



Appendix A

Energy performance

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Original source documents follow. Page references are positions in this combined PDF.

Energy performance certificate (EPC)

1 Malthouse Cottages
Malthouse Lane
Hurstpierpoint
HASSOCKS
BN6 9PE

Energy rating

B

Valid until:

1 October 2036

Certificate number:

9340-3242-3600-2006-2741

Property type

Semi-detached house

Total floor area

80 square metres

Rules on letting this property

Properties can be let if they have an energy rating from A to E.

You can read [guidance for landlords on the regulations and exemptions \(https://www.gov.uk/guidance/domestic-private-rented-property-minimum-energy-efficiency-standard-landlord-guidance\)](https://www.gov.uk/guidance/domestic-private-rented-property-minimum-energy-efficiency-standard-landlord-guidance).

Energy rating and score

This property's energy rating is B. It has the potential to be A.

[See how to improve this property's energy efficiency.](#)

The graph shows this property's current and potential energy rating.

Properties get a rating from A (best) to G (worst) and a score. The better the rating and score, the lower your energy bills are likely to be.

For properties in England and Wales:

the average energy rating is D
the average energy score is 60

Score	Energy rating	Current	Potential
92+	A		94 A
81-91	B	86 B	
69-80	C		
55-68	D		
39-54	E		
21-38	F		
1-20	G		

Breakdown of property's energy performance

Features in this property

Features get a rating from very good to very poor, based on how energy efficient they are. Ratings are not based on how well features work or their condition.

Assumed ratings are based on the property's age and type. They are used for features the assessor could not inspect.

Feature	Description	Rating
Walls	Average thermal transmittance 0.15 W/m ² K	Very good
Roof	Average thermal transmittance 0.11 W/m ² K	Very good
Floor	Average thermal transmittance 0.13 W/m ² K	Very good
Windows	High performance glazing	Good
Main heating	Air source heat pump, radiators and underfloor, electric	Average
Main heating control	Time and temperature zone control	Very good
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 3.0 m ³ /h.m ² (as tested)	Very good
Secondary heating	None	N/A

Low and zero carbon energy sources

Low and zero carbon energy sources release very little or no CO₂. Installing these sources may help reduce energy bills as well as cutting carbon emissions. The following low or zero carbon energy sources are installed in this property:

- Air source heat pump

Primary energy use

The primary energy use for this property per year is 33 kilowatt hours per square metre (kWh/m²).

Smart meters

This property had a **smart meter for electricity** when it was assessed.

Smart meters help you understand your energy use and how you could save money. They may help you access better energy deals.

[Find out about using your smart meter \(https://www.smartenergygb.org/using-your-smart-meter\)](https://www.smartenergygb.org/using-your-smart-meter)

How this affects your energy bills

An average household would need to spend **£441 per year on heating, hot water and lighting** in this property. These costs usually make up the majority of your energy bills.

You could **save £51 per year** if you complete the suggested steps for improving this property's energy rating.

This is **based on average costs in 2026** when this EPC was created. People living at the property may use different amounts of energy for heating, hot water and lighting.

Impact on the environment

This property's environmental impact rating is A. It has the potential to be A.

Properties get a rating from A (best) to G (worst) on how much carbon dioxide (CO2) they produce each year.

Carbon emissions

An average household produces 6 tonnes of CO2

This property produces	0.2 tonnes of CO2
This property's potential production	0.1 tonnes of CO2

You could improve this property's CO2 emissions by making the suggested changes. This will help to protect the environment.

These ratings are based on assumptions about average occupancy and energy use. People living at the property may use different amounts of energy.

Steps you could take to save energy

Step	Typical installation cost	Typical yearly saving
1. Solar water heating	£4,000 - £7,000	£51
2. Solar photovoltaic panels	£8,000 - £10,000	£277

Advice on making energy saving improvements

[Get detailed recommendations and cost estimates \(www.gov.uk/improve-energy-efficiency\)](http://www.gov.uk/improve-energy-efficiency)

Who to contact about this certificate

Contacting the assessor

If you're unhappy about your property's energy assessment or certificate, you can complain to the assessor who created it.

Assessor's name	Daniel Watt
Telephone	0161 228 6757
Email	dan.watt@team-civic.com

Contacting the accreditation scheme

If you're still unhappy after contacting the assessor, you should contact the assessor's accreditation scheme.

Accreditation scheme	Elmhurst Energy Systems Ltd
Assessor's ID	EES/027301
Telephone	01455 883 250
Email	enquiries@elmhurstenergy.co.uk

About this assessment

Assessor's declaration	No related party
Date of assessment	2 October 2026
Date of certificate	2 October 2026
Type of assessment	SAP

Energy Report



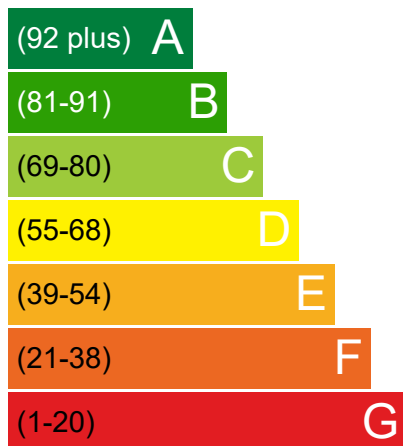
Dwelling Address	1 Malthouse Cottages, Malthouse Lane, Hurstpierpoint, HASSECKS, BN6 9PE
Reference	Plot 1-00001
SAP Version	10.2
Assessment Date	11/02/2026
Submission Date	02/10/2026
Property Type	House, Semi-Detached
Total Floor Area	80

This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

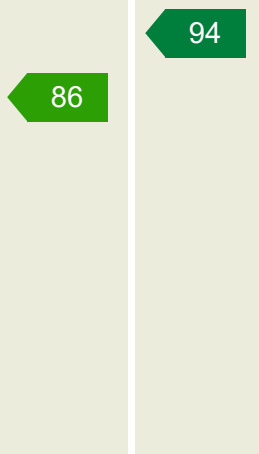
This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

Energy Efficiency Rating

Most energy efficient - lower running costs

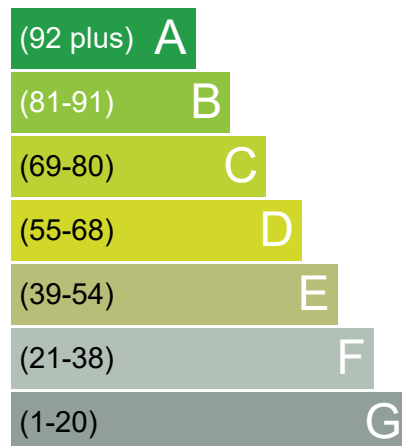


CURRENT POTENTIAL

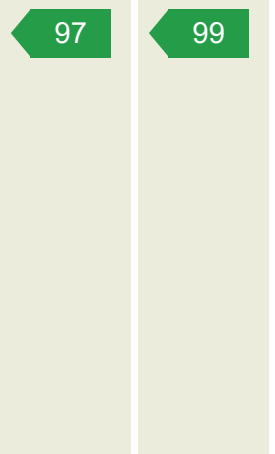


Carbon Dioxide (CO2) Emissions Rating

Very environmentally friendly - lower CO2 emissions



CURRENT POTENTIAL



Additional ratings for your home

	Primary Energy	Energy	Carbon	Cost	HTC
CURRENT	32.50 kWh	1698 kWh	245 kg	441.35 £	60 W/K
POTENTIAL	12.67 kWh	631 kWh	104 kg	164.10 £	60 W/K

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good
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Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.15 W/m ² K	Very Good
Roof	Average thermal transmittance 0.11 W/m ² K	Very Good
Floor	Average thermal transmittance 0.13 W/m ² K	Very Good
Windows	High performance glazing	Good
Main heating	Air source heat pump, radiators and underfloor, electric	Average
Main heating controls	Time and temperature zone control	Very Good
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 3.0 m ³ /h.m ² (as tested)	Very Good

