.8913	19.2121	18.6002	19.6348	20.1753	23.1101	25.3188	28.8262 (46)
Water storage loss:												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8694 (55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (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	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263 (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)

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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	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263 (64)
Total per year (kWh/year) = Sum(64)m =												2196.1611 (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	64.8007	57.0197	59.9084	51.1447	48.5258	42.5869	41.2305	43.5238	44.7218	51.2273	56.1233	63.8982 (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	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.0167	19.5551	15.9033	12.0398	8.9999	7.5981	8.2100	10.6717	14.3235	18.1869	21.2268	22.6287	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	281.3365	284.2559	276.8991	261.2374	241.4673	222.8862	210.4729	207.5535	214.9103	230.5720	250.3421	268.9232	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	(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)	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	(71)
Water heating gains (Table 5)	87.0977	84.8508	80.5220	71.0343	65.2229	59.1484	55.4173	58.4997	62.1136	68.8539	77.9490	85.8846	(72)
Total internal gains	483.5787	481.7895	466.4521	437.4392	408.8178	382.7605	367.2280	369.8527	384.4752	410.7406	442.6457	470.5642	(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
East					6.4140	22.3313	0.4700	0.0000			0.7700			51.8360 (76)
South					6.3150	50.9848	0.4700	0.0000			0.7700			116.5206 (78)
West					6.1200	22.3313	0.4700	0.0000			0.7700			49.4600 (80)
Solar gains	217.8167	349.5042	504.5830	685.2415	773.9169	831.6290	789.4539	721.9383	608.2462	422.7328	270.7714	182.2921 (83)		
Total gains	701.3954	831.2936	971.0352	1122.6807	1182.7347	1214.3895	1156.6819	1091.7910	992.7214	833.4734	713.4170	652.8563 (84)		

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	47.2088	
alpha	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	4.1473	
util living area	0.9288	0.8775	0.7731	0.6094	0.4378	0.2710	0.1769	0.1934	0.3813	0.6731	0.8724	0.9423	(86)
MIT	20.1008	20.3512	20.6673	20.8897	20.9763	20.9975	20.9997	20.9996	20.9897	20.8651	20.4672	20.0190	(87)
Th 2	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	20.0865	(88)
util rest of house	0.9159	0.8578	0.7422	0.5683	0.3905	0.2219	0.1248	0.1383	0.3230	0.6236	0.8481	0.9313	(89)
MIT 2	19.0810	19.3813	19.7474	19.9860	20.0688	20.0853	20.0864	20.0864	20.0805	19.9687	19.5274	18.9815	(90)
Living area fraction	19.4542	19.7363	20.0840	20.3167	20.4009	20.4191	20.4206	20.4206	20.4132	20.2967	19.8713	19.3612	(91)
MIT	19.4542	19.7363	20.0840	20.3167	20.4009	20.4191	20.4206	20.4206	20.4132	20.2967	19.8713	19.3612	(92)
Temperature adjustment	19.4542	19.7363	20.0840	20.3167	20.4009	20.4191	20.4206	20.4206	20.4132	20.2967	19.8713	19.3612	(93)
adjusted MIT	19.4542	19.7363	20.0840	20.3167	20.4009	20.4191	20.4206	20.4206	20.4132	20.2967	19.8713	19.3612	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9054	0.8494	0.7421	0.5789	0.4070	0.2398	0.1439	0.1585	0.3440	0.6355	0.8418	0.9209	(94)
Useful gains	635.0166	706.1366	720.6170	649.9509	481.3580	291.2545	166.4256	173.0010	341.5023	529.6668	600.5198	601.2111	(95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Heat loss rate W	947.9974	933.6038	837.6942	687.9527	488.7809	291.8544	166.4716	173.0711	344.2984	574.3611	784.0200	941.8557	(97)
Space heating kWh	232.8577	152.8580	87.1055	27.3613	5.5226	0.0000	0.0000	0.0000	0.0000	33.2525	132.1201	253.4396	(98a)
Space heating requirement - total per year (kWh/year)													924.5172
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	232.8577	152.8580	87.1055	27.3613	5.5226	0.0000	0.0000	0.0000	0.0000	33.2525	132.1201	253.4396	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)													924.5172
Space heating per m2													(98c) / (4) = 13.9459 (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)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	232.8577	152.8580	87.1055	27.3613	5.5226	0.0000	0.0000	0.0000	0.0000	33.2525	132.1201	253.4396	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	232.8577	152.8580	87.1055	27.3613	5.5226	0.0000	0.0000	0.0000	0.0000	33.2525	132.1201	253.4396	(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)
Space heating fuel used, main system 2												0.0000	(213)
Water heating requirement	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263	(64)
Efficiency of water heater (217)m	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	(216)
Fuel for water heating, kWh/month	64.2421	56.7100	59.9812	52.0968	50.0677	44.6435	43.7139	45.7112	46.5029	52.4205	56.4328	63.4560	(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	1.8370	1.6592	1.8370	1.7777	1.8370	1.7777	1.8370	1.8370	1.7777	1.8370	1.7777	1.8370	(231)
Lighting	19.2711	15.4600	13.9200	10.1984	7.8775	6.4360	7.1862	9.3408	12.1328	15.9189	17.9804	19.8067	(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												924.5172	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												345.3200	
Water heating fuel used												635.9785	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.3400, total flow = 21.0000, SFP = 0.1114)													
mechanical ventilation fans (SFP = 0.1114)												21.6289	(230a)
Total electricity for the above, kWh/year												21.6289	(231)
Electricity for lighting (calculated in Appendix L)												155.5290	(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												1737.6537	(238)

10a. Fuel costs - using BEDF prices (552)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	924.5172	26.0600	240.9292	(240)
Space heating - main system 2	0.0000	26.0600	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	635.9785	26.0600	165.7360	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	21.6289	26.0600	5.6365	(249)
Energy for lighting	155.5290	26.0600	40.5309	(250)
Additional standing charges			0.0000	(251)
Total energy cost			452.8325	(255)

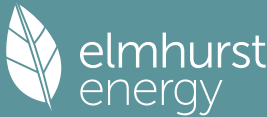
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	924.5172	0.1581	146.1650	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	635.9785	0.1412	89.7773	(264)
Space and water heating			235.9423	(265)
Pumps, fans and electric keep-hot	21.6289	0.1387	3.0002	(267)
Energy for lighting	155.5290	0.1443	22.4476	(268)
Total CO2, kg/year			261.3901	(272)

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

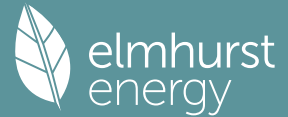
	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	924.5172	1.5852	1465.5690	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	635.9785	1.5220	967.9508	(278)
Space and water heating			2433.5197	(279)

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Pumps, fans and electric keep-hot	21.6289	1.5128	32.7203 (281)
Energy for lighting	155.5290	1.5338	238.5556 (282)
Total Primary energy kWh/year			2704.7955 (286)

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Property Reference	006 GF				Issued on Date	10/09/2024
Assessment Reference	006 GF Flat Elec DWHP PV		Prop Type Ref	006 GF		
Property	006 GF, 006 GF, 0					
SAP Rating	86 B	DER	3.75	TER	13.24	
Environmental	97 A	% DER < TER				71.68
CO ₂ Emissions (t/year)	0.19	DFEE	32.29	TFEE	36.68	
Compliance Check	See BREL	% DFEE < TFEE				11.99
% DPER < TPER	39.53	DPER	42.16	TPER	69.71	
Assessor Details	Mr. Scott Binstead				Assessor ID	U903-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	66.2930 (1b)	2.4000 (2b)	159.1032 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.2930		159.1032 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	159.1032 (5)

2. Ventilation rate

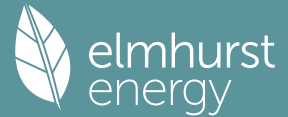
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
Solid Door			2.1000	1.0000	2.1000		(26)
Windows (Uw = 1.30)			18.8490	1.2357	23.2937		(27)
Flr - Ground			66.2930	0.1100	7.2922	75.0000	4971.9750 (28a)
Wl - 1	65.3810	18.8490	46.5320	0.1800	8.3758	60.0000	2791.9198 (29a)
Wl - 3	3.6360	2.1000	1.5360	0.2400	0.3686	60.0000	92.1600 (29a)
Total net area of external elements Aum(A, m ²)			135.3110				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.4304		(33)
Party Wall			23.7400	0.0000	0.0000	110.0000	2611.4000 (32)
Party Ceiling 1			66.2930			30.0000	1988.7900 (32b)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	12456.2448 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							187.8968 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				10.3180	0.2210	2.2803	
E3 Sill				1.9210	0.0240	0.0461	

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E4 Jamb	40.2860	0.0190	0.7654
E5 Ground floor (normal)	28.7550	0.0450	1.2940
E7 Party floor between dwellings (in blocks of flats)	28.7580	0.0360	1.0353
E16 Corner (normal)	7.2000	0.0370	0.2664
E18 Party wall between dwellings	4.8000	0.0310	0.1488
P1 Party wall - Ground floor	9.8920	0.0430	0.4254
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	9.8920	0.0000	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			6.2616 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	47.6920 (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	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520 (38)
Average = Sum(39)m / 12 =	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440 (39)
	73.9440											73.9440
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.1529 (42)
Hot water usage for mixer showers													
	60.3163	59.4099	58.0890	55.5618	53.6968	51.6169	50.4347	51.7456	53.1826	55.4157	57.9972	60.0852	(42a)
Hot water usage for baths													
	26.0612	25.6742	25.1291	24.1242	23.3717	22.5373	22.0866	22.6278	23.2171	24.1099	25.1356	25.9731	(42b)
Hot water usage for other uses													
	36.6776	35.3439	34.0102	32.6764	31.3427	30.0090	30.0090	31.3427	32.6764	34.0102	35.3439	36.6776	(42c)
Average daily hot water use (litres/day)												113.1158	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	123.0552	120.4280	117.2284	112.3624	108.4112	104.1632	102.5303	105.7161	109.0761	113.5358	118.4767	122.7360	(44)
Energy conte	194.8894	171.4879	180.1756	153.8186	145.9423	128.0808	124.0015	130.8986	134.5017	154.0670	168.7918	192.1749	(45)
Energy content (annual)										Total =	Sum(45)m =	1878.8301	
Distribution loss (46)m = 0.15 x (45)m													
	29.2334	25.7232	27.0263	23.0728	21.8913	19.2121	18.6002	19.6348	20.1753	23.1101	25.3188	28.8262	(46)
Water storage loss:													
Store volume												201.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(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													
	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263	(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													
	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263	(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													
	64.8007	57.0197	59.9084	51.1447	48.5258	42.5869	41.2305	43.5238	44.7218	51.2273	56.1233	63.8982	(65)

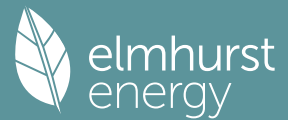
5. Internal gains (see Table 5 and 5a)

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	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	22.0167	19.5551	15.9033	12.0398	8.9999	7.5981	8.2100	10.6717	14.3235	18.1869	21.2268	22.6287 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	281.3365	284.2559	276.8991	261.2374	241.4673	222.8862	210.4729	207.5535	214.9103	230.5720	250.3421	268.9232 (68)
Pumps, fans	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702 (69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Water heating gains (Table 5)	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152 (71)
Total internal gains	87.0977	84.8508	80.5220	71.0343	65.2229	59.1484	55.4173	58.4997	62.1136	68.8539	77.9490	85.8846 (72)
	483.5787	481.7895	466.4521	437.4392	408.8178	382.7605	367.2280	369.8527	384.4752	410.7406	442.6457	470.5642 (73)

6. Solar gains

[Jan]												
		Area		Solar flux		g		FF		Access		Gains
		m2		Table 6a		W/m2		Specific data		factor		W
								or Table 6b		Table 6d		
East		6.4140		19.6403		0.4700		0.0000		0.7700		45.5895 (76)
South		6.3150		46.7521		0.4700		0.0000		0.7700		106.8471 (78)
West		6.1200		19.6403		0.4700		0.0000		0.7700		43.4998 (80)
Solar gains	195.9364	349.2656	509.9141	670.5171	775.5209	777.7871	746.8062	669.1806	566.6542	395.5360	237.7341	165.5884 (83)
Total gains	679.5151	831.0551	976.3662	1107.9563	1184.3387	1160.5476	1114.0342	1039.0333	951.1293	806.2766	680.3798	636.1527 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	
alpha	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	
util living area	0.9597	0.9184	0.8404	0.7107	0.5530	0.4017	0.2907	0.3251	0.5165	0.7852	0.9297	0.9680 (86)	
MIT	19.8182	20.1334	20.4896	20.7824	20.9336	20.9857	20.9971	20.9953	20.9615	20.7243	20.1984	19.7295 (87)	
Th 2	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883 (88)	
util rest of house	0.9511	0.9026	0.8131	0.6692	0.5003	0.3405	0.2245	0.2547	0.4477	0.7403	0.9131	0.9609 (89)	
MIT 2	18.6512	19.0369	19.4588	19.7841	19.9354	19.9799	19.9872	19.9864	19.9632	19.7350	19.1250	18.5410 (90)	
Living area fraction	fLA = Living area / (4) =												0.3660 (91)
MIT	19.0783	19.4382	19.8361	20.1494	20.3007	20.3480	20.3568	20.3556	20.3286	20.0970	19.5178	18.9759 (92)	
Temperature adjustment													0.0000
adjusted MIT	19.0783	19.4382	19.8361	20.1494	20.3007	20.3480	20.3568	20.3556	20.3286	20.0970	19.5178	18.9759 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9414	0.8927	0.8086	0.6761	0.5170	0.3625	0.2487	0.2804	0.4713	0.7455	0.9040	0.9520 (94)
Useful gains	639.7193	741.8543	789.5375	749.1141	612.2599	420.7078	277.1069	291.3597	448.2908	601.0865	615.0439	605.6066 (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	1092.7667	1075.0135	986.1212	831.8273	635.9731	425.0308	277.7903	292.4956	460.5664	702.2497	918.2228	1092.5909 (97)
Space heating kWh	337.0673	223.8830	146.2583	59.5535	17.6426	0.0000	0.0000	0.0000	0.0000	75.2654	218.2889	362.3163 (98a)
Space heating requirement - total per year (kWh/year)												1440.2753
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	337.0673	223.8830	146.2583	59.5535	17.6426	0.0000	0.0000	0.0000	0.0000	75.2654	218.2889	362.3163 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1440.2753
Space heating per m2										(98c) / (4) =		21.7259 (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)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	337.0673	223.8830	146.2583	59.5535	17.6426	0.0000	0.0000	0.0000	0.0000	75.2654	218.2889	362.3163	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	337.0673	223.8830	146.2583	59.5535	17.6426	0.0000	0.0000	0.0000	0.0000	75.2654	218.2889	362.3163	(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)
Space heating fuel used, main system 2													(213)
Water heating													
Water heating requirement	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263	(64)
Efficiency of water heater													(216)
(217)m	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	(217)
Fuel for water heating, kWh/month	64.2421	56.7100	59.9812	52.0968	50.0677	44.6435	43.7139	45.7112	46.5029	52.4205	56.4328	63.4560	(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	1.8370	1.6592	1.8370	1.7777	1.8370	1.7777	1.8370	1.8370	1.7777	1.8370	1.7777	1.8370	(231)
Lighting	19.2711	15.4600	13.9200	10.1984	7.8775	6.4360	7.1862	9.3408	12.1328	15.9189	17.9804	19.8067	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-20.6117	-31.3386	-47.5818	-55.2291	-60.4507	-56.1604	-55.3794	-50.9337	-43.3611	-35.7134	-23.2509	-17.5813	(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	-4.4316	-10.4514	-23.5914	-40.1569	-57.3907	-59.6964	-58.9464	-48.9533	-34.8704	-17.7096	-6.4540	-3.3756	(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													1440.2753 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													345.3200
Water heating fuel used													635.9785 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 2.3400, total flow = 21.0000, SFP = 0.1114)													
mechanical ventilation fans (SFP = 0.1114)													21.6289 (230a)

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Total electricity for the above, kWh/year	21.6289 (231)
Electricity for lighting (calculated in Appendix L)	155.5290 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-863.6197 (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	1389.7921 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1440.2753	16.4900	237.5014 (240)
Space heating - main system 2	0.0000	16.4900	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	635.9785	16.4900	104.8729 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	21.6289	16.4900	3.5666 (249)
Energy for lighting	155.5290	16.4900	25.6467 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-497.5920	16.4900	-82.0529
PV Unit electricity exported	-366.0277	5.5900	-20.4609
Total			-102.5139 (252)
Total energy cost			269.0737 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] = 0.8704 (257)
SAP value	85.8912
SAP rating (Section 12)	86 (258)
SAP band	B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1440.2753	0.1571	226.2410 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	635.9785	0.1412	89.7773 (264)
Space and water heating			316.0183 (265)
Pumps, fans and electric keep-hot	21.6289	0.1387	3.0002 (267)
Energy for lighting	155.5290	0.1443	22.4476 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-497.5920	0.1339	-66.6458
PV Unit electricity exported	-366.0277	0.1226	-44.8692
Total			-111.5150 (269)
Total CO2, kg/year			229.9512 (272)
CO2 emissions per m2			3.4700 (273)
EI value			97.2313
EI rating			97 (274)
EI band			A

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

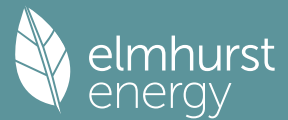
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	66.2930 (1b)	x 2.4000 (2b)	= 159.1032 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.2930		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 159.1032 (5)