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling. To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed. Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating
Solar water heating	£51	B 87	£4,000 - £7,000	£51	A 97
Photovoltaic	£277	A 94	£8,000 - £10,000	£226	A 99

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

	Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting 	£53	£53	
Heating 	£144	£165	
Hot Water 	£244	£172	
New Technologies e.g. Impact of PV	£0	-(£226)	
TOTAL	£441	£164	

Estimated energy use and potential savings



Space Heating

325

kWh per year



Water Heating

937

kWh per year

About this document

Created by:	Mr. Daniel Watt
Company/Trading name:	CIVIC MEP Ltd
Phone number:	0161 228 6757
Email address:	dan.watt@team-civic.com

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g.heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO ₂)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Fri 02 Oct 2026 12:40:37

Project Information			
Assessed By	Daniel Watt	Building Type	House, Semi-detached
OCDEA Registration	EES/027301	Assessment Date	2026-10-02

Dwelling Details			
Assessment Type	As built	Total Floor Area	80 m ²
Site Reference	Plot 1	Plot Reference	00001
Address	1 Malthouse Cottages, Malthouse Lane, Hurstpierpoint, HASSOCKS, BN6 9PE		

Client Details	
Name	.
Company	.
Address	., ., .

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate			
Fuel for main heating system	Electricity		
Target carbon dioxide emission rate	11.22 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	3.36 kgCO ₂ /m ²		OK

1b Target primary energy rate and dwelling primary energy			
Target primary energy	58.56 kWh _{PE} /m ²		
Dwelling primary energy	35.63 kWh _{PE} /m ²		OK

1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	35.7 kWh/m ²		
Dwelling fabric energy efficiency	32.4 kWh/m ²		OK

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m ² K]	Dwelling average U-Value [W/m ² K]	Element with highest individual U-Value	
External walls	0.26	0.15	Walls (1) (0.15)	OK
Party walls	0.2	0	Party Wall (1) (0)	N/A
Curtain walls	1.6	0	N/A	N/A
Floors	0.18	0.13	Ground Floor (0.13)	OK
Roofs	0.16	0.11	Roof (1) (0.11)	OK
Windows, doors, and roof windows	1.6	1.31	Front Door (1.4)	OK
Rooflights	2.2	N/A	N/A	N/A

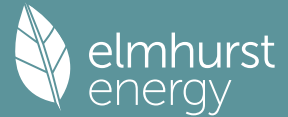
2b Envelope elements (better than typically expected values are flagged with a subsequent (!))			
Name	Net area [m ²]	U-Value [W/m ² K]	
Exposed wall: Walls (1)	77.252274	0.15	
Party wall: Party Wall (1)	37.65	0 (!)	
Ground floor: Ground Floor, Ground Floor	41.26	0.13	
Exposed roof: Roof (1)	41.26	0.11	

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
North Windows, Window	2.330686	North	0.75	1.3
North Windows, Window	1.335	North	0.75	1.3
Front Door, Door	2.1	North	N/A	1.4
East Windows, Window	0.6615	East	0.75	1.3
East Windows, Window	0.6615	East	0.75	1.3
East Windows, Window	0.6615	East	0.75	1.3
East Windows, Window	0.58457	East	0.75	1.3
South Windows, Window	2.8314	South	0.75	1.3
South Windows, Window	1.209	South	0.75	1.3
South Windows, Window	0.7812	South	0.75	1.3
South Windows, Window	1.3268	South	0.75	1.3
West Window, Window	0.58457	West	0.75	1.3

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))				
Building part 1: Thermal bridging calculated from linear thermal transmittances for each junction				
Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.093	
External wall	E3: Sill	Calculated by person with suitable expertise	-0.059	
External wall	E4: Jamb	Calculated by person with suitable expertise	-0.065	
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.03 (!)	
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.018 (!)	
Party wall	P1: Ground floor	Calculated by person with suitable expertise	0.101	
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.117	
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	0.04	
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.039 (!)	
Party wall	P4: Roof (insulation at ceiling level)	Calculated by person with suitable expertise	0.101	
External wall	E10: Eaves (insulation at ceiling level)	Calculated by person with suitable expertise	0.043	
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.054	
3 Air permeability (better than typically expected values are flagged with a subsequent (!))				
Maximum permitted air permeability at 50Pa		8 m³/hm²		
Dwelling air permeability at 50Pa		2.97 m³/hm², Measured value (!)		OK
Air permeability test certificate reference				
4 Space heating				
Main heating system 1: Heat pump with radiators or underfloor heating - Electricity				
Efficiency		249.3%		
Emitter type		Both radiators and underfloor		
Flow temperature		35°C		
System type		Heat Pump		
Manufacturer		Vaillant Group UK Ltd		
Model		aroTHERM 12kW		
Commissioning				
Secondary heating system: N/A				
Fuel		N/A		
Efficiency		N/A		
Commissioning				
5 Hot water				
Cylinder/store - type: Cylinder				
Capacity		200 litres		
Declared heat loss		1.69 kWh/day		
Primary pipework insulated		Yes		
Manufacturer				
Model				
Commissioning				
Waste water heat recovery system 1 - type: N/A				
Efficiency				
Manufacturer				
Model				

6 Controls		
Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: Cylinder thermostat and HW separately timed		
Manufacturer		
Model		
7 Lighting		
Minimum permitted light source efficacy	75 lm/W	
Lowest light source efficacy	75 lm/W	OK
External lights control	N/A	
8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	1.5 W/(l/s)	
Specific fan power	0.77 W/(l/s)	OK
Minimum permitted heat recovery efficiency	73%	
Heat recovery efficiency	91%	OK
Manufacturer/Model	Komfort EC LB400, S25	
Commissioning		
9 Local generation		
N/A		
10 Heat networks		
N/A		
11 Supporting documentary evidence		
Documentary evidence identified in 11.1 and 11.2 is needed to confirm the data values used for any calculations undertaken, manufacturer declarations made, and tests performed as reflected in this "As built" BREL Compliance Report are correct. 11.1 SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required. 11.2 Indicative photographic evidence of key stages during construction (guidance within Approved Document L, Volume 1 – Appendix B) that confirms the products identified in this BREL Compliance Report are used in this dwelling, and workmanship is of sufficient quality to support the calculated values claimed in 2a to 2d.		
12 Declarations		
a. Assessor Declaration		
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design and construction information submitted for this dwelling for the purpose of carrying out the assessment, and that the supporting documentary evidence (identified in 11.1 and 11.2) pursuant to Part L of the Building Regulations 2010 (as amended) has been reviewed in the course of preparing this BREL Compliance Report.		
Signed:	Assessor ID:	
Name:	Date:	
b. Client Declaration		
This declaration by the client is confirmation that the dwelling has been constructed and completed according to the specifications set out in this BREL Compliance Report, and that photographic evidence of key stages, as described in 11.2, has been provided to the Assessor for this dwelling.		
Signed:	Organisation:	
Name:	Date:	

Full SAP Calculation Printout



Plot Reference	Plot 1			Issued on Date	02/10/2026
Assessment Reference	00001	Plot Type Ref			
Plot Address	1 Malthouse Cottages, Malthouse Lane, Hurstpierpoint, HASSOCKS, BN6 9PE			SAP Version	10.2
SAP Rating	86 B	DER	3.36	TER	11.22
Environmental	97 A	% DER < TER			70.05
CO ₂ Emissions (t/year)	0.24	DFEE	32.39	TFEE	35.69
Compliance Check	See BREL	% DFEE < TFEE			9.23
% DPER < TPER	39.15	DPER	35.63	TPER	58.56
Assessor Details	Mr. Daniel Watt			Assessor ID	AV75-0001
Client	..				

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	41.2600 (1b)	x 2.3000 (2b)	= 94.8980 (1b) - (3b)
First floor	38.8200 (1c)	x 2.6000 (2c)	= 100.9320 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.0800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 195.8300 (5)

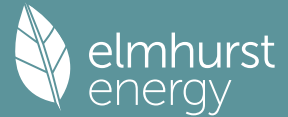
2. Ventilation rate

	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	2.9700 (17)
Infiltration rate	0.1485 (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) = 0.1374 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 4.7000 (22)
Wind factor	1.2750 1.2500 1.2250 1.1000 1.0750 0.9500 0.9500 0.9250 1.0000 1.0750 1.1250 1.1750 (22a)
Adj infilt rate	0.1751 0.1717 0.1683 0.1511 0.1477 0.1305 0.1305 0.1271 0.1374 0.1477 0.1545 0.1614 (22b)
Balanced mechanical ventilation with heat recovery	
If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	81.9000 (23c)
Effective ac	0.2656 0.2622 0.2588 0.2416 0.2382 0.2210 0.2210 0.2176 0.2279 0.2382 0.2450 0.2519 (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
Main dwelling							
Window			12.9700	1.2357	16.0276		(27)
Door			2.1000	1.4000	2.9400		(26)
Ground Floor			41.2600	0.1300	5.3638	110.0000	4538.6000 (28a)
External Walls	92.3200	15.0700	77.2500	0.1500	11.5875	18.0000	1390.5000 (29a)
External Roof	41.2600		41.2600	0.1100	4.5386	9.0000	371.3400 (30)
Total net area of external elements Aum(A, m ²)			174.8400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.4575		(33)
Main dwelling							
Party Walls			37.6500	0.0000	0.0000	70.0000	2635.5001 (32)
Internal Walls			53.4100			9.0000	480.6900 (32c)
Internal Walls			54.3200			9.0000	488.8800 (32c)
Internal Floor			38.8200			18.0000	698.7600 (32d)
Internal Ceiling			38.8200			9.0000	349.3800 (32e)

Full SAP Calculation Printout



Heat capacity $C_m = \text{Sum}(A \times k)$
Thermal mass parameter (TMP = C_m / TFA) in $\text{kJ/m}^2\text{K}$
List of Thermal Bridges

(28)...(30) + (32) + (32a)...(32e) = 10953.6501 (34)
136.7838 (35)

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.6900	0.0930	1.0872
E3 Sill	10.6900	-0.0590	-0.6307
E4 Jamb	29.8700	-0.0650	-1.9416
E5 Ground floor (normal)	19.4500	0.0300	0.5835
E6 Intermediate floor within a dwelling	17.8400	0.0180	0.3211
P1 Party wall - Ground floor	7.6200	0.1010	0.7696
E16 Corner (normal)	15.0800	0.1170	1.7644
E17 Corner (inverted - internal area greater than external area)	5.1000	0.0400	0.2040
E12 Gable (insulation at ceiling level)	7.6200	0.0390	0.2972
P4 Party wall - Roof (insulation at ceiling level)	7.6200	0.1010	0.7696
E10 Eaves (insulation at ceiling level)	11.8300	0.0430	0.5087
E18 Party wall between dwellings	4.9600	0.0540	0.2678
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			4.0008 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	44.4583 (37)

Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)\text{m} \times (5)$													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	17.1665	16.9446	16.7227	15.6131	15.3911	14.2815	14.2815	14.0596	14.7254	15.3911	15.8350	16.2788	(38)
Average = Sum(39)m / 12 =	61.6248	61.4029	61.1810	60.0714	59.8494	58.7398	58.7398	58.5179	59.1837	59.8494	60.2933	60.7371	(39)
												60.0159	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.7695	0.7668	0.7640	0.7501	0.7474	0.7335	0.7335	0.7307	0.7391	0.7474	0.7529	0.7585	(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													2.4644 (42)
Hot water usage for mixer showers	65.5392	64.5543	63.1191	60.3730	58.3465	56.0865	54.8020	56.2263	57.7877	60.2142	63.0193	65.2881	(42a)
Hot water usage for baths	28.3072	27.8868	27.2948	26.2032	25.3859	24.4796	23.9900	24.5779	25.2180	26.1878	27.3018	28.2115	(42b)
Hot water usage for other uses	39.8677	38.4180	36.9682	35.5185	34.0688	32.6190	32.6190	34.0688	35.5185	36.9682	38.4180	39.8677	(42c)
Average daily hot water use (litres/day)												122.9136	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	133.7141	130.8591	127.3821	122.0947	117.8011	113.1851	111.4110	114.8730	118.5242	123.3702	128.7390	133.3673	(44)
Energy content (annual)	211.7705	186.3416	195.7815	167.1416	158.5830	139.1743	134.7420	142.2367	146.1522	167.4122	183.4124	208.8210	(45)
Distribution loss (46)m = $0.15 \times (45)\text{m}$	31.7656	27.9512	29.3672	25.0712	23.7874	20.8761	20.2113	21.3355	21.9228	25.1118	27.5119	31.3232	(46)
Water storage loss (or HIU loss):												200.0000	(47)
Store volume												1.6900	(48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400	(49)
Temperature factor from Table 2b												0.9126	(55)
Enter (49) or (54) in (55)													
Total storage loss	28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906	(56)
If cylinder contains dedicated solar storage	28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906	(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	263.3235	232.9056	247.3345	217.0316	210.1360	189.0643	186.2950	193.7897	196.0422	218.9652	233.3024	260.3740	(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	263.3235	232.9056	247.3345	217.0316	210.1360	189.0643	186.2950	193.7897	196.0422	218.9652	233.3024	260.3740	(64)
12Total per year (kWh/year)												2648.5639	(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	111.6561	99.2098	106.3398	95.4866	93.9712	86.1875	86.0441	88.5361	88.5076	96.9070	100.8966	110.6754	(65)

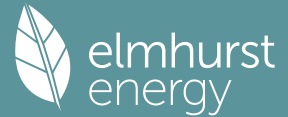
5. Internal gains (see Table 5 and 5a)

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	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	113.8255	126.0211	113.8255	117.6197	113.8255	117.6197	113.8255	113.8255	117.6197	113.8255	117.6197	113.8255	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	219.6077	221.8865	216.1439	203.9186	188.4863	173.9821	164.2925	162.0136	167.7562	179.9815	195.4138	209.9180	(68)
Pumps, fans	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	(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)	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	(71)
Total internal gains	150.0754	147.6336	142.9298	132.6202	126.3054	119.7048	115.6507	119.0002	122.9272	130.2513	140.1342	148.7572	(72)
	543.4742	555.5068	532.8648	514.1242	488.5829	471.2723	453.7343	454.8049	468.2688	484.0240	513.1333	532.4664	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	g Specific data or Table 6c	FF Specific data or Table 6c	Access factor Table 6d	Gains W
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North			3.6700		10.6334		0.4000		0.7500		0.7700		8.1132 (74)
East			2.5700		19.6403		0.4000		0.7500		0.7700		10.4939 (76)
South			6.1500		46.7521		0.4000		0.7500		0.7700		59.7765 (78)
West			0.5800		19.6403		0.4000		0.7500		0.7700		2.3683 (80)