2. Ventilation rate

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

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Number of passive vents
Number of flueless gas fires

0 * 10 = 0.0000 (7b)
0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =
Pressure test
Pressure Test Method
Measured/design AP50
Infiltration rate
Number of sides sheltered

Air changes per hour
0.0000 / (5) = 0.0000 (8)
Yes
Blower Door
3.0000 (17)
0.1500 (18)
2 (19)

Shelter factor
Infiltration rate adjusted to include shelter factor

(20) = 1 - [0.075 x (19)] = 0.8500 (20)
(21) = (18) x (20) = 0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.1339	0.1275	0.1275	0.1179	0.1179	0.1052	0.1084	0.1020	0.1052	0.1116	0.1116	0.1211 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
Solid Door			2.1000	1.0000	2.1000		(26)
Windows (Uw = 1.30)			18.8490	1.2357	23.2937		(27)
Flr - Ground			66.2930	0.1100	7.2922	75.0000	4971.9750 (28a)
W1 - 1	65.3810	18.8490	46.5320	0.1800	8.3758	60.0000	2791.9198 (29a)
W1 - 3	3.6360	2.1000	1.5360	0.2400	0.3686	60.0000	92.1600 (29a)
Total net area of external elements Aum(A, m2)			135.3110				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.4304		(33)
Party Wall			23.7400	0.0000	0.0000	110.0000	2611.4000 (32)
Party Ceiling 1			66.2930			30.0000	1988.7900 (32b)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K

(28)...(30) + (32) + (32a)...(32e) = 12456.2448 (34)
187.8968 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.3180	0.2210	2.2803
E3 Sill	1.9210	0.0240	0.0461
E4 Jamb	40.2860	0.0190	0.7654
E5 Ground floor (normal)	28.7550	0.0450	1.2940
E7 Party floor between dwellings (in blocks of flats)	28.7580	0.0360	1.0353
E16 Corner (normal)	7.2000	0.0370	0.2664
E18 Party wall between dwellings	4.8000	0.0310	0.1488
P1 Party wall - Ground floor	9.8920	0.0430	0.4254
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	9.8920	0.0000	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			6.2616 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 47.6920 (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	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520 (38)
Heat transfer coeff	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440 (39)
Average = Sum(39)m / 12 =												73.9440

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154 (40)
HLP (average)												1.1154
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy
Hot water usage for mixer showers
60.3163 59.4099 58.0890 55.5618 53.6968 51.6169 50.4347 51.7456 53.1826 55.4157 57.9972 60.0852 (42a)

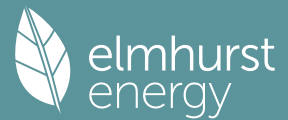
Hot water usage for baths
26.0612 25.6742 25.1291 24.1242 23.3717 22.5373 22.0866 22.6278 23.2171 24.1099 25.1356 25.9731 (42b)

Hot water usage for other uses
36.6776 35.3439 34.0102 32.6764 31.3427 30.0090 30.0090 31.3427 32.6764 34.0102 35.3439 36.6776 (42c)

Average daily hot water use (litres/day)
113.1158 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	123.0552	120.4280	117.2284	112.3624	108.4112	104.1632	102.5303	105.7161	109.0761	113.5358	118.4767	122.7360 (44)
Energy conte	194.8894	171.4879	180.1756	153.8186	145.9423	128.0808	124.0015	130.8986	134.5017	154.0670	168.7918	192.1749 (45)
Energy content (annual)										Total = Sum(45)m =		1878.8301
Distribution loss (46)m = 0.15 x (45)m	29.2334	25.7232	27.0263	23.0728	21.8913	19.2121	18.6002	19.6348	20.1753	23.1101	25.3188	28.8262 (46)
Water storage loss:												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8694 (55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (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	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263 (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)

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Output from w/h	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263 (64)
	Total per year (kWh/year) = Sum(64)m =											2196.1611 (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	64.8007	57.0197	59.9084	51.1447	48.5258	42.5869	41.2305	43.5238	44.7218	51.2273	56.1233	63.8982 (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	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.0167	19.5551	15.9033	12.0398	8.9999	7.5981	8.2100	10.6717	14.3235	18.1869	21.2268	22.6287 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	281.3365	284.2559	276.8991	261.2374	241.4673	222.8862	210.4729	207.5535	214.9103	230.5720	250.3421	268.9232 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702 (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)	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152 (71)
Water heating gains (Table 5)	87.0977	84.8508	80.5220	71.0343	65.2229	59.1484	55.4173	58.4997	62.1136	68.8539	77.9490	85.8846 (72)
Total internal gains	483.5787	481.7895	466.4521	437.4392	408.8178	382.7605	367.2280	369.8527	384.4752	410.7406	442.6457	470.5642 (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	
East					6.4140	22.3313		0.4700	0.0000	0.7700		51.8360 (76)	
South					6.3150	50.9848		0.4700	0.0000	0.7700		116.5206 (78)	
West					6.1200	22.3313		0.4700	0.0000	0.7700		49.4600 (80)	
Solar gains	217.8167	349.5042	504.5830	685.2415	773.9169	831.6290	789.4539	721.9383	608.2462	422.7328	270.7714	182.2921 (83)	
Total gains	701.3954	831.2936	971.0352	1122.6807	1182.7347	1214.3895	1156.6819	1091.7910	992.7214	833.4734	713.4170	652.8563 (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	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931
alpha	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195
util living area	0.9483	0.9077	0.8185	0.6634	0.4853	0.3029	0.1980	0.2164	0.4242	0.7257	0.9036	0.9585 (86)
MIT	19.9645	20.2209	20.5724	20.8458	20.9644	20.9961	20.9995	20.9993	20.9842	20.8170	20.3578	19.8847 (87)
Th 2	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883 (88)
util rest of house	0.9371	0.8897	0.7873	0.6172	0.4287	0.2423	0.1335	0.1482	0.3534	0.6719	0.8811	0.9492 (89)
MIT 2	18.8338	19.1442	19.5554	19.8503	19.9629	19.9866	19.9882	19.9881	19.9797	19.8315	19.3172	18.7360 (90)
Living area fraction	FLA = Living area / (4) =											0.3660 (91)
MIT	19.2476	19.5382	19.9276	20.2146	20.3294	20.3560	20.3583	20.3582	20.3473	20.1921	19.6980	19.1564 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2476	19.5382	19.9276	20.2146	20.3294	20.3560	20.3583	20.3582	20.3473	20.1921	19.6980	19.1564 (93)

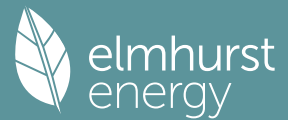
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9271	0.8804	0.7853	0.6280	0.4481	0.2644	0.1571	0.1732	0.3788	0.6834	0.8736	0.9397 (94)
Useful gains	650.2649	731.8980	762.5166	704.9913	529.9538	321.1009	181.7015	189.0483	376.0597	569.5884	623.2649	613.4661 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	1046.1289	1030.6501	926.3392	762.7063	541.9678	322.1015	181.7765	189.1626	380.6155	635.3364	864.9979	1039.3869 (97)
Space heating kWh	294.5228	200.7614	121.8840	41.5548	8.9384	0.0000	0.0000	0.0000	0.0000	48.9165	174.0478	316.8851 (98a)
Space heating requirement - total per year (kWh/year)												1207.5107
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	294.5228	200.7614	121.8840	41.5548	8.9384	0.0000	0.0000	0.0000	0.0000	48.9165	174.0478	316.8851 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1207.5107
Space heating per m2												(98c) / (4) =
												18.2148 (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)
Fraction of main heating from main system 2												0.0000 (203)
Fraction of total heating from main system 1												1.0000 (204)
Fraction of total heating from main system 2												0.0000 (205)
Efficiency of main space heating system 1 (in %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	294.5228	200.7614	121.8840	41.5548	8.9384	0.0000	0.0000	0.0000	0.0000	48.9165	174.0478	316.8851 (98)

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Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	294.5228	200.7614	121.8840	41.5548	8.9384	0.0000	0.0000	0.0000	0.0000	48.9165	174.0478	316.8851 (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	(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	(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	(215)
Space heating fuel used, main system 2											0.0000	(213)
Water heating requirement	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263 (64)
Efficiency of water heater	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200 (216)
Fuel for water heating, kWh/month	64.2421	56.7100	59.9812	52.0968	50.0677	44.6435	43.7139	45.7112	46.5029	52.4205	56.4328	63.4560 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	1.8370	1.6592	1.8370	1.7777	1.8370	1.7777	1.8370	1.7777	1.8370	1.7777	1.8370	(231)
Lighting	19.2711	15.4600	13.9200	10.1984	7.8775	6.4360	7.1862	9.3408	12.1328	15.9189	17.9804	19.8067 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-22.6710	-31.3757	-46.9666	-55.4984	-59.9344	-58.7366	-57.5266	-53.7442	-45.8106	-37.2360	-25.8948	-19.1945 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-5.4023	-10.8185	-24.0938	-42.7288	-58.3642	-65.7675	-63.9880	-54.7690	-38.8843	-20.3803	-8.2292	-4.0645 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1207.5107 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												345.3200
Water heating fuel used												635.9785 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(MEV)Decentralised, Database: total watage = 2.3400, total flow = 21.0000, SFP = 0.1114)												
mechanical ventilation fans (SFP = 0.1114)												21.6289 (230a)
Total electricity for the above, kWh/year												21.6289 (231)
Electricity for lighting (calculated in Appendix L)												155.5290 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-912.0798 (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												1108.5674 (238)

10a. Fuel costs - using BEDF prices (552)												
		Fuel		Fuel price		Fuel cost						
		kWh/year		p/kWh		£/year						
Space heating - main system 1		1207.5107		26.0600		314.6773 (240)						
Space heating - main system 2		0.0000		26.0600		0.0000 (241)						
Total CO2 associated with community systems						0.0000 (473)						
Water heating (other fuel)		635.9785		26.0600		165.7360 (247)						
Energy for instantaneous electric shower(s)		0.0000		26.0600		0.0000 (247a)						
Pumps, fans and electric keep-hot		21.6289		26.0600		5.6365 (249)						
Energy for lighting		155.5290		26.0600		40.5309 (250)						
Additional standing charges						0.0000 (251)						
Energy saving/generation technologies												
PV Unit electricity used in dwelling		-514.5893		26.0600		-134.1020						
PV Unit electricity exported		-397.4905		5.8100		-23.0942						
Total						-157.1962 (252)						
Total energy cost						369.3845 (255)						

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP												
		Energy		Emission factor		Emissions						
		kWh/year		kg CO2/kWh		kg CO2/year						
Space heating - main system 1		1207.5107		0.1578		190.4856 (261)						
Space heating - main system 2		0.0000		0.0000		0.0000 (262)						
Total CO2 associated with community systems						0.0000 (373)						
Water heating (other fuel)		635.9785		0.1412		89.7773 (264)						
Space and water heating						280.2629 (265)						
Pumps, fans and electric keep-hot		21.6289		0.1387		3.0002 (267)						
Energy for lighting		155.5290		0.1443		22.4476 (268)						
Energy saving/generation technologies												
PV Unit electricity used in dwelling		-514.5893		0.1339		-68.8940						
PV Unit electricity exported		-397.4905		0.1223		-48.6303						
Total						-117.5242 (269)						
Total CO2, kg/year						188.1865 (272)						

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

	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Space heating - main system 1	1207.5107	1.5840	1912.6433 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	635.9785	1.5220	967.9508 (278)
Space and water heating			2880.5940 (279)
Pumps, fans and electric keep-hot	21.6289	1.5128	32.7203 (281)
Energy for lighting	155.5290	1.5338	238.5556 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-514.5893	1.4948	-769.1860
PV Unit electricity exported	-397.4905	0.4489	-178.4193
Total			-947.6053 (283)
Total Primary energy kWh/year			2204.2645 (286)

SAP 10 EPC IMPROVEMENTS

006 GF Flat Elec DWHP PV

Current energy efficiency rating: B 86
Current environmental impact rating: A 97

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

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

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

Potential energy efficiency rating: B 86
Potential environmental impact rating: A 97

Fuel prices for cost data on this page from database revision number 552 TEST (30 Aug 2024)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£527	£527	£0
Space heating	£320	£320	£0
Water heating	£166	£166	£0
Lighting	£41	£41	£0
Generated (PV)	-£157	-£157	£0
Total cost of fuels	£370	£370	£0
Total cost of uses	£370	£370	£0
Delivered energy	17 kWh/m ²	17 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO ₂ emissions per m ²	3 kg/m ²	3 kg/m ²	0 kg/m ²
Primary energy	33 kWh/m ²	33 kWh/m ²	0 kWh/m ²

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

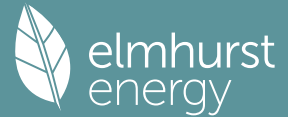
1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	66.2930 (1b)	x 2.4000 (2b)	= 159.1032 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.2930		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 159.1032 (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	

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Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 0.0000 / (5) = 0.0000 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 3.0000 (17)
Infiltration rate 0.1500 (18)
Number of sides sheltered 2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(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	
Solid Door			2.1000	1.0000	2.1000			(26)
Windows (Uw = 1.30)			18.8490	1.2357	23.2937			(27)
Flr - Ground			66.2930	0.1100	7.2922	75.0000	4971.9750	(28a)
W1 - 1	65.3810	18.8490	46.5320	0.1800	8.3758	60.0000	2791.9198	(29a)
W1 - 3	3.6360	2.1000	1.5360	0.2400	0.3686	60.0000	92.1600	(29a)
Total net area of external elements Aum(A, m ²)			135.3110					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.4304			(33)
Party Wall			23.7400	0.0000	0.0000	110.0000	2611.4000	(32)
Party Ceiling 1			66.2930			30.0000	1988.7900	(32b)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K (28)...(30) + (32) + (32a)...(32e) = 12456.2448 (34)
List of Thermal Bridges 187.8968 (35)

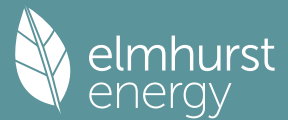
K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	10.3180	0.2210	2.2803	
E3 Sill	1.9210	0.0240	0.0461	
E4 Jamb	40.2860	0.0190	0.7654	
E5 Ground floor (normal)	28.7550	0.0450	1.2940	
E7 Party floor between dwellings (in blocks of flats)	28.7580	0.0360	1.0353	
E16 Corner (normal)	7.2000	0.0370	0.2664	
E18 Party wall between dwellings	4.8000	0.0310	0.1488	
P1 Party wall - Ground floor	9.8920	0.0430	0.4254	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	9.8920	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			6.2616	(36)
Point Thermal bridges			0.0000	(36a) =
Total fabric heat loss			47.6920	(33) + (36) + (36a) = (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	(38)
Heat transfer coeff	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	(39)
Average = Sum(39)m / 12 =													73.9440
HLP	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	(40)
HLP (average)													1.1154
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.1529 (42)
Hot water usage for mixer showers													
60.3163	59.4099	58.0890	55.5618	53.6968	51.6169	50.4347	51.7456	53.1826	55.4157	57.9972	60.0852		(42a)
Hot water usage for baths													
26.0612	25.6742	25.1291	24.1242	23.3717	22.5373	22.0866	22.6278	23.2171	24.1099	25.1356	25.9731		(42b)
Hot water usage for other uses													
36.6776	35.3439	34.0102	32.6764	31.3427	30.0090	30.0090	31.3427	32.6764	34.0102	35.3439	36.6776		(42c)
Average daily hot water use (litres/day)													113.1158 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.0552	120.4280	117.2284	112.3624	108.4112	104.1632	102.5303	105.7161	109.0761	113.5358	118.4767	122.7360	(44)
Energy conte	194.8894	171.4879	180.1756	153.8186	145.9423	128.0808	124.0015	130.8986	134.5017	154.0670	168.7918	192.1749	(45)
Energy content (annual)										Total = Sum(45)m =			1878.8301
Distribution loss (46)m = 0.15 x (45)m													
29.2334	25.7232	27.0263	23.0728	21.8913	19.2121	18.6002	19.6348	20.1753	23.1101	25.3188	28.8262		(46)
Water storage loss:													
Store volume													201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6100 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8694 (55)
Total storage loss													
26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514		(56)
If cylinder contains dedicated solar storage													
26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514		(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(61)
Total heat required for water heating calculated for each month													
221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263		(62)
WWHRS	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		(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(63d)
Output from w/h													
221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263		(64)
Electric shower(s)													Total per year (kWh/year) = Sum(64)m = 2196.1611 (64)

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	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	64.8007	57.0197	59.9084	51.1447	48.5258	42.5869	41.2305	43.5238	44.7218	51.2273	56.1233	63.8982 (65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)												

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	22.0167	19.5551	15.9033	12.0398	8.9999	7.5981	8.2100	10.6717	14.3235	18.1869	21.2268	22.6287 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	281.3365	284.2559	276.8991	261.2374	241.4673	222.8862	210.4729	207.5535	214.9103	230.5720	250.3421	268.9232 (68)
Pumps, fans	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702 (69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Water heating gains (Table 5)	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152 (71)
Total internal gains	87.0977	84.8508	80.5220	71.0343	65.2229	59.1484	55.4173	58.4997	62.1136	68.8539	77.9490	85.8846 (72)
	483.5787	481.7895	466.4521	437.4392	408.8178	382.7605	367.2280	369.8527	384.4752	410.7406	442.6457	470.5642 (73)