Solar gains	80.7518	138.5643	192.4883	243.6959	277.9427	278.1894	267.2604	241.3229	210.1388	153.9048	96.9018	68.9931 (83)
Total gains	624.2260	694.0711	725.3531	757.8201	766.5256	749.4617	720.9947	696.1278	678.4076	637.9288	610.0351	601.4595 (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	49.3743	49.5527	49.7325	50.6511	50.8389	51.7993	51.7993	51.9957	51.4108	50.8389	50.4647	50.0959
alpha	4.2916	4.3035	4.3155	4.3767	4.3893	4.4533	4.4533	4.4664	4.4274	4.3893	4.3643	4.3397
util living area	0.9505	0.9232	0.8836	0.7967	0.6667	0.4898	0.3561	0.3833	0.5749	0.8043	0.9168	0.9560 (86)
Living	20.1639	20.3179	20.4960	20.7121	20.8492	20.9148	20.9275	20.9265	20.8977	20.7365	20.4378	20.1452
Non living	19.2966	19.4895	19.7103	19.9781	20.1333	20.2103	20.2205	20.2225	20.1906	20.0125	19.6510	19.2811
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	20.5723	20.3179	20.4960	20.7121	20.8492	20.9148	20.9275	20.9265	20.8977	20.7365	20.4378	20.2647 (87)
Th 2	20.2798	20.2822	20.2846	20.2968	20.2992	20.3113	20.3113	20.3138	20.3065	20.2992	20.2943	20.2895 (88)
util rest of house	0.9432	0.9125	0.8675	0.7705	0.6279	0.4406	0.3013	0.3275	0.5244	0.7741	0.9036	0.9494 (89)
MIT 2	19.8878	19.4895	19.7103	19.9781	20.1333	20.2103	20.2205	20.2225	20.1906	20.0125	19.6510	19.4628 (90)
Living area fraction									fLA = Living area / (4) =			0.1859 (91)
MIT	20.0151	19.6435	19.8564	20.1146	20.2664	20.3413	20.3520	20.3534	20.3221	20.1471	19.7973	19.6119 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0151	19.6435	19.8564	20.1146	20.2664	20.3413	20.3520	20.3534	20.3221	20.1471	19.7973	19.6119 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9402	0.9016	0.8568	0.7632	0.6261	0.4428	0.3046	0.3307	0.5256	0.7670	0.8929	0.9421 (94)
Useful gains	586.8758	625.7614	621.5170	578.3737	479.8844	331.8785	219.6087	230.2130	356.5644	489.3018	544.7174	566.6463 (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	968.4398	905.2944	817.1573	673.6751	512.6944	337.2427	220.3906	231.3429	368.2450	571.3875	765.5600	936.0766 (97)
Space heating kWh	283.8836	187.8462	145.5564	68.6170	24.4107	0.0000	0.0000	0.0000	0.0000	61.0718	159.0066	274.8562 (98a)
Space heating requirement - total per year (kWh/year)												1205.2485
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	283.8836	187.8462	145.5564	68.6170	24.4107	0.0000	0.0000	0.0000	0.0000	61.0718	159.0066	274.8562 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1205.2485
Space heating per m2										(98c) / (4) =		15.0506 (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 %)												249.2900 (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	283.8836	187.8462	145.5564	68.6170	24.4107	0.0000	0.0000	0.0000	0.0000	61.0718	159.0066	274.8562 (98)
Space heating efficiency (main heating system 1)	249.2900	249.2900	249.2900	249.2900	249.2900	0.0000	0.0000	0.0000	0.0000	249.2900	249.2900	249.2900 (210)
Space heating fuel (main heating system)	113.8769	75.3525	58.3884	27.5250	9.7921	0.0000	0.0000	0.0000	0.0000	24.4983	63.7838	110.2556 (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	263.3235	232.9056	247.3345	217.0316	210.1360	189.0643	186.2950	193.7897	196.0422	218.9652	233.3024	260.3740 (64)
Efficiency of water heater												282.2137 (216)
(217)m	282.2137	282.2137	282.2137	282.2137	282.2137	282.2137	282.2137	282.2137	282.2137	282.2137	282.2137	282.2137 (217)
Fuel for water heating, kWh/month	93.3064	82.5281	87.6409	76.9033	74.4599	66.9933	66.0120	68.6677	69.4658	77.5884	82.6687	92.2613 (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	19.5303	17.6403	19.5303	18.9003	19.5303	18.9003	19.5303	19.5303	18.9003	19.5303	18.9003	19.5303 (231)
Lighting	25.3839	20.3639	18.3355	13.4334	10.3763	8.4775	9.4656	12.3038	15.9814	20.9684	23.6838	26.0894 (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)												

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(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												483.4725	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												282.2137	
Water heating fuel used												938.4957	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.9625)													
mechanical ventilation fans (SFP = 0.9625)												229.9534	(230a)
Total electricity for the above, kWh/year												229.9534	(231)
Electricity for lighting (calculated in Appendix L)												204.8629	(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												1856.7845	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	483.4725	0.1566	75.7152	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	938.4957	0.1409	132.2541	(264)
Space and water heating			207.9693	(265)
Pumps, fans and electric keep-hot	229.9534	0.1387	31.8974	(267)
Energy for lighting	204.8629	0.1443	29.5681	(268)
Total CO2, kg/year			269.4347	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.3600	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	483.4725	1.5797	763.7649	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	938.4957	1.5211	1427.5244	(278)
Space and water heating			2191.2893	(279)
Pumps, fans and electric keep-hot	229.9534	1.5128	347.8735	(281)
Energy for lighting	204.8629	1.5338	314.2256	(282)
Total Primary energy kWh/year			2853.3884	(286)
Dwelling Primary energy Rate (DPER)			35.6300	(287)

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

1. Overall dwelling characteristics

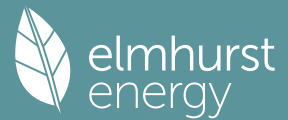
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	41.2600 (1b)	x 2.3000 (2b)	= 94.8980 (1b) - (3b)
First floor	38.8200 (1c)	x 2.6000 (2c)	= 100.9320 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.0800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 195.8300 (5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1532	(8)
Pressure test	Yes		
Pressure Test Method	Blower Door		
Measured/design AP50	5.0000		(17)
Infiltration rate	0.4032		(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) =	0.3730	(21)

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

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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	0.4755	0.4662	0.4569	0.4103	0.4009	0.3543	0.3543	0.3450	0.3730	0.4009	0.4196	0.4382 (22b)
Effective ac	0.6131	0.6087	0.6044	0.5842	0.5804	0.5628	0.5628	0.5595	0.5695	0.5804	0.5880	0.5960 (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
Main dwelling							
TER Opaque door			2.1000	1.0000	2.1000		(26)
TER Opening Type			12.9700	1.1450	14.8511		(27)
Ground Floor			41.2600	0.1300	5.3638		(28a)
External Walls	92.3200	15.0700	77.2500	0.1800	13.9050		(29a)
External Roof	41.2600		41.2600	0.1100	4.5386		(30)
Total net area of external elements Aum(A, m2)			174.8400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.7585		(33)
Main dwelling							
Party Walls			37.6500	0.0000	0.0000		(32)

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

List of Thermal Bridges							136.7838 (35)
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				11.6900	0.0500	0.5845	
E3 Sill				10.6900	0.0500	0.5345	
E4 Jamb				29.8700	0.0500	1.4935	
E5 Ground floor (normal)				19.4500	0.1600	3.1120	
E6 Intermediate floor within a dwelling				17.8400	0.0000	0.0000	
P1 Party wall - Ground floor				7.6200	0.0800	0.6096	
E16 Corner (normal)				15.0800	0.0900	1.3572	
E17 Corner (inverted - internal area greater than external area)				5.1000	-0.0900	-0.4590	
E12 Gable (insulation at ceiling level)				7.6200	0.0600	0.4572	
P4 Party wall - Roof (insulation at ceiling level)				7.6200	0.1200	0.9144	
E10 Eaves (insulation at ceiling level)				11.8300	0.0600	0.7098	
E18 Party wall between dwellings				4.9600	0.0600	0.2976	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)						9.6113 (36)	
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	50.3698 (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	39.6182	39.3345	39.0564	37.7502	37.5058	36.3682	36.3682	36.1575	36.8064	37.5058	38.0002	38.5171 (38)
Average = Sum(39)m / 12 =	89.9881	89.7043	89.4263	88.1201	87.8757	86.7380	86.7380	86.5273	87.1762	87.8757	88.3701	88.8869 (39)
												88.1189
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1237	1.1202	1.1167	1.1004	1.0973	1.0831	1.0831	1.0805	1.0886	1.0973	1.1035	1.1100 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

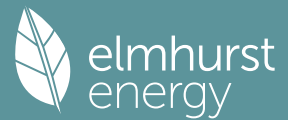
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4644 (42)
Hot water usage for mixer showers												65.2881 (42a)
Hot water usage for baths												28.2115 (42b)
Hot water usage for other uses												39.8677 (42c)
Average daily hot water use (litres/day)												122.9136 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	133.7141	130.8591	127.3821	122.0947	117.8011	113.1851	111.4110	114.8730	118.5242	123.3702	128.7390	133.3673 (44)
Energy content (annual)	211.7705	186.3416	195.7815	167.1416	158.5830	139.1743	134.7420	142.2367	146.1522	167.4122	183.4124	208.8210 (45)
Distribution loss (46)m = 0.15 x (45)m												2041.5689
Water storage loss (or HIU loss):	31.7656	27.9512	29.3672	25.0712	23.7874	20.8761	20.2113	21.3355	21.9228	25.1118	27.5119	31.3232 (46)
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6525 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8924 (55)
Total storage loss	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637 (56)
If cylinder contains dedicated solar storage	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637 (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	262.6966	232.3393	246.7076	216.4249	209.5090	188.4576	185.6680	193.1628	195.4355	218.3383	232.6956	259.7471 (62)
WWHRS	-29.9618	-26.4985	-27.7477	-22.9762	-21.4130	-18.3232	-17.1751	-18.2640	-18.9579	-22.3493	-25.3190	-29.4069 (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	232.7348	205.8409	218.9599	193.4487	188.0961	170.1344	168.4929	174.8988	176.4776	195.9890	207.3766	230.3401 (64)
12Total per year (kWh/year)												2362.7899 (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	111.1545	98.7568	105.8382	95.0012	93.4697	85.7021	85.5426	88.0346	88.0222	96.4054	100.4112	110.1738 (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
	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189 (66)

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Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	115.2851	127.6371	115.2851	119.1280	115.2851	119.1280	115.2851	115.2851	119.1280	115.2851	119.1280	115.2851 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.6077	221.8865	216.1439	203.9186	188.4863	173.9821	164.2925	162.0136	167.7562	179.9815	195.4138	209.9180 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751 (71)
Water heating gains (Table 5)	149.4013	146.9595	142.2557	131.9461	125.6313	119.0307	114.9766	118.3260	122.2531	129.5772	139.4601	148.0831 (72)
Total internal gains	547.2597	559.4488	536.6504	517.9583	492.3684	472.1065	454.5198	455.5905	469.1030	487.8095	516.9675	536.2519 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				3.6700	10.6334	0.6300	0.7000	0.7700	11.9264 (74)			
East				2.5700	19.6403	0.6300	0.7000	0.7700	15.4260 (76)			
South				6.1500	46.7521	0.6300	0.7000	0.7700	87.8714 (78)			
West				0.5800	19.6403	0.6300	0.7000	0.7700	3.4813 (80)			
Solar gains	118.7052	203.6895	282.9578	358.2330	408.5758	408.9384	392.8728	354.7447	308.9040	226.2400	142.4456	101.4199 (83)
Total gains	665.9649	763.1382	819.6081	876.1913	900.9442	881.0449	847.3926	810.3351	778.0070	714.0495	659.4131	637.6718 (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	33.8120	33.9190	34.0245	34.5288	34.6248	35.0790	35.0790	35.1644	34.9026	34.6248	34.4311	34.2309
alpha	3.2541	3.2613	3.2683	3.3019	3.3083	3.3386	3.3386	3.3443	3.3268	3.3083	3.2954	3.2821
util living area	0.9593	0.9369	0.9043	0.8365	0.7292	0.5724	0.4326	0.4669	0.6622	0.8523	0.9359	0.9640 (86)
MIT	19.1851	19.4665	19.8307	20.2951	20.6607	20.8921	20.9679	20.9581	20.8168	20.3538	19.7086	19.1470 (87)
Th 2	19.9815	19.9844	19.9872	20.0005	20.0030	20.0146	20.0146	20.0168	20.0101	20.0030	19.9980	19.9927 (88)
util rest of house	0.9522	0.9262	0.8878	0.8079	0.6815	0.5005	0.3426	0.3762	0.5940	0.8205	0.9233	0.9576 (89)
MIT 2	17.8869	18.2404	18.6948	19.2669	19.6888	19.9363	19.9987	19.9947	19.8656	19.3500	18.5583	17.8463 (90)
Living area fraction									fLA = Living area / (4) =			0.1859 (91)
MIT	18.1283	18.4684	18.9060	19.4581	19.8695	20.1140	20.1789	20.1738	20.0424	19.5366	18.7722	18.0881 (92)
Temperature adjustment												0.0000
adjusted MIT	18.1283	18.4684	18.9060	19.4581	19.8695	20.1140	20.1789	20.1738	20.0424	19.5366	18.7722	18.0881 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9346	0.9057	0.8661	0.7900	0.6745	0.5081	0.3581	0.3912	0.5964	0.8030	0.9033	0.9412 (94)
Useful gains	622.4393	691.1893	709.8784	692.2122	607.6594	447.6735	303.4581	317.0251	463.9965	573.3776	595.6253	600.1893 (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	1244.3791	1217.1443	1109.4206	930.3819	717.9008	478.2749	310.4308	326.5375	518.0385	785.3132	1031.4705	1234.4708 (97)
Space heating kWh	462.7232	353.4418	297.2594	171.4822	82.0196	0.0000	0.0000	0.0000	0.0000	157.6801	313.8085	471.9054 (98a)
Space heating requirement - total per year (kWh/year)												2310.3203
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	462.7232	353.4418	297.2594	171.4822	82.0196	0.0000	0.0000	0.0000	0.0000	157.6801	313.8085	471.9054 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2310.3203
Space heating per m2										(98c) / (4) =		28.8502 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	462.7232	353.4418	297.2594	171.4822	82.0196	0.0000	0.0000	0.0000	0.0000	157.6801	313.8085	471.9054 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	501.3252	382.9272	322.0579	185.7879	88.8620	0.0000	0.0000	0.0000	0.0000	170.8343	339.9876	511.2735 (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	232.7348	205.8409	218.9599	193.4487	188.0961	170.1344	168.4929	174.8988	176.4776	195.9890	207.3766	230.3401 (64)
Efficiency of water heater (217)m	85.5704	85.2609	84.7460	83.7906	82.3338	79.8000	79.8000	79.8000	79.8000	83.5765	84.9862	79.8000 (216)
Fuel for water heating, kWh/month	271.9806	241.4246	258.3722	230.8718	228.4554	213.2010	211.1440	219.1715	221.1498	234.5024	244.0121	268.9877 (219)
Space cooling fuel requirement												

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(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	(231)
Lighting	23.9540	19.2168	17.3026	12.6766	9.7918	8.0000	8.9324	11.6107	15.0811	19.7872	22.3496	24.6197	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-38.1899	-53.6275	-76.7833	-85.9847	-92.4264	-86.1630	-85.0927	-80.4714	-72.2739	-61.1552	-41.9078	-33.0421	(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	-22.2229	-46.6774	-92.6464	-138.9661	-183.5759	-184.3925	-182.2262	-154.3715	-113.2552	-66.6962	-29.6518	-17.5790	(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												2503.0555	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2843.2731	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												193.3223	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2039.3788	(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												3586.2721	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2503.0555	0.2100	525.6417 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2843.2731	0.2100	597.0873 (264)
Space and water heating			1122.7290 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	193.3223	0.1443	27.9024 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-807.1177	0.1347	-108.6954
PV Unit electricity exported	-1232.2610	0.1259	-155.1839
Total			-263.8793 (269)
Total CO2, kg/year			898.6813 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.2200 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2503.0555	1.1300	2828.4527 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2843.2731	1.1300	3212.8986 (278)
Space and water heating			6041.3513 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	193.3223	1.5338	296.5242 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-807.1177	1.4977	-1208.8413
PV Unit electricity exported	-1232.2610	0.4623	-569.6339
Total			-1778.4752 (283)
Total Primary energy kWh/year			4689.5011 (286)
Target Primary Energy Rate (TPER)			58.5600 (287)