6. Solar gains

[Jan]												
		Area		Solar flux		g		FF		Access		Gains
		m2		Table 6a		Specific data		Specific data		factor		W
				W/m2		or Table 6b		or Table 6c		Table 6d		
East		6.4140		19.6403		0.4700		0.0000		0.7700		45.5895 (76)
South		6.3150		46.7521		0.4700		0.0000		0.7700		106.8471 (78)
West		6.1200		19.6403		0.4700		0.0000		0.7700		43.4998 (80)
Solar gains	195.9364	349.2656	509.9141	670.5171	775.5209	777.7871	746.8062	669.1806	566.6542	395.5360	237.7341	165.5884 (83)
Total gains	679.5151	831.0551	976.3662	1107.9563	1184.3387	1160.5476	1114.0342	1039.0333	951.1293	806.2766	680.3798	636.1527 (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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931
util living area	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195
	0.9597	0.9184	0.8404	0.7107	0.5530	0.4017	0.2907	0.3251	0.5165	0.7852	0.9297	0.9680 (86)
MIT	19.8182	20.1334	20.4896	20.7824	20.9336	20.9857	20.9971	20.9953	20.9615	20.7243	20.1984	19.7295 (87)
Th 2	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883 (88)
util rest of house	0.9511	0.9026	0.8131	0.6692	0.5003	0.3405	0.2245	0.2547	0.4477	0.7403	0.9131	0.9609 (89)
MIT 2	18.6512	19.0369	19.4588	19.7841	19.9354	19.9799	19.9872	19.9864	19.9632	19.7350	19.1250	18.5410 (90)
Living area fraction												
MIT	19.0783	19.4382	19.8361	20.1494	20.3007	20.3480	20.3568	20.3556	20.3286	20.0970	19.5178	18.9759 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0783	19.4382	19.8361	20.1494	20.3007	20.3480	20.3568	20.3556	20.3286	20.0970	19.5178	18.9759 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9414	0.8927	0.8086	0.6761	0.5170	0.3625	0.2487	0.2804	0.4713	0.7455	0.9040	0.9520 (94)
Ext temp.	639.7193	741.8543	789.5375	749.1141	612.2599	420.7078	277.1069	291.3597	448.2908	601.0865	615.0439	605.6066 (95)
Heat loss rate W	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)
Space heating kWh	1092.7667	1075.0135	986.1212	831.8273	635.9731	425.0308	277.7903	292.4956	460.5664	702.2497	918.2228	1092.5909 (97)
Space heating requirement - total per year (kWh/year)	337.0673	223.8830	146.2583	59.5535	17.6426	0.0000	0.0000	0.0000	0.0000	75.2654	218.2889	362.3163 (98a)
Solar heating kWh												1440.2753
Solar heating contribution - total per year (kWh/year)	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)
Space heating kWh	337.0673	223.8830	146.2583	59.5535	17.6426	0.0000	0.0000	0.0000	0.0000	75.2654	218.2889	362.3163 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1440.2753
Space heating per m2										(98c) / (4) =		21.7259 (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)
Fraction of main heating from main system 2												0.0000 (203)
Fraction of total heating from main system 1												1.0000 (204)
Fraction of total heating from main system 2												0.0000 (205)
Efficiency of main space heating system 1 (in %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating efficiency (main heating system 1)	337.0673	223.8830	146.2583	59.5535	17.6426	0.0000	0.0000	0.0000	0.0000	75.2654	218.2889	362.3163 (98)
Space heating fuel (main heating system)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	337.0673	223.8830	146.2583	59.5535	17.6426	0.0000	0.0000	0.0000	0.0000	75.2654	218.2889	362.3163 (211)

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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)
Space heating fuel used, main system 2												0.0000	(213)
Water heating requirement	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263	(64)
Efficiency of water heater (217)m	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	(216)
Fuel for water heating, kWh/month	64.2421	56.7100	59.9812	52.0968	50.0677	44.6435	43.7139	45.7112	46.5029	52.4205	56.4328	63.4560	(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	1.8370	1.6592	1.8370	1.7777	1.8370	1.7777	1.8370	1.7777	1.8370	1.7777	1.8370	1.8370	(231)
Lighting	19.2711	15.4600	13.9200	10.1984	7.8775	6.4360	7.1862	9.3408	12.1328	15.9189	17.9804	19.8067	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-20.6117	-31.3386	-47.5818	-55.2291	-60.4507	-56.1604	-55.3794	-50.9337	-43.3611	-35.7134	-23.2509	-17.5813	(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	-4.4316	-10.4514	-23.5914	-40.1569	-57.3907	-59.6964	-58.9464	-48.9533	-34.8704	-17.7096	-6.4540	-3.3756	(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												1440.2753	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												345.3200	
Water heating fuel used												635.9785	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.3400, total flow = 21.0000, SFP = 0.1114)													
mechanical ventilation fans (SFP = 0.1114)												21.6289	(230a)
Total electricity for the above, kWh/year												21.6289	(231)
Electricity for lighting (calculated in Appendix L)												155.5290	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-863.6197	(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												1389.7921	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1440.2753	16.4900	237.5014	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	635.9785	16.4900	104.8729	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	21.6289	16.4900	3.5666	(249)
Energy for lighting	155.5290	16.4900	25.6467	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-497.5920	16.4900	-82.0529	
PV Unit electricity exported	-366.0277	5.5900	-20.4609	
Total			-102.5139	(252)
Total energy cost			269.0737	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)		0.8704	(257)
SAP value	$[(255) \times (256)] / [(4) + 45.0] =$	85.8912	
SAP rating (Section 12)		86	(258)
SAP band		B	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1440.2753	0.1571	226.2410	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	635.9785	0.1412	89.7773	(264)
Space and water heating			316.0183	(265)
Pumps, fans and electric keep-hot	21.6289	0.1387	3.0002	(267)
Energy for lighting	155.5290	0.1443	22.4476	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-497.5920	0.1339	-66.6458	
PV Unit electricity exported	-366.0277	0.1226	-44.8692	

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Total -111.5150 (269)

Total CO₂, kg/year 229.9512 (272)

CO₂ emissions per m² 3.4700 (273)

EI value 97.2313

EI rating 97 (274)

EI band A

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	66.2930 (1b)	x 2.4000 (2b)	= 159.1032 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.2930		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 159.1032 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.1339	0.1275	0.1275	0.1179	0.1179	0.1052	0.1084	0.1020	0.1052	0.1116	0.1116	0.1211 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
Solid Door			2.1000	1.0000	2.1000		(26)
Windows (Uw = 1.30)			18.8490	1.2357	23.2937		(27)
Flr - Ground			66.2930	0.1100	7.2922	75.0000	4971.9750 (28a)
W1 - 1	65.3810	18.8490	46.5320	0.1800	8.3758	60.0000	2791.9198 (29a)
W1 - 3	3.6360	2.1000	1.5360	0.2400	0.3686	60.0000	92.1600 (29a)
Total net area of external elements Aum(A, m ²)			135.3110				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.4304		(33)
Party Wall			23.7400	0.0000	0.0000	110.0000	2611.4000 (32)
Party Ceiling 1			66.2930			30.0000	1988.7900 (32b)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12456.2448 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							187.8968 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				10.3180	0.2210	2.2803	
E3 Sill				1.9210	0.0240	0.0461	
E4 Jamb				40.2860	0.0190	0.7654	
E5 Ground floor (normal)				28.7550	0.0450	1.2940	
E7 Party floor between dwellings (in blocks of flats)				28.7580	0.0360	1.0353	
E16 Corner (normal)				7.2000	0.0370	0.2664	
E18 Party wall between dwellings				4.8000	0.0310	0.1488	
P1 Party wall - Ground floor				9.8920	0.0430	0.4254	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				9.8920	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.2616 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	47.6920 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520 (38)
Heat transfer coeff	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440 (39)

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Average = Sum(39)m / 12 =

73.9440

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154
HLP (average)												1.1154 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1529 (42)
Hot water usage for mixer showers												
60.3163	59.4099	58.0890	55.5618	53.6968	51.6169	50.4347	51.7456	53.1826	55.4157	57.9972	60.0852	(42a)
Hot water usage for baths												
26.0612	25.6742	25.1291	24.1242	23.3717	22.5373	22.0866	22.6278	23.2171	24.1099	25.1356	25.9731	(42b)
Hot water usage for other uses												
36.6776	35.3439	34.0102	32.6764	31.3427	30.0090	30.0090	31.3427	32.6764	34.0102	35.3439	36.6776	(42c)
Average daily hot water use (litres/day)												113.1158 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	123.0552	120.4280	117.2284	112.3624	108.4112	104.1632	102.5303	105.7161	109.0761	113.5358	118.4767	122.7360 (44)
Energy content (annual)	194.8894	171.4879	180.1756	153.8186	145.9423	128.0808	124.0015	130.8986	134.5017	154.0670	168.7918	192.1749 (45)
Distribution loss (46)m = 0.15 x (45)m												1878.8301
29.2334	25.7232	27.0263	23.0728	21.8913	19.2121	18.6002	19.6348	20.1753	23.1101	25.3188	28.8262	(46)
Water storage loss:												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8694 (55)
Total storage loss												
26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage												
26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(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	(61)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month												
221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263	(62)
WWHRS	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	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263 (64)
Total per year (kWh/year) = Sum(64)m =												2196.1611 (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												
64.8007	57.0197	59.9084	51.1447	48.5258	42.5869	41.2305	43.5238	44.7218	51.2273	56.1233	63.8982	(65)

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

Metabolic gains (Table 5), Watts												
(66)m	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
22.0167	19.5551	15.9033	12.0398	8.9999	7.5981	8.2100	10.6717	14.3235	18.1869	21.2268	22.6287	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
281.3365	284.2559	276.8991	261.2374	241.4673	222.8862	210.4729	207.5535	214.9103	230.5720	250.3421	268.9232	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	(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)												
-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	(71)
Water heating gains (Table 5)												
87.0977	84.8508	80.5220	71.0343	65.2229	59.1484	55.4173	58.4997	62.1136	68.8539	77.9490	85.8846	(72)
Total internal gains												
483.5787	481.7895	466.4521	437.4392	408.8178	382.7605	367.2280	369.8527	384.4752	410.7406	442.6457	470.5642	(73)

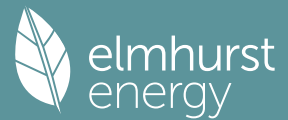
6. Solar gains

[Jan]												
				Area	Solar flux		g	FF		Access	Gains	
				m2	Table 6a		Specific data	Specific data		factor		
					W/m2		or Table 6b	or Table 6c		Table 6d	W	
East				6.4140	22.3313		0.4700	0.0000		0.7700	51.8360 (76)	
South				6.3150	50.9848		0.4700	0.0000		0.7700	116.5206 (78)	
West				6.1200	22.3313		0.4700	0.0000		0.7700	49.4600 (80)	
Solar gains	217.8167	349.5042	504.5830	685.2415	773.9169	831.6290	789.4539	721.9383	608.2462	422.7328	270.7714	182.2921 (83)
Total gains	701.3954	831.2936	971.0352	1122.6807	1182.7347	1214.3895	1156.6819	1091.7910	992.7214	833.4734	713.4170	652.8563 (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	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	
alpha	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	
util living area	0.9483	0.9077	0.8185	0.6634	0.4853	0.3029	0.1980	0.2164	0.4242	0.7257	0.9036	0.9585 (86)
MIT	19.9645	20.2209	20.5724	20.8458	20.9644	20.9961	20.9995	20.9993	20.9842	20.8170	20.3578	19.8847 (87)
Th 2	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883 (88)
util rest of house	0.9371	0.8897	0.7873	0.6172	0.4287	0.2423	0.1335	0.1482	0.3534	0.6719	0.8811	0.9492 (89)

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MIT 2	18.8338	19.1442	19.5554	19.8503	19.9629	19.9866	19.9882	19.9881	19.9797	19.8315	19.3172	18.7360 (90)
Living area fraction									FLA = Living area / (4) =			0.3660 (91)
MIT	19.2476	19.5382	19.9276	20.2146	20.3294	20.3560	20.3583	20.3582	20.3473	20.1921	19.6980	19.1564 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2476	19.5382	19.9276	20.2146	20.3294	20.3560	20.3583	20.3582	20.3473	20.1921	19.6980	19.1564 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9271	0.8804	0.7853	0.6280	0.4481	0.2644	0.1571	0.1732	0.3788	0.6834	0.8736	0.9397	(94)
Useful gains	650.2649	731.8980	762.5166	704.9913	529.9538	321.1009	181.7015	189.0483	376.0597	569.5884	623.2649	613.4661	(95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Heat loss rate W	1046.1289	1030.6501	926.3392	762.7063	541.9678	322.1015	181.7765	189.1626	380.6155	635.3364	864.9979	1039.3869	(97)
Space heating kWh	294.5228	200.7614	121.8840	41.5548	8.9384	0.0000	0.0000	0.0000	0.0000	48.9165	174.0478	316.8851	(98a)
Space heating requirement - total per year (kWh/year)												1207.5107	
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	294.5228	200.7614	121.8840	41.5548	8.9384	0.0000	0.0000	0.0000	0.0000	48.9165	174.0478	316.8851	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1207.5107	
Space heating per m2										(98c) / (4) =		18.2148	(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)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	294.5228	200.7614	121.8840	41.5548	8.9384	0.0000	0.0000	0.0000	0.0000	48.9165	174.0478	316.8851	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	294.5228	200.7614	121.8840	41.5548	8.9384	0.0000	0.0000	0.0000	0.0000	48.9165	174.0478	316.8851	(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)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263	(64)
Efficiency of water heater (217)m	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	(216)
Fuel for water heating, kWh/month	64.2421	56.7100	59.9812	52.0968	50.0677	44.6435	43.7139	45.7112	46.5029	52.4205	56.4328	63.4560	(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	1.8370	1.6592	1.8370	1.7777	1.8370	1.7777	1.8370	1.7777	1.8370	1.7777	1.8370	1.8370	(231)
Lighting	19.2711	15.4600	13.9200	10.1984	7.8775	6.4360	7.1862	9.3408	12.1328	15.9189	17.9804	19.8067	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-22.6710	-31.3757	-46.9666	-55.4984	-59.9344	-58.7366	-57.5266	-53.7442	-45.8106	-37.2360	-25.8948	-19.1945	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-5.4023	-10.8185	-24.0938	-42.7288	-58.3642	-65.7675	-63.9880	-54.7690	-38.8843	-20.3803	-8.2292	-4.0645	(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												1207.5107	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												345.3200	
Water heating fuel used												635.9785	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.3400, total flow = 21.0000, SFP = 0.1114)													
mechanical ventilation fans (SFP = 0.1114)													21.6289 (230a)
Total electricity for the above, kWh/year													21.6289 (231)
Electricity for lighting (calculated in Appendix L)													155.5290 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-912.0798	(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												1108.5674	(238)

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10a. Fuel costs - using BEDF prices (552)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1207.5107	26.0600	314.6773 (240)
Space heating - main system 2	0.0000	26.0600	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	635.9785	26.0600	165.7360 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Pumps, fans and electric keep-hot	21.6289	26.0600	5.6365 (249)
Energy for lighting	155.5290	26.0600	40.5309 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-514.5893	26.0600	-134.1020
PV Unit electricity exported	-397.4905	5.8100	-23.0942
Total			-157.1962 (252)
Total energy cost			369.3845 (255)

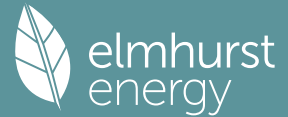
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1207.5107	0.1578	190.4856 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	635.9785	0.1412	89.7773 (264)
Space and water heating			280.2629 (265)
Pumps, fans and electric keep-hot	21.6289	0.1387	3.0002 (267)
Energy for lighting	155.5290	0.1443	22.4476 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-514.5893	0.1339	-68.8940
PV Unit electricity exported	-397.4905	0.1223	-48.6303
Total			-117.5242 (269)
Total CO2, kg/year			188.1865 (272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1207.5107	1.5840	1912.6433 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	635.9785	1.5220	967.9508 (278)
Space and water heating			2880.5940 (279)
Pumps, fans and electric keep-hot	21.6289	1.5128	32.7203 (281)
Energy for lighting	155.5290	1.5338	238.5556 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-514.5893	1.4948	-769.1860
PV Unit electricity exported	-397.4905	0.4489	-178.4193
Total			-947.6053 (283)
Total Primary energy kWh/year			2204.2645 (286)

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Property Reference	006 GF				Issued on Date	10/09/2024
Assessment Reference	006 GF Flat ASHP	Prop Type Ref	006 GF			
Property	006 GF, 006 GF, 0					
SAP Rating	86 B	DER	3.74	TER	13.24	
Environmental	97 A	% DER < TER				71.75
CO ₂ Emissions (t/year)	0.23	DFEE	32.29	TFEE	36.68	
Compliance Check	See BREL	% DFEE < TFEE				11.99
% DPER < TPER	43.76	DPER	39.20	TPER	69.71	
Assessor Details	Mr. Scott Binstead				Assessor ID	U903-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	66.2930 (1b)	2.4000 (2b)	159.1032 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.2930		159.1032 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	159.1032 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