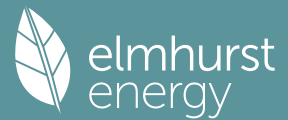
SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	41.2600 (1b)	x 2.3000 (2b)	= 94.8980 (1b) - (3b)
First floor	38.8200 (1c)	x 2.6000 (2c)	= 100.9320 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.0800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 195.8300 (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											3 * 10 =	30.0000 (7a)	
Number of passive vents											0 * 10 =	0.0000 (7b)	
Number of flueless gas fires											0 * 40 =	0.0000 (7c)	
											Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											30.0000 / (5) =	0.1532 (8)	
Pressure test											Yes		
Pressure Test Method											Blower Door		
Measured/design AP50											2.9700 (17)		
Infiltration rate											0.3017 (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) =	0.2791 (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	0.3558	0.3488	0.3419	0.3070	0.3000	0.2651	0.2651	0.2581	0.2791	0.3000	0.3140	0.3279 (22b)	
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													0.0000 (23c)
Effective ac	0.5633	0.5608	0.5584	0.5471	0.5450	0.5351	0.5351	0.5333	0.5389	0.5450	0.5493	0.5538 (25)	

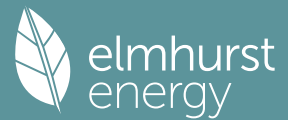
3. Heat losses and heat loss parameter

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						
Main dwelling													
Window			12.9700	1.2357	16.0276			(27)					
Door			2.1000	1.4000	2.9400			(26)					
Ground Floor			41.2600	0.1300	5.3638	110.0000	4538.6000	(28a)					
External Walls	92.3200	15.0700	77.2500	0.1500	11.5875	18.0000	1390.5000	(29a)					
External Roof	41.2600		41.2600	0.1100	4.5386	9.0000	371.3400	(30)					
Total net area of external elements Aum(A, m2)			174.8400					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.4575			(33)					
Main dwelling													
Party Walls			37.6500	0.0000	0.0000	70.0000	2635.5001	(32)					
Internal Walls			53.4100			9.0000	480.6900	(32c)					
Internal Walls			54.3200			9.0000	488.8800	(32c)					
Internal Floor			38.8200			18.0000	698.7600	(32d)					
Internal Ceiling			38.8200			9.0000	349.3800	(32e)					
Heat capacity Cm = Sum(A x k)								(28)...(30) + (32) + (32a)...(32e) = 10953.6501 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								136.7838 (35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value	Total							
E2 Other lintels (including other steel lintels)				11.6900	0.0930	1.0872							
E3 Sill				10.6900	-0.0590	-0.6307							
E4 Jamb				29.8700	-0.0650	-1.9416							
E5 Ground floor (normal)				19.4500	0.0300	0.5835							
E6 Intermediate floor within a dwelling				17.8400	0.0180	0.3211							
P1 Party wall - Ground floor				7.6200	0.1010	0.7696							
E16 Corner (normal)				15.0800	0.1170	1.7644							
E17 Corner (inverted - internal area greater than external area)				5.1000	0.0400	0.2040							
E12 Gable (insulation at ceiling level)				7.6200	0.0390	0.2972							
P4 Party wall - Roof (insulation at ceiling level)				7.6200	0.1010	0.7696							
E10 Eaves (insulation at ceiling level)				11.8300	0.0430	0.5087							
E18 Party wall between dwellings				4.9600	0.0540	0.2678							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.0008	(36)					
Point Thermal bridges							(36a) = 0.0000						
Total fabric heat loss							(33) + (36) + (36a) = 44.4583	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 36.4027	Feb 36.2438	Mar 36.0881	Apr 35.3568	May 35.2200	Jun 34.5830	Jul 34.5830	Aug 34.4650	Sep 34.8284	Oct 35.2200	Nov 35.4968	Dec 35.7862	(38)
Heat transfer coeff	80.8610	80.7021	80.5464	79.8151	79.6783	79.0413	79.0413	78.9234	79.2867	79.6783	79.9551	80.2445	(39)
Average = Sum(39)m / 12 =												79.8144	
HLP	Jan 1.0098	Feb 1.0078	Mar 1.0058	Apr 0.9967	May 0.9950	Jun 0.9870	Jul 0.9870	Aug 0.9856	Sep 0.9901	Oct 0.9950	Nov 0.9984	Dec 1.0021	(40)
HLP (average)												0.9967	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4644 (42)											
Hot water usage for mixer showers	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (42a)											
Hot water usage for baths	28.3072	27.8868	27.2948	26.2032	25.3859	24.4796	23.9900	24.5779	25.2180	26.1878	27.3018	28.2115
Hot water usage for other uses	39.8677	38.4180	36.9682	35.5185	34.0688	32.6190	32.6190	34.0688	35.5185	36.9682	38.4180	39.8677
Average daily hot water use (litres/day)												62.4886
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	68.1749	66.3048	64.2630	61.7217	59.4546	57.0986	56.6090	58.6467	60.7365	63.1560	65.7198	68.0792
Energy content (annual)	107.9724	94.4171	98.7699	84.4940	80.0374	70.2094	68.4637	72.6168	74.8941	85.7021	93.6299	106.5956
Distribution loss (46)m = 0.15 x (45)m	Total = Sum(45)m = 1037.8024											
Water storage loss (or HIU 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
Total storage loss												

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If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (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	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	91.7765	80.2546	83.9544	71.8199	68.0318	59.6780	58.1942	61.7243	63.6600	72.8468	79.5854	90.6063 (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)
12Total per year (kWh/year)	91.7765	80.2546	83.9544	71.8199	68.0318	59.6780	58.1942	61.7243	63.6600	72.8468	79.5854	90.6063 (64)
Electric shower(s)								Total per year (kWh/year) = Sum(64)m =				882.1321 (64)
	52.4860	46.7654	51.0661	48.7317	49.6462	47.3576	48.9362	49.6462	48.7317	51.0661	50.1058	52.4860 (64a)
Heat gains from water heating, kWh/month								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				597.0250 (64a)
	36.0656	31.7550	33.7551	30.1379	29.4195	26.7589	26.7826	27.8426	28.0979	30.9782	32.4228	35.7731 (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	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	113.8255	126.0211	113.8255	117.6197	113.8255	117.6197	113.8255	113.8255	117.6197	113.8255	117.6197	113.8255	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.6077	221.8865	216.1439	203.9186	188.4863	173.9821	164.2925	162.0136	167.7562	179.9815	195.4138	209.9180	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	(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)	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	(71)
Water heating gains (Table 5)	48.4753	47.2545	45.3698	41.8582	39.5423	37.1651	35.9981	37.4229	39.0249	41.6374	45.0317	48.0821	(72)
Total internal gains	441.8741	455.1277	435.3048	423.3621	401.8198	388.7326	374.0817	373.2276	384.3665	395.4101	418.0308	431.7912	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North				3.6700	10.6334		0.4000		0.7500		0.7700		8.1132 (74)
East				2.5700	19.6403		0.4000		0.7500		0.7700		10.4939 (76)
South				6.1500	46.7521		0.4000		0.7500		0.7700		59.7765 (78)
West				0.5800	19.6403		0.4000		0.7500		0.7700		2.3683 (80)
Solar gains	80.7518	138.5643	192.4883	243.6959	277.9427	278.1894	267.2604	241.3229	210.1388	153.9048	96.9018	68.9931	(83)
Total gains	522.6259	593.6920	627.7931	667.0580	679.7625	666.9220	641.3421	614.5506	594.5053	549.3148	514.9326	500.7844	(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	37.6285	37.7026	37.7755	38.1216	38.1871	38.4948	38.4948	38.5523	38.3757	38.1871	38.0549	37.9176	
alpha	3.5086	3.5135	3.5184	3.5414	3.5458	3.5663	3.5663	3.5702	3.5584	3.5458	3.5370	3.5278	
util living area	0.9778	0.9643	0.9446	0.8975	0.8124	0.6632	0.5125	0.5502	0.7471	0.9072	0.9636	0.9807	(86)
MIT	19.1773	19.4208	19.7501	20.1998	20.5882	20.8610	20.9582	20.9455	20.7752	20.2796	19.6596	19.1348	(87)
Th 2	20.0752	20.0769	20.0785	20.0861	20.0875	20.0942	20.0942	20.0954	20.0916	20.0875	20.0846	20.0816	(88)
util rest of house	0.9737	0.9579	0.9342	0.8773	0.7733	0.5939	0.4182	0.4566	0.6862	0.8849	0.9560	0.9772	(89)
MIT 2	18.4103	18.6513	18.9758	19.4155	19.7765	20.0107	20.0767	20.0712	19.9450	19.4990	18.8952	18.3730	(90)
Living area fraction	18.5529	18.7944	19.1198	19.5613	19.9274	20.1688	20.2406	20.2337	20.0994	19.6441	19.0373	18.5146	(91)
MIT	18.5529	18.7944	19.1198	19.5613	19.9274	20.1688	20.2406	20.2337	20.0994	19.6441	19.0373	18.5146	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5529	18.7944	19.1198	19.5613	19.9274	20.1688	20.2406	20.2337	20.0994	19.6441	19.0373	18.5146	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	504.2927	561.9819	578.1075	576.0838	520.4649	400.1619	278.4186	289.8318	408.2892	478.9538	486.4680	485.3228	(94)
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	1152.5062	1121.3085	1016.4786	850.9352	655.5454	440.1636	287.7614	302.5706	475.6709	720.6216	954.4484	1148.6688	(97)
Space heating kWh	482.2708	375.8675	326.1481	197.8930	100.4999	0.0000	0.0000	0.0000	0.0000	179.8008	336.9459	493.5294	(98a)
Space heating requirement - total per year (kWh/year)												2492.9555	
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	482.2708	375.8675	326.1481	197.8930	100.4999	0.0000	0.0000	0.0000	0.0000	179.8008	336.9459	493.5294	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2492.9555	
Space heating per m ²										(98c) / (4) =		31.1308	(99)

8c. Space cooling requirement

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Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W												
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	742.9883	584.9057	599.8175	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.7760	0.8479	0.8257	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	576.5260	495.9237	495.2949	0.0000	0.0000	0.0000	0.0000 (102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	733.4939	705.8926	676.8262	0.0000	0.0000	0.0000	0.0000 (103)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	113.0169	156.2169	135.0592	0.0000	0.0000	0.0000	0.0000 (104)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	28.2542	39.0542	33.7648	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling requirement												101.0732 (107)
Energy for space heating												31.1308 (99)
Energy for space cooling												1.2622 (108)
Total												32.3930 (109)
Fabric Energy Efficiency (DFEE)												32.4 (109)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	41.2600 (1b)	x 2.3000 (2b)	= 94.8980 (1b) - (3b)
First floor	38.8200 (1c)	x 2.6000 (2c)	= 100.9320 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.0800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 195.8300 (5)

2. Ventilation rate

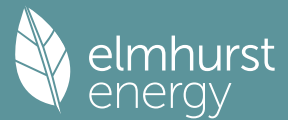
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1532 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4032 (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) = 0.3730 (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	0.4755	0.4662	0.4569	0.4103	0.4009	0.3543	0.3543	0.3450	0.3730	0.4009	0.4196	0.4382 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.6131	0.6087	0.6044	0.5842	0.5804	0.5628	0.5628	0.5595	0.5695	0.5804	0.5880	0.5960 (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
Main dwelling							
TER Opaque door			2.1000	1.0000	2.1000		(26)
TER Opening Type			12.9700	1.1450	14.8511		(27)
Ground Floor			41.2600	0.1300	5.3638		(28a)
External Walls	92.3200	15.0700	77.2500	0.1800	13.9050		(29a)
External Roof	41.2600		41.2600	0.1100	4.5386		(30)
Total net area of external elements Aum(A, m ²)			174.8400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.7585		(33)
Main dwelling							
Party Walls			37.6500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							136.7838 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value		Total
E2 Other lintels (including other steel lintels)				11.6900	0.0500		0.5845
E3 Sill				10.6900	0.0500		0.5345
E4 Jamb				29.8700	0.0500		1.4935
E5 Ground floor (normal)				19.4500	0.1600		3.1120
E6 Intermediate floor within a dwelling				17.8400	0.0000		0.0000
P1 Party wall - Ground floor				7.6200	0.0800		0.6096

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E16 Corner (normal)													15.0800	0.0900	1.3572
E17 Corner (inverted - internal area greater than external area)													5.1000	-0.0900	-0.4590
E12 Gable (insulation at ceiling level)													7.6200	0.0600	0.4572
P4 Party wall - Roof (insulation at ceiling level)													7.6200	0.1200	0.9144
E10 Eaves (insulation at ceiling level)													11.8300	0.0600	0.7098
E18 Party wall between dwellings													4.9600	0.0600	0.2976
Thermal bridges (Sum(L x Psi) calculated using Appendix K)															9.6113 (36)
Point Thermal bridges															0.0000
Total fabric heat loss													(33) + (36) + (36a) =		50.3698 (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	39.6182	39.3345	39.0564	37.7502	37.5058	36.3682	36.3682	36.1575	36.8064	37.5058	38.0002	38.5171	(38)		
Average = Sum(39)m / 12 =	89.9881	89.7043	89.4263	88.1201	87.8757	86.7380	86.7380	86.5273	87.1762	87.8757	88.3701	88.8869	(39)		
												88.1189			
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
HLP (average)	1.1237	1.1202	1.1167	1.1004	1.0973	1.0831	1.0831	1.0805	1.0886	1.0973	1.1035	1.1100	(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															2.4644 (42)
Hot water usage for mixer showers															
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)		
Hot water usage for baths															
	28.3072	27.8868	27.2948	26.2032	25.3859	24.4796	23.9900	24.5779	25.2180	26.1878	27.3018	28.2115	(42b)		
Hot water usage for other uses															
	39.8677	38.4180	36.9682	35.5185	34.0688	32.6190	32.6190	34.0688	35.5185	36.9682	38.4180	39.8677	(42c)		
Average daily hot water use (litres/day)															62.4886 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
	68.1749	66.3048	64.2630	61.7217	59.4546	57.0986	56.6090	58.6467	60.7365	63.1560	65.7198	68.0792	(44)		
Energy conte	107.9724	94.4171	98.7699	84.4940	80.0374	70.2094	68.4637	72.6168	74.8941	85.7021	93.6299	106.5956	(45)		
Energy content (annual)															
Distribution loss	(46)m = 0.15 x (45)m														
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)		
Water storage loss (or HIU loss):															
Total storage loss															
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)		
If cylinder contains dedicated solar storage															
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)		
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)		
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)		
Total heat required for water heating calculated for each month															
	91.7765	80.2546	83.9544	71.8199	68.0318	59.6780	58.1942	61.7243	63.6600	72.8468	79.5854	90.6063	(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															
	91.7765	80.2546	83.9544	71.8199	68.0318	59.6780	58.1942	61.7243	63.6600	72.8468	79.5854	90.6063	(64)		
12Total per year (kWh/year)															
Electric shower(s)															
	52.4860	46.7654	51.0661	48.7317	49.6462	47.3576	48.9362	49.6462	48.7317	51.0661	50.1058	52.4860	(64a)		
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =															597.0250 (64a)
Heat gains from water heating, kWh/month															
	36.0656	31.7550	33.7551	30.1379	29.4195	26.7589	26.7826	27.8426	28.0979	30.9782	32.4228	35.7731	(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			
	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	(66)		
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5															
	115.2851	127.6371	115.2851	119.1280	115.2851	119.1280	115.2851	115.2851	119.1280	115.2851	119.1280	115.2851	(67)		
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5															
	219.6077	221.8865	216.1439	203.9186	188.4863	173.9821	164.2925	162.0136	167.7562	179.9815	195.4138	209.9180	(68)		
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5															
	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	(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)															
	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	(71)		
Water heating gains (Table 5)															
	48.4753	47.2545	45.3698	41.8582	39.5423	37.1651	35.9981	37.4229	39.0249	41.6374	45.0317	48.0821	(72)		
Total internal gains															
	443.3338	456.7437	436.7645	424.8704	403.2794	390.2409	375.5414	374.6873	385.8748	396.8697	419.5391	433.2509	(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			3.6700	10.6334	0.6300	0.7000	0.7700	11.9264	(74)						
East			2.5700	19.6403	0.6300	0.7000	0.7700	15.4260	(76)						
South			6.1500	46.7521	0.6300	0.7000	0.7700	87.8714	(78)						
West			0.5800	19.6403	0.6300	0.7000	0.7700	3.4813	(80)						