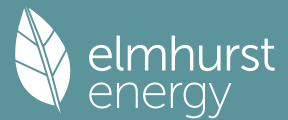
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Solid Door			2.1000	1.0000	2.1000		(26)
Windows (Uw = 1.30)			18.8490	1.2357	23.2937		(27)
Flr - Ground			66.2930	0.1100	7.2922	75.0000	4971.9750 (28a)
Wl - 1	65.3810	18.8490	46.5320	0.1800	8.3758	60.0000	2791.9198 (29a)
Wl - 3	3.6360	2.1000	1.5360	0.2400	0.3686	60.0000	92.1600 (29a)
Total net area of external elements Aum(A, m ²)			135.3110				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.4304		(33)
Party Wall			23.7400	0.0000	0.0000	110.0000	2611.4000 (32)
Party Ceiling 1			66.2930			30.0000	1988.7900 (32b)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	12456.2448 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							187.8968 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				10.3180	0.2210	2.2803	
E3 Sill				1.9210	0.0240	0.0461	

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E4 Jamb													40.2860	0.0190	0.7654	
E5 Ground floor (normal)													28.7550	0.0450	1.2940	
E7 Party floor between dwellings (in blocks of flats)													28.7580	0.0360	1.0353	
E16 Corner (normal)													7.2000	0.0370	0.2664	
E18 Party wall between dwellings													4.8000	0.0310	0.1488	
P1 Party wall - Ground floor													9.8920	0.0430	0.4254	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)													9.8920	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)															6.2616	(36)
Point Thermal Bridges															0.0000	
Total fabric heat loss															(33) + (36) + (36a) =	47.6920 (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	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520				(38)
Average = Sum(39)m / 12 =	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440				(39)
																73.9440
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
HLP (average)	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154				(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31				1.1154
																31
4. Water heating energy requirements (kWh/year)																
Assumed occupancy																2.1529 (42)
Hot water usage for mixer showers																
	60.3163	59.4099	58.0890	55.5618	53.6968	51.6169	50.4347	51.7456	53.1826	55.4157	57.9972	60.0852				(42a)
Hot water usage for baths																
	26.0612	25.6742	25.1291	24.1242	23.3717	22.5373	22.0866	22.6278	23.2171	24.1099	25.1356	25.9731				(42b)
Hot water usage for other uses																
	36.6776	35.3439	34.0102	32.6764	31.3427	30.0090	30.0090	31.3427	32.6764	34.0102	35.3439	36.6776				(42c)
Average daily hot water use (litres/day)																113.1158 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
	123.0552	120.4280	117.2284	112.3624	108.4112	104.1632	102.5303	105.7161	109.0761	113.5358	118.4767	122.7360				(44)
Energy conte	194.8894	171.4879	180.1756	153.8186	145.9423	128.0808	124.0015	130.8986	134.5017	154.0670	168.7918	192.1749				(45)
Energy content (annual)																
Distribution loss (46)m = 0.15 x (45)m																
	29.2334	25.7232	27.0263	23.0728	21.8913	19.2121	18.6002	19.6348	20.1753	23.1101	25.3188	28.8262				(46)
Water storage loss:																
Store volume																150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):																1.0000 (48)
Temperature factor from Table 2b																0.5400 (49)
Enter (49) or (54) in (55)																0.5400 (55)
Total storage loss																
	16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400				(56)
If cylinder contains dedicated solar storage																
	16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400				(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624				(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000				(61)
Total heat required for water heating calculated for each month																
	234.8918	207.6191	220.1780	192.5306	185.9447	166.7928	164.0039	170.9010	173.2137	194.0694	207.5038	232.1773				(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																
	234.8918	207.6191	220.1780	192.5306	185.9447	166.7928	164.0039	170.9010	173.2137	194.0694	207.5038	232.1773				(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																
	96.8026	85.9247	91.9103	82.1143	80.5277	73.5565	73.2324	75.5257	75.6914	83.2292	87.0929	95.9001				(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	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728				(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	22.0167	19.5551	15.9033	12.0398	8.9999	7.5981	8.2100	10.6717	14.3235	18.1869	21.2268	22.6287				(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	281.3365	284.2559	276.8991	261.2374	241.4673	222.8862	210.4729	207.5535	214.9103	230.5720	250.3421	268.9232				(68)
Pumps, fans	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702				(69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000				(70)
Water heating gains (Table 5)	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152				(71)
Total internal gains	130.1111	127.8641	123.5354	114.0476	108.2362	102.1618	98.4307	101.5131	105.1270	111.8672	120.9623	128.8980				(72)
	526.5920	524.8028	509.4655	480.4525	451.8312	425.7738	410.2413	412.8660	427.4885	453.7539	485.6590	513.5775				(73)
6. Solar gains																
[Jan]																
				Area		Solar flux		g		FF		Access		Gains		
				m2		Table 6a		or Table 6b		Specific data		factor		W		
										or Table 6c		Table 6d				
East				6.4140		19.6403		0.4700		0.0000		0.7700		45.5895		(76)
South				6.3150		46.7521		0.4700		0.0000		0.7700		106.8471		(78)
West				6.1200		19.6403		0.4700		0.0000		0.7700		43.4998		(80)
Solar gains	195.9364	349.2656	509.9141	670.5171	775.5209	777.7871	746.8062	669.1806	566.6542	395.5360	237.7341	165.5884				(83)
Total gains	722.5285	874.0684	1019.3795	1150.9696	1227.3520	1203.5609	1157.0476	1082.0466	994.1427	849.2899	723.3931	679.1660				(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931
alpha	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195
util living area	0.9513	0.9063	0.8244	0.6927	0.5364	0.3881	0.2801	0.3125	0.4967	0.7628	0.9165	0.9605 (86)
Living	19.8895	20.1922	20.5300	20.8024	20.9405	20.9874	20.9974	20.9960	20.9666	20.7543	20.2601	19.8036
Non living	19.0147	19.3013	19.6107	19.8447	19.9516	19.9826	19.9875	19.9870	19.9715	19.8142	19.3724	18.9320
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.4319	20.1922	20.5300	20.8024	20.9405	20.9874	20.9974	20.9960	20.9666	20.7543	20.2601	19.9710 (87)
Th 2	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883 (88)
util rest of house	0.9412	0.8889	0.7958	0.6509	0.4846	0.3287	0.2162	0.2446	0.4296	0.7164	0.8977	0.9521 (89)
MIT 2	19.4902	19.3013	19.6107	19.8447	19.9516	19.9826	19.9875	19.9870	19.9715	19.8142	19.3724	19.0798 (90)
Living area fraction									fLA = Living area / (4) =			0.3660 (91)
MIT	19.8349	19.6274	19.9471	20.1952	20.3135	20.3503	20.3571	20.3563	20.3357	20.1583	19.6973	19.4059 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8349	19.6274	19.9471	20.1952	20.3135	20.3503	20.3571	20.3563	20.3357	20.1583	19.6973	19.4059 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9394	0.8819	0.7945	0.6598	0.5016	0.3501	0.2396	0.2695	0.4531	0.7247	0.8914	0.9463 (94)
Useful gains	678.7551	770.8328	809.9320	759.3812	615.6340	421.4001	277.2253	291.5655	450.4453	615.4786	644.8299	642.6995 (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	1148.7097	1088.9996	994.3346	835.2123	636.9189	425.2012	277.8173	292.5420	461.0907	706.7761	931.4934	1124.3876 (97)
Space heating kWh	349.6462	213.8081	137.1955	54.5984	15.8360	0.0000	0.0000	0.0000	0.0000	67.9253	206.3977	358.3759 (98a)
Space heating requirement - total per year (kWh/year)												1403.7832
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	349.6462	213.8081	137.1955	54.5984	15.8360	0.0000	0.0000	0.0000	0.0000	67.9253	206.3977	358.3759 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1403.7832
Space heating per m2										(98c) / (4) =		21.1754 (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 %)												244.0862 (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	349.6462	213.8081	137.1955	54.5984	15.8360	0.0000	0.0000	0.0000	0.0000	67.9253	206.3977	358.3759 (98)
Space heating efficiency (main heating system 1)	244.0862	244.0862	244.0862	244.0862	244.0862	0.0000	0.0000	0.0000	0.0000	244.0862	244.0862	244.0862 (210)
Space heating fuel (main heating system)	143.2470	87.5953	56.2078	22.3685	6.4879	0.0000	0.0000	0.0000	0.0000	27.8284	84.5594	146.8235 (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	234.8918	207.6191	220.1780	192.5306	185.9447	166.7928	164.0039	170.9010	173.2137	194.0694	207.5038	232.1773 (64)
Efficiency of water heater	266.8653	266.8653	266.8653	266.8653	266.8653	266.8653	266.8653	266.8653	266.8653	266.8653	266.8653	266.8653 (216)
Fuel for water heating, kWh/month	88.0189	77.7992	82.5053	72.1452	69.6774	62.5008	61.4557	64.0402	64.9068	72.7219	77.7560	87.0017 (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	1.8370	1.6592	1.8370	1.7777	1.8370	1.7777	1.8370	1.8370	1.7777	1.8370	1.7777	1.8370 (231)
Lighting	19.2711	15.4600	13.9200	10.1984	7.8775	6.4360	7.1862	9.3408	12.1328	15.9189	17.9804	19.8067 (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												575.1178 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												266.8653
Water heating fuel used												880.5290 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:
(MEVDcentralised, Database: total watage = 2.3400, total flow = 21.0000, SFP = 0.1114)

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mechanical ventilation fans (SFP = 0.1114) 21.6289 (230a)
 Total electricity for the above, kWh/year 21.6289 (231)
 Electricity for lighting (calculated in Appendix L) 155.5290 (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 1632.8047 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	575.1178	16.4900	94.8369 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	880.5290	16.4900	145.1992 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	21.6289	16.4900	3.5666 (249)
Energy for lighting	155.5290	16.4900	25.6467 (250)
Additional standing charges			0.0000 (251)
Total energy cost			269.2495 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12): 0.3600 (256)
 Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] = 0.8709 (257)
 SAP value 85.8820
 SAP rating (Section 12) 86 (258)
 SAP band B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	575.1178	0.1574	90.5048 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	880.5290	0.1410	124.1579 (264)
Space and water heating			214.6626 (265)
Pumps, fans and electric keep-hot	21.6289	0.1387	3.0002 (267)
Energy for lighting	155.5290	0.1443	22.4476 (268)
Total CO2, kg/year			240.1105 (272)
CO2 emissions per m2			3.6200 (273)
EI value			97.1090
EI rating			97 (274)
EI band			A

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

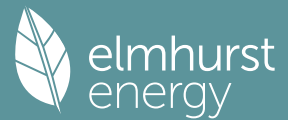
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	66.2930 (1b)	2.4000 (2b)	159.1032 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	66.2930		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)... (3n)	159.1032 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Air changes per hour	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)

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Shelter factor												(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) = 0.1275 (21)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate												
	0.1339	0.1275	0.1275	0.1179	0.1179	0.1052	0.1084	0.1020	0.1052	0.1116	0.1116	0.1211 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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	
Solid Door			2.1000	1.0000	2.1000			(26)
Windows (Uw = 1.30)			18.8490	1.2357	23.2937			(27)
Flr - Ground			66.2930	0.1100	7.2922	75.0000	4971.9750	(28a)
W1 - 1	65.3810	18.8490	46.5320	0.1800	8.3758	60.0000	2791.9198	(29a)
W1 - 3	3.6360	2.1000	1.5360	0.2400	0.3686	60.0000	92.1600	(29a)
Total net area of external elements Aum(A, m2)			135.3110					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 41.4304			(33)
Party Wall			23.7400	0.0000	0.0000	110.0000	2611.4000	(32)
Party Ceiling 1			66.2930			30.0000	1988.7900	(32b)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
(28)...(30) + (32) + (32a)...(32e) = 12456.2448 (34)
187.8968 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	10.3180	0.2210	2.2803
E2 Other lintels (including other steel lintels)	1.9210	0.0240	0.0461
E3 Sill	40.2860	0.0190	0.7654
E4 Jamb	28.7550	0.0450	1.2940
E5 Ground floor (normal)	28.7580	0.0360	1.0353
E7 Party floor between dwellings (in blocks of flats)	7.2000	0.0370	0.2664
E16 Corner (normal)	4.8000	0.0310	0.1488
E18 Party wall between dwellings	9.8920	0.0430	0.4254
P1 Party wall - Ground floor	9.8920	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)			

Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Point Thermal bridges
Total fabric heat loss
(33) + (36) + (36a) = 47.6920 (37)

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

(38)m	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520 (38)
Heat transfer coeff	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440 (39)
Average = Sum(39)m / 12 =												73.9440

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154 (40)
HLP (average)												1.1154
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1529 (42)
Hot water usage for mixer showers												
60.3163	59.4099	58.0890	55.5618	53.6968	51.6169	50.4347	51.7456	53.1826	55.4157	57.9972	60.0852	(42a)
Hot water usage for baths												
26.0612	25.6742	25.1291	24.1242	23.3717	22.5373	22.0866	22.6278	23.2171	24.1099	25.1356	25.9731	(42b)
Hot water usage for other uses												
36.6776	35.3439	34.0102	32.6764	31.3427	30.0090	30.0090	31.3427	32.6764	34.0102	35.3439	36.6776	(42c)
Average daily hot water use (litres/day)												113.1158 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	123.0552	120.4280	117.2284	112.3624	108.4112	104.1632	102.5303	105.7161	109.0761	113.5358	118.4767	122.7360 (44)
Energy conte	194.8894	171.4879	180.1756	153.8186	145.9423	128.0808	124.0015	130.8986	134.5017	154.0670	168.7918	192.1749 (45)
Energy content (annual)										Total = Sum(45)m =		1878.8301
Distribution loss (46)m = 0.15 x (45)m	29.2334	25.7232	27.0263	23.0728	21.8913	19.2121	18.6002	19.6348	20.1753	23.1101	25.3188	28.8262 (46)

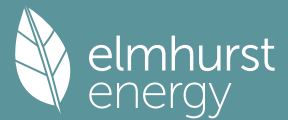
Water storage loss:

Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.0000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.5400 (55)
Total storage loss												
16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400	(56)

If cylinder contains dedicated solar storage												
16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month												
234.8918	207.6191	220.1780	192.5306	185.9447	166.7928	164.0039	170.9010	173.2137	194.0694	207.5038	232.1773	(62)
WWHRS	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	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
234.8918	207.6191	220.1780	192.5306	185.9447	166.7928	164.0039	170.9010	173.2137	194.0694	207.5038	232.1773	(64)
Total per year (kWh/year) = Sum(64)m =												2349.8261 (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												
96.8026	85.9247	91.9103	82.1143	80.5277	73.5565	73.2324	75.5257	75.6914	83.2292	87.0929	95.9001	(65)

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.0167	19.5551	15.9033	12.0398	8.9999	7.5981	8.2100	10.6717	14.3235	18.1869	21.2268	22.6287 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	281.3365	284.2559	276.8991	261.2374	241.4673	222.8862	210.4729	207.5535	214.9103	230.5720	250.3421	268.9232 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702 (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)	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152 (71)
Water heating gains (Table 5)	130.1111	127.8641	123.5354	114.0476	108.2362	102.1618	98.4307	101.5131	105.1270	111.8672	120.9623	128.8980 (72)
Total internal gains	526.5920	524.8028	509.4655	480.4525	451.8312	425.7738	410.2413	412.8660	427.4885	453.7539	485.6590	513.5775 (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	
East					6.4140	22.3313		0.4700	0.0000	0.7700		51.8360 (76)	
South					6.3150	50.9848		0.4700	0.0000	0.7700		116.5206 (78)	
West					6.1200	22.3313		0.4700	0.0000	0.7700		49.4600 (80)	
Solar gains	217.8167	349.5042	504.5830	685.2415	773.9169	831.6290	789.4539	721.9383	608.2462	422.7328	270.7714	182.2921 (83)	
Total gains	744.4088	874.3070	1014.0485	1165.6941	1225.7480	1257.4028	1199.6952	1134.8043	1035.7347	876.4868	756.4304	695.8697 (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	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931
alpha	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195
util living area	0.9382	0.8946	0.8013	0.6452	0.4699	0.2927	0.1909	0.2083	0.4076	0.7022	0.8877	0.9495 (86)
Living	20.0320	20.2767	20.6084	20.8608	20.9684	20.9966	20.9996	20.9994	20.9864	20.8385	20.4122	19.9556
Non living	19.1525	19.3816	19.6815	19.8919	19.9708	19.9871	19.9882	19.9882	19.9826	19.8816	19.5140	19.0801
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.5048	20.2767	20.6084	20.8608	20.9684	20.9966	20.9996	20.9994	20.9864	20.8385	20.4122	20.1017 (87)
Th 2	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883 (88)
util rest of house	0.9253	0.8748	0.7688	0.5992	0.4145	0.2341	0.1287	0.1425	0.3391	0.6477	0.8628	0.9385 (89)
MIT 2	19.5607	19.3816	19.6815	19.8919	19.9708	19.9871	19.9882	19.9882	19.9826	19.8816	19.5140	19.2071 (90)
Living area fraction	19.9062	19.7092	20.0207	20.2465	20.3359	20.3565	20.3583	20.3583	20.3499	20.2318	19.8427	19.5345 (92)
MIT	19.9062	19.7092	20.0207	20.2465	20.3359	20.3565	20.3583	20.3583	20.3499	20.2318	19.8427	19.5345 (93)
Temperature adjustment												0.0000
adjusted MIT	19.9062	19.7092	20.0207	20.2465	20.3359	20.3565	20.3583	20.3583	20.3499	20.2318	19.8427	19.5345 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9242	0.8686	0.7699	0.6113	0.4338	0.2555	0.1515	0.1666	0.3639	0.6615	0.8587	0.9327 (94)
Useful gains	687.9456	759.4340	780.7114	712.5919	531.7583	321.2617	181.7146	189.0691	376.8785	579.7672	649.5660	649.0546 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	1094.8333	1043.2919	933.2280	765.0587	542.4439	322.1397	181.7795	189.1673	380.8060	638.2699	875.6998	1067.3456 (97)
Space heating kWh	302.7244	190.7525	113.4724	37.7761	7.9501	0.0000	0.0000	0.0000	0.0000	43.5260	162.8164	311.2085 (98a)
Space heating requirement - total per year (kWh/year)												1170.2263
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	302.7244	190.7525	113.4724	37.7761	7.9501	0.0000	0.0000	0.0000	0.0000	43.5260	162.8164	311.2085 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1170.2263
Space heating per m ²										(98c) / (4) =		17.6523 (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 %)												244.0862 (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	302.7244	190.7525	113.4724	37.7761	7.9501	0.0000	0.0000	0.0000	0.0000	43.5260	162.8164	311.2085 (98)
Space heating efficiency (main heating system 1)	244.0862	244.0862	244.0862	244.0862	244.0862	0.0000	0.0000	0.0000	0.0000	244.0862	244.0862	244.0862 (210)
Space heating fuel (main heating system)	124.0236	78.1496	46.4886	15.4765	3.2571	0.0000	0.0000	0.0000	0.0000	17.8322	66.7045	127.4994 (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)												

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	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	234.8918	207.6191	220.1780	192.5306	185.9447	166.7928	164.0039	170.9010	173.2137	194.0694	207.5038	232.1773	(64)
Efficiency of water heater												266.8653	(216)
(217)m	266.8653	266.8653	266.8653	266.8653	266.8653	266.8653	266.8653	266.8653	266.8653	266.8653	266.8653	266.8653	(217)
Fuel for water heating, kWh/month	88.0189	77.7992	82.5053	72.1452	69.6774	62.5008	61.4557	64.0402	64.9068	72.7219	77.7560	87.0017	(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	1.8370	1.6592	1.8370	1.7777	1.8370	1.7777	1.8370	1.8370	1.7777	1.8370	1.7777	1.8370	(231)
Lighting	19.2711	15.4600	13.9200	10.1984	7.8775	6.4360	7.1862	9.3408	12.1328	15.9189	17.9804	19.8067	(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												479.4315	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												266.8653	
Water heating fuel used												880.5290	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.3400, total flow = 21.0000, SFP = 0.1114)													
mechanical ventilation fans (SFP = 0.1114)												21.6289	(230a)
Total electricity for the above, kWh/year												21.6289	(231)
Electricity for lighting (calculated in Appendix L)												155.5290	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
FV 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												1537.1185	(238)

10a. Fuel costs - using BEDF prices (552)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	479.4315	26.0600	124.9399	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	880.5290	26.0600	229.4659	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	21.6289	26.0600	5.6365	(249)
Energy for lighting	155.5290	26.0600	40.5309	(250)
Additional standing charges			0.0000	(251)
Total energy cost			400.5731	(255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	479.4315	0.1580	75.7556	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	880.5290	0.1410	124.1579	(264)
Space and water heating			199.9134	(265)
Pumps, fans and electric keep-hot	21.6289	0.1387	3.0002	(267)
Energy for lighting	155.5290	0.1443	22.4476	(268)
Total CO2, kg/year			225.3613	(272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	479.4315	1.5849	759.8489	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	880.5290	1.5214	1339.6243	(278)
Space and water heating			2099.4732	(279)
Pumps, fans and electric keep-hot	21.6289	1.5128	32.7203	(281)
Energy for lighting	155.5290	1.5338	238.5556	(282)
Total Primary energy kWh/year			2370.7490	(286)

SAP 10 EPC IMPROVEMENTS

006 GF Flat ASHP

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Current energy efficiency rating:
Current environmental impact rating:

B 86
A 97

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

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

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

Potential energy efficiency rating: B 86
Potential environmental impact rating: A 97

Fuel prices for cost data on this page from database revision number 552 TEST (30 Aug 2024)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current £401	Potential £401	Saving £0
Electricity			
Space heating	£131	£131	£0
Water heating	£229	£229	£0
Lighting	£41	£41	£0
Total cost of fuels	£401	£401	£0
Total cost of uses	£401	£401	£0
Delivered energy	23 kWh/m ²	23 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m ²	3 kg/m ²	3 kg/m ²	0 kg/m ²
Primary energy	36 kWh/m ²	36 kWh/m ²	0 kWh/m ²

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	66.2930 (1b)	2.4000 (2b)	159.1032 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.2930		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 159.1032 (5)

2. Ventilation rate

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

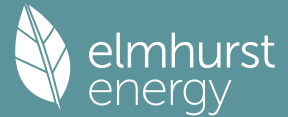
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K
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	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Solid Door			2.1000	1.0000	2.1000			(26)
Windows (Uw = 1.30)			18.8490	1.2357	23.2937			(27)
Flr - Ground			66.2930	0.1100	7.2922	75.0000	4971.9750	(28a)
W1 - 1	65.3810	18.8490	46.5320	0.1800	8.3758	60.0000	2791.9198	(29a)
W1 - 3	3.6360	2.1000	1.5360	0.2400	0.3686	60.0000	92.1600	(29a)
Total net area of external elements Aum(A, m2)			135.3110					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		41.4304			(33)
Party Wall			23.7400	0.0000	0.0000	110.0000	2611.4000	(32)
Party Ceiling 1			66.2930			30.0000	1988.7900	(32b)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
(28)...(30) + (32) + (32a)...(32e) = 12456.2448 (34)
187.8968 (35)

List of Thermal Bridges								
K1 Element				Length	Psi-value	Total		
E2 Other lintels (including other steel lintels)				10.3180	0.2210	2.2803		
E3 Sill				1.9210	0.0240	0.0461		
E4 Jamb				40.2860	0.0190	0.7654		
E5 Ground floor (normal)				28.7550	0.0450	1.2940		
E7 Party floor between dwellings (in blocks of flats)				28.7580	0.0360	1.0353		
E16 Corner (normal)				7.2000	0.0370	0.2664		
E18 Party wall between dwellings				4.8000	0.0310	0.1488		
P1 Party wall - Ground floor				9.8920	0.0430	0.4254		
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				9.8920	0.0000	0.0000		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.2616	(36)
Point Thermal bridges							(36a) =	0.0000
Total fabric heat loss							(33) + (36) + (36a) =	47.6920 (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	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	(38)
Average = Sum(39)m / 12 =	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	(39)
	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	(39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

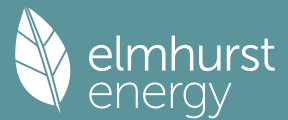
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.1529 (42)
Hot water usage for mixer showers													
Hot water usage for baths	60.3163	59.4099	58.0890	55.5618	53.6968	51.6169	50.4347	51.7456	53.1826	55.4157	57.9972	60.0852	(42a)
Hot water usage for other uses	26.0612	25.6742	25.1291	24.1242	23.3717	22.5373	22.0866	22.6278	23.2171	24.1099	25.1356	25.9731	(42b)
Average daily hot water use (litres/day)	36.6776	35.3439	34.0102	32.6764	31.3427	30.0090	30.0090	31.3427	32.6764	34.0102	35.3439	36.6776	(42c)
	113.1158	113.1158	113.1158	113.1158	113.1158	113.1158	113.1158	113.1158	113.1158	113.1158	113.1158	113.1158	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	123.0552	120.4280	117.2284	112.3624	108.4112	104.1632	102.5303	105.7161	109.0761	113.5358	118.4767	122.7360	(44)
Energy content (annual)	194.8894	171.4879	180.1756	153.8186	145.9423	128.0808	124.0015	130.8986	134.5017	154.0670	168.7918	192.1749	(45)
Distribution loss (46)m = 0.15 x (45)m	29.2334	25.7232	27.0263	23.0728	21.8913	19.2121	18.6002	19.6348	20.1753	23.1101	25.3188	28.8262	(46)
Water storage loss:													
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.0000 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.5400 (55)
Total storage loss	16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400	(56)
If cylinder contains dedicated solar storage	16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	234.8918	207.6191	220.1780	192.5306	185.9447	166.7928	164.0039	170.9010	173.2137	194.0694	207.5038	232.1773	(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	234.8918	207.6191	220.1780	192.5306	185.9447	166.7928	164.0039	170.9010	173.2137	194.0694	207.5038	232.1773	(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	96.8026	85.9247	91.9103	82.1143	80.5277	73.5565	73.2324	75.5257	75.6914	83.2292	87.0929	95.9001	(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	22.0167	19.5551	15.9033	12.0398	8.9999	7.5981	8.2100	10.6717	14.3235	18.1869	21.2268	22.6287	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	281.3365	284.2559	276.8991	261.2374	241.4673	222.8862	210.4729	207.5535	214.9103	230.5720	250.3421	268.9232	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	(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)	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	(71)
Water heating gains (Table 5)	130.1111	127.8641	123.5354	114.0476	108.2362	102.1618	98.4307	101.5131	105.1270	111.8672	120.9623	128.8980	(72)
Total internal gains	526.5920	524.8028	509.4655	480.4525	451.8312	425.7738	410.2413	412.8660	427.4885	453.7539	485.6590	513.5775	(73)

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6. Solar gains

[Jan]	Area m2				Solar flux Table 6a W/m2	Specific data or Table 6b	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W		
East	6.4140	19.6403			0.4700	0.0000	0.7700	45.5895 (76)				
South	6.3150	46.7521			0.4700	0.0000	0.7700	106.8471 (78)				
West	6.1200	19.6403			0.4700	0.0000	0.7700	43.4998 (80)				
Solar gains	195.9364	349.2656	509.9141	670.5171	775.5209	777.7871	746.8062	669.1806	566.6542	395.5360	237.7341	165.5884 (83)
Total gains	722.5285	874.0684	1019.3795	1150.9696	1227.3520	1203.5609	1157.0476	1082.0466	994.1427	849.2899	723.3931	679.1660 (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	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	
alpha	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	
util living area	0.9513	0.9063	0.8244	0.6927	0.5364	0.3881	0.2801	0.3125	0.4967	0.7628	0.9165	0.9605 (86)
Living	19.8895	20.1922	20.5300	20.8024	20.9405	20.9874	20.9974	20.9960	20.9666	20.7543	20.2601	19.8036
Non living	19.0147	19.3013	19.6107	19.8447	19.9516	19.9826	19.9875	19.9870	19.9715	19.8142	19.3724	18.9320
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.4319	20.1922	20.5300	20.8024	20.9405	20.9874	20.9974	20.9960	20.9666	20.7543	20.2601	19.9710 (87)
Th 2	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883 (88)
util rest of house	0.9412	0.8889	0.7958	0.6509	0.4846	0.3287	0.2162	0.2446	0.4296	0.7164	0.8977	0.9521 (89)
MIT 2	19.4902	19.3013	19.6107	19.8447	19.9516	19.9826	19.9875	19.9870	19.9715	19.8142	19.3724	19.0798 (90)
Living area fraction									fLA = Living area / (4) =			0.3660 (91)
MIT	19.8349	19.6274	19.9471	20.1952	20.3135	20.3503	20.3571	20.3563	20.3357	20.1583	19.6973	19.4059 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8349	19.6274	19.9471	20.1952	20.3135	20.3503	20.3571	20.3563	20.3357	20.1583	19.6973	19.4059 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	678.7551	770.8328	809.9320	759.3812	615.6340	421.4001	277.2253	291.5655	450.4453	615.4786	644.8299	642.6995 (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	1148.7097	1088.9996	994.3346	835.2123	636.9189	425.2012	277.8173	292.5420	461.0907	706.7761	931.4934	1124.3876 (97)	
Space heating kWh	349.6462	213.8081	137.1955	54.5984	15.8360	0.0000	0.0000	0.0000	0.0000	67.9253	206.3977	358.3759 (98a)	
Space heating requirement - total per year (kWh/year)												1403.7832	
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	349.6462	213.8081	137.1955	54.5984	15.8360	0.0000	0.0000	0.0000	0.0000	67.9253	206.3977	358.3759 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1403.7832	
Space heating per m2										(98c) / (4) =		21.1754 (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 %)													244.0862 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating efficiency (main heating system 1)	349.6462	213.8081	137.1955	54.5984	15.8360	0.0000	0.0000	0.0000	0.0000	67.9253	206.3977	358.3759 (98)	
Space heating fuel (main heating system)	244.0862	244.0862	244.0862	244.0862	244.0862	0.0000	0.0000	0.0000	0.0000	244.0862	244.0862	244.0862 (210)	
Space heating efficiency (main heating system 2)	143.2470	87.5953	56.2078	22.3685	6.4879	0.0000	0.0000	0.0000	0.0000	27.8284	84.5594	146.8235 (211)	
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 (212)	
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)	
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	234.8918	207.6191	220.1780	192.5306	185.9447	166.7928	164.0039	170.9010	173.2137	194.0694	207.5038	232.1773 (64)	
Efficiency of water heater	266.8653	266.8653	266.8653	266.8653	266.8653	266.8653	266.8653	266.8653	266.8653	266.8653	266.8653	266.8653 (216)	
Fuel for water heating, kWh/month	88.0189	77.7992	82.5053	72.1452	69.6774	62.5008	61.4557	64.0402	64.9068	72.7219	77.7560	87.0017 (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	1.8370	1.6592	1.8370	1.7777	1.8370	1.7777	1.8370	1.8370	1.7777	1.8370	1.7777	1.8370 (231)	
Lighting	19.2711	15.4600	13.9200	10.1984	7.8775	6.4360	7.1862	9.3408	12.1328	15.9189	17.9804	19.8067 (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)													

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(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												575.1178	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												266.8653	
Water heating fuel used												880.5290	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 2.3400, total flow = 21.0000, SFP = 0.1114)													
mechanical ventilation fans (SFP = 0.1114)												21.6289	(230a)
Total electricity for the above, kWh/year												21.6289	(231)
Electricity for lighting (calculated in Appendix L)												155.5290	(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												1632.8047	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	575.1178	16.4900	94.8369	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	880.5290	16.4900	145.1992	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	21.6289	16.4900	3.5666	(249)
Energy for lighting	155.5290	16.4900	25.6467	(250)
Additional standing charges			0.0000	(251)
Total energy cost			269.2495	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):				0.3600	(256)
Energy cost factor (ECF)				0.8709	(257)
SAP value				85.8820	
SAP rating (Section 12)				86	(258)
SAP band				B	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	575.1178	0.1574	90.5048	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	880.5290	0.1410	124.1579	(264)
Space and water heating			214.6626	(265)
Pumps, fans and electric keep-hot	21.6289	0.1387	3.0002	(267)
Energy for lighting	155.5290	0.1443	22.4476	(268)
Total CO2, kg/year			240.1105	(272)
CO2 emissions per m2			3.6200	(273)
EI value			97.1090	
EI rating			97	(274)
EI band			A	

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

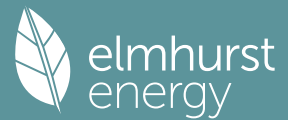
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	66.2930	2.4000	159.1032	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.2930			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	159.1032	(5)

2. Ventilation rate

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

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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

0 * 20 = 0.0000 (6b)
0 * 10 = 0.0000 (6c)
0 * 20 = 0.0000 (6d)
0 * 35 = 0.0000 (6e)
0 * 20 = 0.0000 (6f)
0 * 10 = 0.0000 (7a)
0 * 10 = 0.0000 (7b)
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
Pressure Test Method
Measured/design AP50
Infiltration rate
Number of sides sheltered
Blower Door
Yes
3.0000 (17)
0.1500 (18)
2 (19)
Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.1339	0.1275	0.1275	0.1179	0.1179	0.1052	0.1084	0.1020	0.1052	0.1116	0.1116	0.1211 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
Solid Door			2.1000	1.0000	2.1000		(26)
Windows (Uw = 1.30)			18.8490	1.2357	23.2937		(27)
Flr - Ground			66.2930	0.1100	7.2922	75.0000	4971.9750 (28a)
Wl - 1	65.3810	18.8490	46.5320	0.1800	8.3758	60.0000	2791.9198 (29a)
Wl - 3	3.6360	2.1000	1.5360	0.2400	0.3686	60.0000	92.1600 (29a)
Total net area of external elements Aum(A, m2)			135.3110				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 41.4304		(33)
Party Wall			23.7400	0.0000	0.0000	110.0000	2611.4000 (32)
Party Ceiling 1			66.2930			30.0000	1988.7900 (32b)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
(28)...(30) + (32) + (32a)...(32e) = 12456.2448 (34)
187.8968 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.3180	0.2210	2.2803
E3 Sill	1.9210	0.0240	0.0461
E4 Jamb	40.2860	0.0190	0.7654
E5 Ground floor (normal)	28.7550	0.0450	1.2940
E7 Party floor between dwellings (in blocks of flats)	28.7580	0.0360	1.0353
E16 Corner (normal)	7.2000	0.0370	0.2664
E18 Party wall between dwellings	4.8000	0.0310	0.1488
P1 Party wall - Ground floor	9.8920	0.0430	0.4254
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	9.8920	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Point Thermal bridges
Total fabric heat loss
(33) + (36) + (36a) = 47.6920 (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	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520 (38)
Heat transfer coeff	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440 (39)
Average = Sum(39)m / 12 =												73.9440

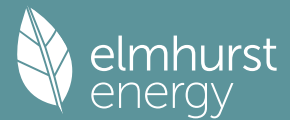
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154 (40)
HLP (average)												1.1154
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy
Hot water usage for mixer showers
60.3163 59.4099 58.0890 55.5618 53.6968 51.6169 50.4347 51.7456 53.1826 55.4157 57.9972 60.0852 (42a)
Hot water usage for baths
26.0612 25.6742 25.1291 24.1242 23.3717 22.5373 22.0866 22.6278 23.2171 24.1099 25.1356 25.9731 (42b)
Hot water usage for other uses
36.6776 35.3439 34.0102 32.6764 31.3427 30.0090 30.0090 31.3427 32.6764 34.0102 35.3439 36.6776 (42c)
Average daily hot water use (litres/day)
113.1158 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	123.0552	120.4280	117.2284	112.3624	108.4112	104.1632	102.5303	105.7161	109.0761	113.5358	118.4767	122.7360 (44)
Energy conte	194.8894	171.4879	180.1756	153.8186	145.9423	128.0808	124.0015	130.8986	134.5017	154.0670	168.7918	192.1749 (45)
Energy content (annual)										Total = Sum(45)m =		1878.8301
Distribution loss (46)m = 0.15 x (45)m	29.2334	25.7232	27.0263	23.0728	21.8913	19.2121	18.6002	19.6348	20.1753	23.1101	25.3188	28.8262 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.0000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.5400 (55)
Total storage loss	16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400 (56)
If cylinder contains dedicated solar storage	16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)

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Total heat required for water heating calculated for each month												
	234.8918	207.6191	220.1780	192.5306	185.9447	166.7928	164.0039	170.9010	173.2137	194.0694	207.5038	232.1773 (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	234.8918	207.6191	220.1780	192.5306	185.9447	166.7928	164.0039	170.9010	173.2137	194.0694	207.5038	232.1773 (64)
Total per year (kWh/year) = Sum(64)m =												2349.8261 (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	96.8026	85.9247	91.9103	82.1143	80.5277	73.5565	73.2324	75.5257	75.6914	83.2292	87.0929	95.9001 (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	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.0167	19.5551	15.9033	12.0398	8.9999	7.5981	8.2100	10.6717	14.3235	18.1869	21.2268	22.6287 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	281.3365	284.2559	276.8991	261.2374	241.4673	222.8862	210.4729	207.5535	214.9103	230.5720	250.3421	268.9232 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702 (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)	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152 (71)
Water heating gains (Table 5)	130.1111	127.8641	123.5354	114.0476	108.2362	102.1618	98.4307	101.5131	105.1270	111.8672	120.9623	128.8980 (72)
Total internal gains	526.5920	524.8028	509.4655	480.4525	451.8312	425.7738	410.2413	412.8660	427.4885	453.7539	485.6590	513.5775 (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	
East					6.4140	22.3313		0.4700	0.0000		0.7700	51.8360 (76)	
South					6.3150	50.9848		0.4700	0.0000		0.7700	116.5206 (78)	
West					6.1200	22.3313		0.4700	0.0000		0.7700	49.4600 (80)	
Solar gains	217.8167	349.5042	504.5830	685.2415	773.9169	831.6290	789.4539	721.9383	608.2462	422.7328	270.7714	182.2921 (83)	
Total gains	744.4088	874.3070	1014.0485	1165.6941	1225.7480	1257.4028	1199.6952	1134.8043	1035.7347	876.4868	756.4304	695.8697 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												
Utilisation factor for gains for living area, nil,m (see Table 9a)												21.0000 (85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931
alpha	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195
util living area	0.9382	0.8946	0.8013	0.6452	0.4699	0.2927	0.1909	0.2083	0.4076	0.7022	0.8877	0.9495 (86)
Living	20.0320	20.2767	20.6084	20.8608	20.9684	20.9966	20.9996	20.9994	20.9864	20.8385	20.4122	19.9556
Non living	19.1525	19.3816	19.6815	19.8919	19.9708	19.9871	19.9882	19.9882	19.9826	19.8816	19.5140	19.0801
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.5048	20.2767	20.6084	20.8608	20.9684	20.9966	20.9996	20.9994	20.9864	20.8385	20.4122	20.1017 (87)
Th 2	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883 (88)
util rest of house	0.9253	0.8748	0.7688	0.5992	0.4145	0.2341	0.1287	0.1425	0.3391	0.6477	0.8628	0.9385 (89)
MIT 2	19.5607	19.3816	19.6815	19.8919	19.9708	19.9871	19.9882	19.9882	19.9826	19.8816	19.5140	19.2071 (90)
Living area fraction	19.9062	19.7092	20.0207	20.2465	20.3359	20.3565	20.3583	20.3583	20.3499	20.2318	19.8427	19.5345 (91)
MIT	19.9062	19.7092	20.0207	20.2465	20.3359	20.3565	20.3583	20.3583	20.3499	20.2318	19.8427	19.5345 (92)
Temperature adjustment	19.9062	19.7092	20.0207	20.2465	20.3359	20.3565	20.3583	20.3583	20.3499	20.2318	19.8427	19.5345 (93)
adjusted MIT	19.9062	19.7092	20.0207	20.2465	20.3359	20.3565	20.3583	20.3583	20.3499	20.2318	19.8427	19.5345 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9242	0.8686	0.7699	0.6113	0.4338	0.2555	0.1515	0.1666	0.3639	0.6615	0.8587	0.9327 (94)
Useful gains	687.9456	759.4340	780.7114	712.5919	531.7583	321.2617	181.7146	189.0691	376.8785	579.7672	649.0546	649.0546 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	1094.8333	1043.2919	933.2280	765.0587	542.4439	322.1397	181.7795	189.1673	380.8060	638.2699	875.6998	1067.3456 (97)
Space heating kWh	302.7244	190.7525	113.4724	37.7761	7.9501	0.0000	0.0000	0.0000	0.0000	43.5260	162.8164	311.2085 (98a)
Space heating requirement - total per year (kWh/year)												1170.2263
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	302.7244	190.7525	113.4724	37.7761	7.9501	0.0000	0.0000	0.0000	0.0000	43.5260	162.8164	311.2085 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1170.2263
Space heating per m ²										(98c) / (4) =		17.6523 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
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Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												244.0862	(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	302.7244	190.7525	113.4724	37.7761	7.9501	0.0000	0.0000	0.0000	0.0000	43.5260	162.8164	311.2085	(98)
Space heating efficiency (main heating system 1)	244.0862	244.0862	244.0862	244.0862	244.0862	0.0000	0.0000	0.0000	0.0000	244.0862	244.0862	244.0862	(210)
Space heating fuel (main heating system)	124.0236	78.1496	46.4886	15.4765	3.2571	0.0000	0.0000	0.0000	0.0000	17.8322	66.7045	127.4994	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	234.8918	207.6191	220.1780	192.5306	185.9447	166.7928	164.0039	170.9010	173.2137	194.0694	207.5038	232.1773	(64)
Efficiency of water heater	266.8653	266.8653	266.8653	266.8653	266.8653	266.8653	266.8653	266.8653	266.8653	266.8653	266.8653	266.8653	(216)
Fuel for water heating, kWh/month	88.0189	77.7992	82.5053	72.1452	69.6774	62.5008	61.4557	64.0402	64.9068	72.7219	77.7560	87.0017	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
(221)m	1.8370	1.6592	1.8370	1.7777	1.8370	1.7777	1.8370	1.8370	1.7777	1.8370	1.7777	1.8370	(231)
Pumps and Fa	19.2711	15.4600	13.9200	10.1984	7.8775	6.4360	7.1862	9.3408	12.1328	15.9189	17.9804	19.8067	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												479.4315	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												266.8653	
Water heating fuel used												880.5290	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 2.3400, total flow = 21.0000, SFP = 0.1114)													
mechanical ventilation fans (SFP = 0.1114)												21.6289	(230a)
Total electricity for the above, kWh/year												21.6289	(231)
Electricity for lighting (calculated in Appendix L)												155.5290	(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												1537.1185	(238)

10a. Fuel costs - using BEDF prices (552)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	479.4315	26.0600	124.9399	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	880.5290	26.0600	229.4659	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	21.6289	26.0600	5.6365	(249)
Energy for lighting	155.5290	26.0600	40.5309	(250)
Additional standing charges			0.0000	(251)
Total energy cost			400.5731	(255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	479.4315	0.1580	75.7556	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	880.5290	0.1410	124.1579	(264)
Space and water heating			199.9134	(265)
Pumps, fans and electric keep-hot	21.6289	0.1387	3.0002	(267)
Energy for lighting	155.5290	0.1443	22.4476	(268)
Total CO2, kg/year			225.3613	(272)

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

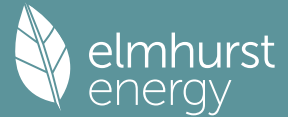
	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	479.4315	1.5849	759.8489	(275)

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Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	880.5290	1.5214	1339.6243 (278)
Space and water heating			2099.4732 (279)
Pumps, fans and electric keep-hot	21.6289	1.5128	32.7203 (281)
Energy for lighting	155.5290	1.5338	238.5556 (282)
Total Primary energy kWh/year			2370.7490 (286)

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Property Reference	006 GF				Issued on Date	10/09/2024
Assessment Reference	006 GF Flat Elec DWHP	Prop Type Ref	006 GF			
Property	006 GF, 006 GF, 0					
SAP Rating	81 B	DER	5.43	TER	13.24	
Environmental	96 A	% DER < TER				58.99
CO ₂ Emissions (t/year)	0.31	DFEE	32.29	TFEE	36.68	
Compliance Check	See BREL	% DFEE < TFEE				11.99
% DPER < TPER	19.84	DPER	55.88	TPER	69.71	
Assessor Details	Mr. Scott Binstead				Assessor ID	U903-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	66.2930 (1b)	2.4000 (2b)	159.1032 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.2930		159.1032 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	159.1032 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

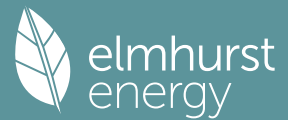
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Solid Door			2.1000	1.0000	2.1000		(26)
Windows (Uw = 1.30)			18.8490	1.2357	23.2937		(27)
Flr - Ground			66.2930	0.1100	7.2922	75.0000	4971.9750 (28a)
Wl - 1	65.3810	18.8490	46.5320	0.1800	8.3758	60.0000	2791.9198 (29a)
Wl - 3	3.6360	2.1000	1.5360	0.2400	0.3686	60.0000	92.1600 (29a)
Total net area of external elements Aum(A, m ²)			135.3110				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.4304		(33)
Party Wall			23.7400	0.0000	0.0000	110.0000	2611.4000 (32)
Party Ceiling 1			66.2930			30.0000	1988.7900 (32b)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	12456.2448 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							187.8968 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				10.3180	0.2210	2.2803	
E3 Sill				1.9210	0.0240	0.0461	

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E4 Jamb													40.2860	0.0190	0.7654	
E5 Ground floor (normal)													28.7550	0.0450	1.2940	
E7 Party floor between dwellings (in blocks of flats)													28.7580	0.0360	1.0353	
E16 Corner (normal)													7.2000	0.0370	0.2664	
E18 Party wall between dwellings													4.8000	0.0310	0.1488	
P1 Party wall - Ground floor													9.8920	0.0430	0.4254	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)													9.8920	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)																6.2616 (36)
Point Thermal Bridges																0.0000
Total fabric heat loss															(33) + (36) + (36a) =	47.6920 (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	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520				(38)
Average = Sum(39)m / 12 =	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440				(39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
HLP (average)	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154				(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31				(41)
4. Water heating energy requirements (kWh/year)																
Assumed occupancy																2.1529 (42)
Hot water usage for mixer showers																
Hot water usage for baths	60.3163	59.4099	58.0890	55.5618	53.6968	51.6169	50.4347	51.7456	53.1826	55.4157	57.9972	60.0852				(42a)
Hot water usage for other uses	26.0612	25.6742	25.1291	24.1242	23.3717	22.5373	22.0866	22.6278	23.2171	24.1099	25.1356	25.9731				(42b)
Average daily hot water use (litres/day)	36.6776	35.3439	34.0102	32.6764	31.3427	30.0090	30.0090	31.3427	32.6764	34.0102	35.3439	36.6776				(42c)
																113.1158 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
Energy conte	123.0552	120.4280	117.2284	112.3624	108.4112	104.1632	102.5303	105.7161	109.0761	113.5358	118.4767	122.7360				(44)
Energy content (annual)	194.8894	171.4879	180.1756	153.8186	145.9423	128.0808	124.0015	130.8986	134.5017	154.0670	168.7918	192.1749				(45)
Distribution loss (46)m = 0.15 x (45)m																
Water storage loss:	29.2334	25.7232	27.0263	23.0728	21.8913	19.2121	18.6002	19.6348	20.1753	23.1101	25.3188	28.8262				(46)
Store volume																201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):																1.6100 (48)
Temperature factor from Table 2b																0.5400 (49)
Enter (49) or (54) in (55)																0.8694 (55)
Total storage loss																
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514				(56)
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	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263				(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	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263				(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	64.8007	57.0197	59.9084	51.1447	48.5258	42.5869	41.2305	43.5238	44.7218	51.2273	56.1233	63.8982				(65)
5. Internal gains (see Table 5 and 5a)																
Metabolic gains (Table 5), Watts																
(66)m	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728				(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.0167	19.5551	15.9033	12.0398	8.9999	7.5981	8.2100	10.6717	14.3235	18.1869	21.2268	22.6287				(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	281.3365	284.2559	276.8991	261.2374	241.4673	222.8862	210.4729	207.5535	214.9103	230.5720	250.3421	268.9232				(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702				(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)	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152				(71)
Water heating gains (Table 5)	87.0977	84.8508	80.5220	71.0343	65.2229	59.1484	55.4173	58.4997	62.1136	68.8539	77.9490	85.8846				(72)
Total internal gains	483.5787	481.7895	466.4521	437.4392	408.8178	382.7605	367.2280	369.8527	384.4752	410.7406	442.6457	470.5642				(73)
6. Solar gains																
[Jan]																
Area																
Solar flux																
Specific data																
Specific data																
Access factor																
Gains W																
East			6.4140		19.6403		0.4700		0.0000		0.7700		45.5895			(76)
South			6.3150		46.7521		0.4700		0.0000		0.7700		106.8471			(78)
West			6.1200		19.6403		0.4700		0.0000		0.7700		43.4998			(80)
Solar gains	195.9364	349.2656	509.9141	670.5171	775.5209	777.7871	746.8062	669.1806	566.6542	395.5360	237.7341	165.5884				(83)
Total gains	679.5151	831.0551	976.3662	1107.9563	1184.3387	1160.5476	1114.0342	1039.0333	951.1293	806.2766	680.3798	636.1527				(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	
alpha	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	
util living area	0.9597	0.9184	0.8404	0.7107	0.5530	0.4017	0.2907	0.3251	0.5165	0.7852	0.9297	0.9680 (86)	
MIT	19.8182	20.1334	20.4896	20.7824	20.9336	20.9857	20.9971	20.9953	20.9615	20.7243	20.1984	19.7295 (87)	
Th 2	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883 (88)	
util rest of house	0.9511	0.9026	0.8131	0.6692	0.5003	0.3405	0.2245	0.2547	0.4477	0.7403	0.9131	0.9609 (89)	
MIT 2	18.6512	19.0369	19.4588	19.7841	19.9354	19.9799	19.9872	19.9864	19.9632	19.7350	19.1250	18.5410 (90)	
Living area fraction	fLA = Living area / (4) =												0.3660 (91)
MIT	19.0783	19.4382	19.8361	20.1494	20.3007	20.3480	20.3568	20.3556	20.3286	20.0970	19.5178	18.9759 (92)	
Temperature adjustment													0.0000
adjusted MIT	19.0783	19.4382	19.8361	20.1494	20.3007	20.3480	20.3568	20.3556	20.3286	20.0970	19.5178	18.9759 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9414	0.8927	0.8086	0.6761	0.5170	0.3625	0.2487	0.2804	0.4713	0.7455	0.9040	0.9520 (94)
Useful gains	639.7193	741.8543	789.5375	749.1141	612.2599	420.7078	277.1069	291.3597	448.2908	601.0865	615.0439	605.6066 (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	1092.7667	1075.0135	986.1212	831.8273	635.9731	425.0308	277.7903	292.4956	460.5664	702.2497	918.2228	1092.5909 (97)
Space heating kWh	337.0673	223.8830	146.2583	59.5535	17.6426	0.0000	0.0000	0.0000	0.0000	75.2654	218.2889	362.3163 (98a)
Space heating requirement - total per year (kWh/year)												1440.2753
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	337.0673	223.8830	146.2583	59.5535	17.6426	0.0000	0.0000	0.0000	0.0000	75.2654	218.2889	362.3163 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1440.2753
Space heating per m2										(98c) / (4) =		21.7259 (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)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	337.0673	223.8830	146.2583	59.5535	17.6426	0.0000	0.0000	0.0000	0.0000	75.2654	218.2889	362.3163	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	337.0673	223.8830	146.2583	59.5535	17.6426	0.0000	0.0000	0.0000	0.0000	75.2654	218.2889	362.3163	(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)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263	(64)
Efficiency of water heater													345.3200 (216)
(217)m	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	(217)
Fuel for water heating, kWh/month	64.2421	56.7100	59.9812	52.0968	50.0677	44.6435	43.7139	45.7112	46.5029	52.4205	56.4328	63.4560	(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	1.8370	1.6592	1.8370	1.7777	1.8370	1.7777	1.8370	1.8370	1.7777	1.8370	1.7777	1.8370	(231)
Lighting	19.2711	15.4600	13.9200	10.1984	7.8775	6.4360	7.1862	9.3408	12.1328	15.9189	17.9804	19.8067	(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												1440.2753	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												345.3200	
Water heating fuel used												635.9785	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 2.3400, total flow = 21.0000, SFP = 0.1114)													
mechanical ventilation fans (SFP = 0.1114)												21.6289	(230a)

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Total electricity for the above, kWh/year	21.6289	(231)
Electricity for lighting (calculated in Appendix L)	155.5290	(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	2253.4118	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1440.2753	16.4900	237.5014 (240)
Space heating - main system 2	0.0000	16.4900	0.0000 (241)
Total CO2 associated with community systems			0.0000 (243)
Water heating (other fuel)	635.9785	16.4900	104.8729 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	21.6289	16.4900	3.5666 (249)
Energy for lighting	155.5290	16.4900	25.6467 (250)
Additional standing charges			0.0000 (251)
Total energy cost			371.5876 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.2020 (257)
SAP value		80.5160
SAP rating (Section 12)		81 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1440.2753	0.1571	226.2410 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (273)
Water heating (other fuel)	635.9785	0.1412	89.7773 (264)
Space and water heating			316.0183 (265)
Pumps, fans and electric keep-hot	21.6289	0.1387	3.0002 (267)
Energy for lighting	155.5290	0.1443	22.4476 (268)
Total CO2, kg/year			341.4662 (272)
CO2 emissions per m2			5.1500 (273)
EI value			95.8886
EI rating			96 (274)
EI band			A

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	66.2930 (1b)	x 2.4000 (2b)	= 159.1032 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.2930		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	159.1032 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)

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Shelter factor												(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) = 0.1275 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Adj infilt rate	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Mechanical extract ventilation - decentralised	0.1339	0.1275	0.1275	0.1179	0.1179	0.1052	0.1084	0.1020	0.1052	0.1116	0.1116	0.1211 (22b)
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

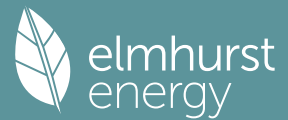
3. Heat losses and heat loss parameter

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					
Solid Door			2.1000	1.0000	2.1000			(26)				
Windows (Uw = 1.30)			18.8490	1.2357	23.2937			(27)				
Flr - Ground			66.2930	0.1100	7.2922	75.0000	4971.9750	(28a)				
Wl - 1	65.3810	18.8490	46.5320	0.1800	8.3758	60.0000	2791.9198	(29a)				
Wl - 3	3.6360	2.1000	1.5360	0.2400	0.3686	60.0000	92.1600	(29a)				
Total net area of external elements Aum(A, m2)			135.3110					(31)				
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.4304			(33)				
Party Wall			23.7400	0.0000	0.0000	110.0000	2611.4000	(32)				
Party Ceiling 1			66.2930			30.0000	1988.7900	(32b)				
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			12456.2448	(34)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							187.8968	(35)				
List of Thermal Bridges												
K1 Element				Length	Psi-value		Total					
E2 Other lintels (including other steel lintels)				10.3180	0.2210		2.2803					
E3 Sill				1.9210	0.0240		0.0461					
E4 Jamb				40.2860	0.0190		0.7654					
E5 Ground floor (normal)				28.7550	0.0450		1.2940					
E7 Party floor between dwellings (in blocks of flats)				28.7580	0.0360		1.0353					
E16 Corner (normal)				7.2000	0.0370		0.2664					
E18 Party wall between dwellings				4.8000	0.0310		0.1488					
P1 Party wall - Ground floor				9.8920	0.0430		0.4254					
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				9.8920	0.0000		0.0000					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								6.2616 (36)				
Point Thermal Bridges								0.0000 (36a)				
Total fabric heat loss						(33) + (36) + (36a) =	47.6920	(37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 26.2520	Feb 26.2520	Mar 26.2520	Apr 26.2520	May 26.2520	Jun 26.2520	Jul 26.2520	Aug 26.2520	Sep 26.2520	Oct 26.2520	Nov 26.2520	Dec 26.2520 (38)
Heat transfer coeff	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440 (39)
Average = Sum(39)m / 12 =												73.9440
HLP	Jan 1.1154	Feb 1.1154	Mar 1.1154	Apr 1.1154	May 1.1154	Jun 1.1154	Jul 1.1154	Aug 1.1154	Sep 1.1154	Oct 1.1154	Nov 1.1154	Dec 1.1154 (40)
HLP (average)												1.1154
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1529 (42)
Hot water usage for mixer showers	60.3163	59.4099	58.0890	55.5618	53.6968	51.6169	50.4347	51.7456	53.1826	55.4157	57.9972	60.0852 (42a)
Hot water usage for baths	26.0612	25.6742	25.1291	24.1242	23.3717	22.5373	22.0866	22.6278	23.2171	24.1099	25.1356	25.9731 (42b)
Hot water usage for other uses	36.6776	35.3439	34.0102	32.6764	31.3427	30.0090	30.0090	31.3427	32.6764	34.0102	35.3439	36.6776 (42c)
Average daily hot water use (litres/day)												113.1158 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	123.0552	120.4280	117.2284	112.3624	108.4112	104.1632	102.5303	105.7161	109.0761	113.5358	118.4767	122.7360 (44)
Energy content (annual)	194.8894	171.4879	180.1756	153.8186	145.9423	128.0808	124.0015	130.8986	134.5017	154.0670	168.7918	192.1749 (45)
Distribution loss (46)m = 0.15 x (45)m	29.2334	25.7232	27.0263	23.0728	21.8913	19.2121	18.6002	19.6348	20.1753	23.1101	25.3188	28.8262 (46)
Water storage loss:												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8694 (55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (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	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263 (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 (64a)
Output from w/h	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263 (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	64.8007	57.0197	59.9084	51.1447	48.5258	42.5869	41.2305	43.5238	44.7218	51.2273	56.1233	63.8982 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.0167	19.5551	15.9033	12.0398	8.9999	7.5981	8.2100	10.6717	14.3235	18.1869	21.2268	22.6287	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	281.3365	284.2559	276.8991	261.2374	241.4673	222.8862	210.4729	207.5535	214.9103	230.5720	250.3421	268.9232	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	(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)	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	(71)
Water heating gains (Table 5)	87.0977	84.8508	80.5220	71.0343	65.2229	59.1484	55.4173	58.4997	62.1136	68.8539	77.9490	85.8846	(72)
Total internal gains	483.5787	481.7895	466.4521	437.4392	408.8178	382.7605	367.2280	369.8527	384.4752	410.7406	442.6457	470.5642	(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			
East				6.4140	22.3313	0.4700	0.0000	0.7700	51.8360 (76)			
South				6.3150	50.9848	0.4700	0.0000	0.7700	116.5206 (78)			
West				6.1200	22.3313	0.4700	0.0000	0.7700	49.4600 (80)			
Solar gains	217.8167	349.5042	504.5830	685.2415	773.9169	831.6290	789.4539	721.9383	608.2462	422.7328	270.7714	182.2921 (83)
Total gains	701.3954	831.2936	971.0352	1122.6807	1182.7347	1214.3895	1156.6819	1091.7910	992.7214	833.4734	713.4170	652.8563 (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	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	
alpha	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	
util living area	0.9483	0.9077	0.8185	0.6634	0.4853	0.3029	0.1980	0.2164	0.4242	0.7257	0.9036	0.9585	(86)
MIT	19.9645	20.2209	20.5724	20.8458	20.9644	20.9961	20.9995	20.9993	20.9842	20.8170	20.3578	19.8847	(87)
Th 2	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	(88)
util rest of house	0.9371	0.8897	0.7873	0.6172	0.4287	0.2423	0.1335	0.1482	0.3534	0.6719	0.8811	0.9492	(89)
MIT 2	18.8338	19.1442	19.5554	19.8503	19.9629	19.9866	19.9882	19.9881	19.9797	19.8315	19.3172	18.7360	(90)
Living area fraction	18.8338	19.1442	19.5554	19.8503	19.9629	19.9866	19.9882	19.9881	19.9797	19.8315	19.3172	18.7360	(91)
MIT	19.2476	19.5382	19.9276	20.2146	20.3294	20.3560	20.3583	20.3582	20.3473	20.1921	19.6980	19.1564	(92)
Temperature adjustment	19.2476	19.5382	19.9276	20.2146	20.3294	20.3560	20.3583	20.3582	20.3473	20.1921	19.6980	19.1564	(93)
adjusted MIT	19.2476	19.5382	19.9276	20.2146	20.3294	20.3560	20.3583	20.3582	20.3473	20.1921	19.6980	19.1564	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9271	0.8804	0.7853	0.6280	0.4481	0.2644	0.1571	0.1732	0.3788	0.6834	0.8736	0.9397	(94)
Useful gains	650.2649	731.8980	762.5166	704.9913	529.9538	321.1009	181.7015	189.0483	376.0597	569.5884	623.2649	613.4661	(95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Heat loss rate W	1046.1289	1030.6501	926.3392	762.7063	541.9678	322.1015	181.7765	189.1626	380.6155	635.3364	864.9979	1039.3869	(97)
Space heating kWh	294.5228	200.7614	121.8840	41.5548	8.9384	0.0000	0.0000	0.0000	0.0000	48.9165	174.0478	316.8851	(98a)
Space heating requirement - total per year (kWh/year)												1207.5107	
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	294.5228	200.7614	121.8840	41.5548	8.9384	0.0000	0.0000	0.0000	0.0000	48.9165	174.0478	316.8851	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1207.5107	
Space heating per m2										(98c) / (4) =		18.2148	(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)

Fraction of main heating from main system 2

0.0000 (203)

Fraction of total heating from main system 1

1.0000 (204)

Fraction of total heating from main system 2

0.0000 (205)

Efficiency of main space heating system 1 (in %)

100.0000 (206)

Efficiency of main space heating system 2 (in %)

0.0000 (207)

Efficiency of secondary/supplementary heating system, %

0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	294.5228	200.7614	121.8840	41.5548	8.9384	0.0000	0.0000	0.0000	0.0000	48.9165	174.0478	316.8851	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	294.5228	200.7614	121.8840	41.5548	8.9384	0.0000	0.0000	0.0000	0.0000	48.9165	174.0478	316.8851	(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)

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Space heating fuel used, main system 2	0.0000	(213)
Water heating		
Water heating requirement		
221.8408 195.8311 207.1270 179.9006 172.8937 154.1628 150.9529 157.8500 160.5837 181.0184 194.8738 219.1263 (64)		
Efficiency of water heater		
(217)m 345.3200 345.3200 345.3200 345.3200 345.3200 345.3200 345.3200 345.3200 345.3200 345.3200 345.3200 345.3200 (216)		
Fuel for water heating, kWh/month		
64.2421 56.7100 59.9812 52.0968 50.0677 44.6435 43.7139 45.7112 46.5029 52.4205 56.4328 63.4560 (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		
Lighting 19.2711 15.4600 13.9200 10.1984 7.8775 6.4360 7.1862 9.3408 12.1328 15.9189 17.9804 19.8067 (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	1207.5107	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	345.3200	
Water heating fuel used	635.9785	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEV)Decentralised, Database: total watage = 2.3400, total flow = 21.0000, SFP = 0.1114)		
mechanical ventilation fans (SFP = 0.1114)	21.6289	(230a)
Total electricity for the above, kWh/year	21.6289	(231)
Electricity for lighting (calculated in Appendix L)	155.5290	(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	2020.6472	(238)

10a. Fuel costs - using BEDF prices (552)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1207.5107	26.0600	314.6773 (240)
Space heating - main system 2	0.0000	26.0600	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	635.9785	26.0600	165.7360 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Pumps, fans and electric keep-hot	21.6289	26.0600	5.6365 (249)
Energy for lighting	155.5290	26.0600	40.5309 (250)
Additional standing charges			0.0000 (251)
Total energy cost			526.5807 (255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1207.5107	0.1578	190.4856 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	635.9785	0.1412	89.7773 (264)
Space and water heating			280.2629 (265)
Pumps, fans and electric keep-hot	21.6289	0.1387	3.0002 (267)
Energy for lighting	155.5290	0.1443	22.4476 (268)
Total CO2, kg/year			305.7108 (272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1207.5107	1.5840	1912.6433 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	635.9785	1.5220	967.9508 (278)
Space and water heating			2880.5940 (279)
Pumps, fans and electric keep-hot	21.6289	1.5128	32.7203 (281)
Energy for lighting	155.5290	1.5338	238.5556 (282)
Total Primary energy kWh/year			3151.8698 (286)

SAP 10 EPC IMPROVEMENTS

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006 GF Flat Elec DWHP

Current energy efficiency rating: B 81
Current environmental impact rating: A 96

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

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

Recommended measures (none)	Total Savings	£0	0.00 kg/m²	Energy efficiency	Environmental impact

Potential energy efficiency rating: B 81
Potential environmental impact rating: A 96

Fuel prices for cost data on this page from database revision number 552 TEST (30 Aug 2024)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):			
	Current	Potential	Saving
Electricity	£527	£527	£0
Space heating	£320	£320	£0
Water heating	£166	£166	£0
Lighting	£41	£41	£0
Total cost of fuels	£527	£527	£0
Total cost of uses	£527	£527	£0
Delivered energy	30 kWh/m²	30 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes
CO2 emissions per m²	5 kg/m²	5 kg/m²	0 kg/m²
Primary energy	48 kWh/m²	48 kWh/m²	0 kWh/m²

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	66.2930 (1b)	x 2.4000 (2b)	= 159.1032 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.2930		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 159.1032 (5)

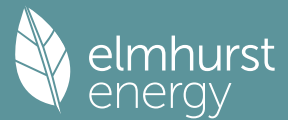
2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 0.0000 / (5) = 0.0000 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 3.0000 (17)
Infiltration rate 0.1500 (18)
Number of sides sheltered 2 (19)
Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Solid Door			2.1000	1.0000	2.1000			(26)
Windows (Uw = 1.30)			18.8490	1.2357	23.2937			(27)
Flr - Ground			66.2930	0.1100	7.2922	75.0000	4971.9750	(28a)
Wl - 1	65.3810	18.8490	46.5320	0.1800	8.3758	60.0000	2791.9198	(29a)
Wl - 3	3.6360	2.1000	1.5360	0.2400	0.3686	60.0000	92.1600	(29a)
Total net area of external elements Aum(A, m2)			135.3110					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.4304			(33)
Party Wall			23.7400	0.0000	0.0000	110.0000	2611.4000	(32)
Party Ceiling 1			66.2930			30.0000	1988.7900	(32b)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			12456.2448	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							187.8968	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.3180	0.2210	2.2803
E3 Sill	1.9210	0.0240	0.0461
E4 Jamb	40.2860	0.0190	0.7654
E5 Ground floor (normal)	28.7550	0.0450	1.2940
E7 Party floor between dwellings (in blocks of flats)	28.7580	0.0360	1.0353
E16 Corner (normal)	7.2000	0.0370	0.2664
E18 Party wall between dwellings	4.8000	0.0310	0.1488
P1 Party wall - Ground floor	9.8920	0.0430	0.4254
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	9.8920	0.0000	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			6.2616 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	47.6920 (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	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	(38)
Average = Sum(39)m / 12 =	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	(39)
HLP	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	(40)
HLP (average)												1.1154	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

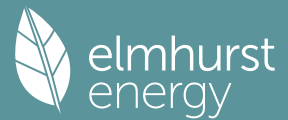
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.1529	(42)
Hot water usage for mixer showers	60.3163	59.4099	58.0890	55.5618	53.6968	51.6169	50.4347	51.7456	53.1826	55.4157	57.9972	60.0852	(42a)	
Hot water usage for baths	26.0612	25.6742	25.1291	24.1242	23.3717	22.5373	22.0866	22.6278	23.2171	24.1099	25.1356	25.9731	(42b)	
Hot water usage for other uses	36.6776	35.3439	34.0102	32.6764	31.3427	30.0090	30.0090	31.3427	32.6764	34.0102	35.3439	36.6776	(42c)	
Average daily hot water use (litres/day)												113.1158	(43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Energy content (annual)	123.0552	120.4280	117.2284	112.3624	108.4112	104.1632	102.5303	105.7161	109.0761	113.5358	118.4767	122.7360	(44)	
Distribution loss (46)m = 0.15 x (45)m	194.8894	171.4879	180.1756	153.8186	145.9423	128.0808	124.0015	130.8986	134.5017	154.0670	168.7918	192.1749	(45)	
Water storage loss:														
Store volume	29.2334	25.7232	27.0263	23.0728	21.8913	19.2121	18.6002	19.6348	20.1753	23.1101	25.3188	28.8262	(46)	
a) If manufacturer declared loss factor is known (kWh/day):														
Temperature factor from Table 2b													201.0000	(47)
Enter (49) or (54) in (55)													1.6100	(48)
Total storage loss													0.5400	(49)
If cylinder contains dedicated solar storage													0.8694	(55)
Primary loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)	
Combi loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)	
Total heat required for water heating calculated for each month	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)
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	(61)
PV diverter	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263	(62)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
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	(63b)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
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	(63d)
Total per year (kWh/year) = Sum(64a)m =	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263	(64)	
Heat gains from water heating, kWh/month	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 =	64.8007	57.0197	59.9084	51.1447	48.5258	42.5869	41.2305	43.5238	44.7218	51.2273	56.1233	63.8982	(64a)	

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

Metabolic gains (Table 5), Watts													
(66)m	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.0167	19.5551	15.9033	12.0398	8.9999	7.5981	8.2100	10.6717	14.3235	18.1869	21.2268	22.6287	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	281.3365	284.2559	276.8991	261.2374	241.4673	222.8862	210.4729	207.5535	214.9103	230.5720	250.3421	268.9232	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	(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)	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	(71)
Water heating gains (Table 5)	87.0977	84.8508	80.5220	71.0343	65.2229	59.1484	55.4173	58.4997	62.1136	68.8539	77.9490	85.8846	(72)
Total internal gains	483.5787	481.7895	466.4521	437.4392	408.8178	382.7605	367.2280	369.8527	384.4752	410.7406	442.6457	470.5642	(73)

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6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W		
East					6.4140	19.6403	0.4700	0.0000	0.7700	45.5895 (76)		
South					6.3150	46.7521	0.4700	0.0000	0.7700	106.8471 (78)		
West					6.1200	19.6403	0.4700	0.0000	0.7700	43.4998 (80)		

Solar gains	195.9364	349.2656	509.9141	670.5171	775.5209	777.7871	746.8062	669.1806	566.6542	395.5360	237.7341	165.5884 (83)
Total gains	679.5151	831.0551	976.3662	1107.9563	1184.3387	1160.5476	1114.0342	1039.0333	951.1293	806.2766	680.3798	636.1527 (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	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	
alpha	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	
util living area	0.9597	0.9184	0.8404	0.7107	0.5530	0.4017	0.2907	0.3251	0.5165	0.7852	0.9297	0.9680 (86)	
MIT	19.8182	20.1334	20.4896	20.7824	20.9336	20.9857	20.9971	20.9953	20.9615	20.7243	20.1984	19.7295 (87)	
Th 2	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883 (88)	
util rest of house	0.9511	0.9026	0.8131	0.6692	0.5003	0.3405	0.2245	0.2547	0.4477	0.7403	0.9131	0.9609 (89)	
MIT 2	18.6512	19.0369	19.4588	19.7841	19.9354	19.9799	19.9872	19.9864	19.9632	19.7350	19.1250	18.5410 (90)	
Living area fraction									fLA = Living area / (4) =				0.3660 (91)
MIT	19.0783	19.4382	19.8361	20.1494	20.3007	20.3480	20.3568	20.3556	20.3286	20.0970	19.5178	18.9759 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.0783	19.4382	19.8361	20.1494	20.3007	20.3480	20.3568	20.3556	20.3286	20.0970	19.5178	18.9759 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9414	0.8927	0.8086	0.6761	0.5170	0.3625	0.2487	0.2804	0.4713	0.7455	0.9040	0.9520	(94)
Useful gains	639.7193	741.8543	789.5375	749.1141	612.2599	420.7078	277.1069	291.3597	448.2908	601.0865	615.0439	605.6066	(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	1092.7667	1075.0135	986.1212	831.8273	635.9731	425.0308	277.7903	292.4956	460.5664	702.2497	918.2228	1092.5909	(97)
Space heating kWh	337.0673	223.8830	146.2583	59.5535	17.6426	0.0000	0.0000	0.0000	0.0000	75.2654	218.2889	362.3163	(98a)
Space heating requirement - total per year (kWh/year)												1440.2753	
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	337.0673	223.8830	146.2583	59.5535	17.6426	0.0000	0.0000	0.0000	0.0000	75.2654	218.2889	362.3163	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1440.2753	
Space heating per m ²										(98c) / (4) =		21.7259	(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)
Fraction of main heating from main system 2													0.0000	(203)
Fraction of total heating from main system 1													1.0000	(204)
Fraction of total heating from main system 2													0.0000	(205)
Efficiency of main space heating system 1 (in %)													100.0000	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	337.0673	223.8830	146.2583	59.5535	17.6426	0.0000	0.0000	0.0000	0.0000	75.2654	218.2889	362.3163	(98)	
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)	
Space heating fuel (main heating system)	337.0673	223.8830	146.2583	59.5535	17.6426	0.0000	0.0000	0.0000	0.0000	75.2654	218.2889	362.3163	(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)	
Space heating fuel used, main system 2												0.0000	(213)	
Water heating														
Water heating requirement	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263	(64)	
Efficiency of water heater (217)m	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	(216)	
Fuel for water heating, kWh/month	64.2421	56.7100	59.9812	52.0968	50.0677	44.6435	43.7139	45.7112	46.5029	52.4205	56.4328	63.4560	(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	1.8370	1.6592	1.8370	1.7777	1.8370	1.7777	1.8370	1.8370	1.7777	1.8370	1.7777	1.8370	(231)	
Lighting	19.2711	15.4600	13.9200	10.1984	7.8775	6.4360	7.1862	9.3408	12.1328	15.9189	17.9804	19.8067	(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)														

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(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												1440.2753	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												345.3200	
Water heating fuel used												635.9785	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 2.3400, total flow = 21.0000, SFP = 0.1114)													
mechanical ventilation fans (SFP = 0.1114)												21.6289	(230a)
Total electricity for the above, kWh/year												21.6289	(231)
Electricity for lighting (calculated in Appendix L)												155.5290	(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												2253.4118	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1440.2753	16.4900	237.5014	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	635.9785	16.4900	104.8729	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	21.6289	16.4900	3.5666	(249)
Energy for lighting	155.5290	16.4900	25.6467	(250)
Additional standing charges			0.0000	(251)
Total energy cost			371.5876	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.2020	(257)
SAP value		80.5160	
SAP rating (Section 12)		81	(258)
SAP band		B	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1440.2753	0.1571	226.2410	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	635.9785	0.1412	89.7773	(264)
Space and water heating			316.0183	(265)
Pumps, fans and electric keep-hot	21.6289	0.1387	3.0002	(267)
Energy for lighting	155.5290	0.1443	22.4476	(268)
Total CO2, kg/year			341.4662	(272)
CO2 emissions per m2			5.1500	(273)
EI value			95.8886	
EI rating			96	(274)
EI band			A	

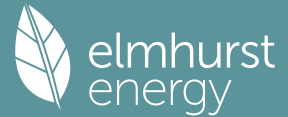
SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	66.2930	2.4000	159.1032	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.2930			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	159.1032	(5)

2. Ventilation rate

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												m3 per hour
Number of open chimneys												0 * 80 = 0.0000 (6a)
Number of open flues												0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire												0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler												0 * 20 = 0.0000 (6d)
Number of flues attached to other heater												0 * 35 = 0.0000 (6e)
Number of blocked chimneys												0 * 20 = 0.0000 (6f)
Number of intermittent extract fans												0 * 10 = 0.0000 (7a)
Number of passive vents												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												Yes
Pressure Test Method												Blower Door
Measured/design AP50												3.0000 (17)
Infiltration rate												0.1500 (18)
Number of sides sheltered												2 (19)
Shelter factor												(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) = 0.1275 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Adj infilt rate	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Mechanical extract ventilation - decentralised	0.1339	0.1275	0.1275	0.1179	0.1179	0.1052	0.1084	0.1020	0.1052	0.1116	0.1116	0.1211 (22b)
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

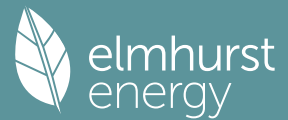
3. Heat losses and heat loss parameter												

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					
Solid Door			2.1000	1.0000	2.1000							
Windows (Uw = 1.30)			18.8490	1.2357	23.2937							
Flr - Ground			66.2930	0.1100	7.2922	75.0000	4971.9750 (28a)					
W1 - 1	65.3810	18.8490	46.5320	0.1800	8.3758	60.0000	2791.9198 (29a)					
W1 - 3	3.6360	2.1000	1.5360	0.2400	0.3686	60.0000	92.1600 (29a)					
Total net area of external elements Aum(A, m2)			135.3110					(31)				
Fabric heat loss, W/K = Sum (A x U)			(26)...	(30) + (32) =	41.4304	(33)						
Party Wall			23.7400	0.0000	0.0000	110.0000	2611.4000 (32)					
Party Ceiling 1			66.2930			30.0000	1988.7900 (32b)					
Heat capacity Cm = Sum(A x k)			(28)...	(30) + (32) + (32a)...	(32e) =	12456.2448 (34)						
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K						187.8968 (35)						
List of Thermal Bridges												
K1 Element			Length	Psi-value	Total							
E2 Other lintels (including other steel lintels)			10.3180	0.2210	2.2803							
E3 Sill			1.9210	0.0240	0.0461							
E4 Jamb			40.2860	0.0190	0.7654							
E5 Ground floor (normal)			28.7550	0.0450	1.2940							
E7 Party floor between dwellings (in blocks of flats)			28.7580	0.0360	1.0353							
E16 Corner (normal)			7.2000	0.0370	0.2664							
E18 Party wall between dwellings			4.8000	0.0310	0.1488							
P1 Party wall - Ground floor			9.8920	0.0430	0.4254							
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)			9.8920	0.0000	0.0000							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)						6.2616 (36)						
Point Thermal bridges						0.0000 (36a)						
Total fabric heat loss			(33) + (36) + (36a) =	47.6920 (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	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520	26.2520 (38)
Average = Sum(39)m / 12 =	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440	73.9440 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154	1.1154 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												

Assumed occupancy												2.1529 (42)
Hot water usage for mixer showers												
Hot water usage for baths												
Hot water usage for other uses												
Average daily hot water use (litres/day)	60.3163	59.4099	58.0890	55.5618	53.6968	51.6169	50.4347	51.7456	53.1826	55.4157	57.9972	60.0852 (42a)
Daily hot water use	26.0612	25.6742	25.1291	24.1242	23.3717	22.5373	22.0866	22.6278	23.2171	24.1099	25.1356	25.9731 (42b)
Distribution loss (46)m = 0.15 x (45)m	36.6776	35.3439	34.0102	32.6764	31.3427	30.0090	30.0090	31.3427	32.6764	34.0102	35.3439	36.6776 (42c)
Water storage loss:	29.2334	25.7232	27.0263	23.0728	21.8913	19.2121	18.6002	19.6348	20.1753	23.1101	25.3188	28.8262 (43)
Store volume	123.0552	120.4280	117.2284	112.3624	108.4112	104.1632	102.5303	105.7161	109.0761	113.5358	118.4767	122.7360 (44)
Energy conte	194.8894	171.4879	180.1756	153.8186	145.9423	128.0808	124.0015	130.8986	134.5017	154.0670	168.7918	192.1749 (45)
Energy content (annual)												Total = Sum(45)m = 1878.8301
Distribution loss (46)m = 0.15 x (45)m	29.2334	25.7232	27.0263	23.0728	21.8913	19.2121	18.6002	19.6348	20.1753	23.1101	25.3188	28.8262 (46)
Water storage loss:												201.0000 (47)
Store volume												1.6100 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.8694 (55)
Enter (49) or (54) in (55)												
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)

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If cylinder contains dedicated solar storage												
Primary loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (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	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263 (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	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263 (64)
Total per year (kWh/year) = Sum(64)m =												2196.1611 (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	64.8007	57.0197	59.9084	51.1447	48.5258	42.5869	41.2305	43.5238	44.7218	51.2273	56.1233	63.8982 (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	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728	129.1728 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.0167	19.5551	15.9033	12.0398	8.9999	7.5981	8.2100	10.6717	14.3235	18.1869	21.2268	22.6287 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	281.3365	284.2559	276.8991	261.2374	241.4673	222.8862	210.4729	207.5535	214.9103	230.5720	250.3421	268.9232 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702	50.0702 (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)	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152	-86.1152 (71)
Water heating gains (Table 5)	87.0977	84.8508	80.5220	71.0343	65.2229	59.1484	55.4173	58.4997	62.1136	68.8539	77.9490	85.8846 (72)
Total internal gains	483.5787	481.7895	466.4521	437.4392	408.8178	382.7605	367.2280	369.8527	384.4752	410.7406	442.6457	470.5642 (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	
East					6.4140	22.3313		0.4700	0.0000	0.7700		51.8360 (76)	
South					6.3150	50.9848		0.4700	0.0000	0.7700		116.5206 (78)	
West					6.1200	22.3313		0.4700	0.0000	0.7700		49.4600 (80)	
Solar gains	217.8167	349.5042	504.5830	685.2415	773.9169	831.6290	789.4539	721.9383	608.2462	422.7328	270.7714	182.2921 (83)	
Total gains	701.3954	831.2936	971.0352	1122.6807	1182.7347	1214.3895	1156.6819	1091.7910	992.7214	833.4734	713.4170	652.8563 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												
Utilisation factor for gains for living area, nil,m (see Table 9a)												21.0000 (85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931	46.7931
alpha	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195	4.1195
util living area	0.9483	0.9077	0.8185	0.6634	0.4853	0.3029	0.1980	0.2164	0.4242	0.7257	0.9036	0.9585 (86)
MIT	19.9645	20.2209	20.5724	20.8458	20.9644	20.9961	20.9995	20.9993	20.9842	20.8170	20.3578	19.8847 (87)
Th 2	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883	19.9883 (88)
util rest of house	0.9371	0.8897	0.7873	0.6172	0.4287	0.2423	0.1335	0.1482	0.3534	0.6719	0.8811	0.9492 (89)
MIT 2	18.8338	19.1442	19.5554	19.8503	19.9629	19.9866	19.9882	19.9881	19.9797	19.8315	19.3172	18.7360 (90)
Living area fraction	19.2476	19.5382	19.9276	20.2146	20.3294	20.3560	20.3583	20.3582	20.3473	20.1921	19.6980	19.1564 (92)
Temperature adjustment	19.2476	19.5382	19.9276	20.2146	20.3294	20.3560	20.3583	20.3582	20.3473	20.1921	19.6980	19.1564 (93)
adjusted MIT	19.2476	19.5382	19.9276	20.2146	20.3294	20.3560	20.3583	20.3582	20.3473	20.1921	19.6980	19.1564 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9271	0.8804	0.7853	0.6280	0.4481	0.2644	0.1571	0.1732	0.3788	0.6834	0.8736	0.9397 (94)
Useful gains	650.2649	731.8980	762.5166	704.9913	529.9538	321.1009	181.7015	189.0483	376.0597	569.5884	623.2649	613.4661 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	1046.1289	1030.6501	926.3392	762.7063	541.9678	322.1015	181.7765	189.1626	380.6155	635.3364	864.9979	1039.3869 (97)
Space heating kWh	294.5228	200.7614	121.8840	41.5548	8.9384	0.0000	0.0000	0.0000	0.0000	48.9165	174.0478	316.8851 (98a)
Space heating requirement - total per year (kWh/year)	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 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)	294.5228	200.7614	121.8840	41.5548	8.9384	0.0000	0.0000	0.0000	0.0000	48.9165	174.0478	316.8851 (98c)
Space heating kWh	294.5228	200.7614	121.8840	41.5548	8.9384	0.0000	0.0000	0.0000	0.0000	48.9165	174.0478	316.8851 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (99)
Space heating per m 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 (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)

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Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	294.5228	200.7614	121.8840	41.5548	8.9384	0.0000	0.0000	0.0000	0.0000	48.9165	174.0478	316.8851	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	294.5228	200.7614	121.8840	41.5548	8.9384	0.0000	0.0000	0.0000	0.0000	48.9165	174.0478	316.8851	(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)
Space heating fuel used, main system 2												0.0000	(213)
Water heating requirement	221.8408	195.8311	207.1270	179.9006	172.8937	154.1628	150.9529	157.8500	160.5837	181.0184	194.8738	219.1263	(64)
Efficiency of water heater (217)m	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	345.3200	(216)
Fuel for water heating, kWh/month	64.2421	56.7100	59.9812	52.0968	50.0677	44.6435	43.7139	45.7112	46.5029	52.4205	56.4328	63.4560	(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	1.8370	1.6592	1.8370	1.7777	1.8370	1.7777	1.8370	1.7777	1.8370	1.7777	1.8370	1.7777	(231)
Lighting	19.2711	15.4600	13.9200	10.1984	7.8775	6.4360	7.1862	9.3408	12.1328	15.9189	17.9804	19.8067	(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												1207.5107	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												345.3200	
Water heating fuel used												635.9785	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 2.3400, total flow = 21.0000, SFP = 0.1114)													
mechanical ventilation fans (SFP = 0.1114)												21.6289	(230a)
Total electricity for the above, kWh/year												21.6289	(231)
Electricity for lighting (calculated in Appendix L)												155.5290	(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												2020.6472	(238)

10a. Fuel costs - using BEDF prices (552)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1207.5107	26.0600	314.6773	(240)
Space heating - main system 2	0.0000	26.0600	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	635.9785	26.0600	165.7360	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	21.6289	26.0600	5.6365	(249)
Energy for lighting	155.5290	26.0600	40.5309	(250)
Additional standing charges			0.0000	(251)
Total energy cost			526.5807	(255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1207.5107	0.1578	190.4856	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	635.9785	0.1412	89.7773	(264)
Space and water heating			280.2629	(265)
Pumps, fans and electric keep-hot	21.6289	0.1387	3.0002	(267)
Energy for lighting	155.5290	0.1443	22.4476	(268)
Total CO2, kg/year			305.7108	(272)

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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	1207.5107	1.5840	1912.6433 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	635.9785	1.5220	967.9508 (278)
Space and water heating			2880.5940 (279)
Pumps, fans and electric keep-hot	21.6289	1.5128	32.7203 (281)
Energy for lighting	155.5290	1.5338	238.5556 (282)
Total Primary energy kWh/year			3151.8698 (286)