Solar gains	118.7052	203.6895	282.9578	358.2330	408.5758	408.9384	392.8728	354.7447	308.9040	226.2400	142.4456	101.4199	(83)		
Total gains	562.0389	660.4332	719.7223	783.1034	811.8552	799.1793	768.4142	729.4320	694.7788	623.1097	561.9847	534.6708	(84)		

7. Mean internal temperature (heating season)															

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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	33.8120	33.9190	34.0245	34.5288	34.6248	35.0790	35.0790	35.1644	34.9026	34.6248	34.4311	34.2309
alpha	3.2541	3.2613	3.2683	3.3019	3.3083	3.3386	3.3386	3.3443	3.3268	3.3083	3.2954	3.2821
util living area	0.9741	0.9561	0.9293	0.8696	0.7704	0.6155	0.4713	0.5104	0.7107	0.8891	0.9573	0.9777 (86)
MIT	18.9931	19.2908	19.6784	20.1852	20.5941	20.8656	20.9585	20.9453	20.7714	20.2382	19.5413	18.9530 (87)
Th 2	19.9815	19.9844	19.9872	20.0005	20.0030	20.0146	20.0146	20.0168	20.0101	20.0030	19.9980	19.9927 (88)
util rest of house	0.9693	0.9482	0.9161	0.8447	0.7253	0.5420	0.3755	0.4142	0.6439	0.8626	0.9482	0.9735 (89)
MIT 2	18.1615	18.4558	18.8363	19.3307	19.7051	19.9371	19.9983	19.9938	19.8662	19.3917	18.7156	18.1299 (90)
Living area fraction									fLA = Living area /	(4) =		0.1859 (91)
MIT	18.3161	18.6110	18.9929	19.4896	19.8704	20.1098	20.1769	20.1707	20.0345	19.5491	18.8691	18.2829 (92)
Temperature adjustment												0.0000
adjusted MIT	18.3161	18.6110	18.9929	19.4896	19.8704	20.1098	20.1769	20.1707	20.0345	19.5491	18.8691	18.2829 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9587	0.9344	0.9002	0.8298	0.7187	0.5496	0.3919	0.4300	0.6457	0.8481	0.9349	0.9639 (94)
Useful gains	538.8434	617.1269	647.8810	649.8200	583.4722	439.2320	301.1155	313.6527	448.6249	528.4899	525.4058	515.3898 (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	1261.2824	1229.9405	1117.1923	933.1524	717.9759	477.9064	310.2501	326.2689	517.3451	786.4077	1040.0356	1251.7876 (97)
Space heating kWh	537.4946	411.8108	349.1676	203.9993	100.0707	0.0000	0.0000	0.0000	0.0000	191.8908	370.5334	547.8800 (98a)
Space heating requirement - total per year (kWh/year)												2712.8473
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	537.4946	411.8108	349.1676	203.9993	100.0707	0.0000	0.0000	0.0000	0.0000	191.8908	370.5334	547.8800 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2712.8473
Space heating per m2										(98c) / (4) =		33.8767 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	815.3374	641.8613	657.6078	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8006	0.8648	0.8425	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	652.7392	555.0983	554.0488	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	886.4451	852.8502	809.5765	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	168.2683	221.5274	190.1126	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fC = cooled area /	(4) =		1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	42.0671	55.3819	47.5281	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												144.9771 (107)
Energy for space heating												33.8767 (99)
Energy for space cooling												1.8104 (108)
Total												35.6871 (109)
Fabric Energy Efficiency (TFEE)												35.7 (109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)

CALCULATION OF ENERGY RATING

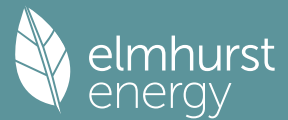
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	41.2600 (1b)	x 2.3000 (2b)	= 94.8980 (1b) - (3b)
First floor	38.8200 (1c)	x 2.6000 (2c)	= 100.9320 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.0800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	195.8300 (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												2.9700 (17)
Infiltration rate												0.1485 (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) = 0.1374 (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)
	0.1751	0.1717	0.1683	0.1511	0.1477	0.1305	0.1305	0.1271	0.1374	0.1477	0.1545	0.1614 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.9000 (23c)
Effective ac	0.2656	0.2622	0.2588	0.2416	0.2382	0.2210	0.2210	0.2176	0.2279	0.2382	0.2450	0.2519 (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
Main dwelling							
Window			12.9700	1.2357	16.0276		(27)
Door			2.1000	1.4000	2.9400		(26)
Ground Floor			41.2600	0.1300	5.3638	110.0000	4538.6000 (28a)
External Walls	92.3200	15.0700	77.2500	0.1500	11.5875	18.0000	1390.5000 (29a)
External Roof	41.2600		41.2600	0.1100	4.5386	9.0000	371.3400 (30)
Total net area of external elements Aum(A, m2)			174.8400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.4575		(33)
Main dwelling							
Party Walls			37.6500	0.0000	0.0000	70.0000	2635.5001 (32)
Internal Walls			53.4100			9.0000	480.6900 (32c)
Internal Walls			54.3200			9.0000	488.8800 (32c)
Internal Floor			38.8200			18.0000	698.7600 (32d)
Internal Ceiling			38.8200			9.0000	349.3800 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 10953.6501 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 136.7838 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.6900	0.0930	1.0872
E3 Sill	10.6900	-0.0590	-0.6307
E4 Jamb	29.8700	-0.0650	-1.9416
E5 Ground floor (normal)	19.4500	0.0300	0.5835
E6 Intermediate floor within a dwelling	17.8400	0.0180	0.3211
P1 Party wall - Ground floor	7.6200	0.1010	0.7696
E16 Corner (normal)	15.0800	0.1170	1.7644
E17 Corner (inverted - internal area greater than external area)	5.1000	0.0400	0.2040
E12 Gable (insulation at ceiling level)	7.6200	0.0390	0.2972
P4 Party wall - Roof (insulation at ceiling level)	7.6200	0.1010	0.7696
E10 Eaves (insulation at ceiling level)	11.8300	0.0430	0.5087
E18 Party wall between dwellings	4.9600	0.0540	0.2678

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.0008 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 44.4583 (37)

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

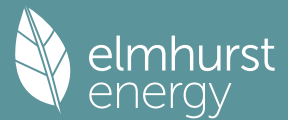
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	17.1665	16.9446	16.7227	15.6131	15.3911	14.2815	14.2815	14.0596	14.7254	15.3911	15.8350	16.2788 (38)
Average = Sum(39)m / 12 =	61.6248	61.4029	61.1810	60.0714	59.8494	58.7398	58.7398	58.5179	59.1837	59.8494	60.2933	60.7371 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7695	0.7668	0.7640	0.7501	0.7474	0.7335	0.7335	0.7307	0.7391	0.7474	0.7529	0.7585 (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												2.4644 (42)
Hot water usage for mixer showers												
Hot water usage for baths	65.5392	64.5543	63.1191	60.3730	58.3465	56.0865	54.8020	56.2263	57.7877	60.2142	63.0193	65.2881 (42a)
Hot water usage for other uses	28.3072	27.8868	27.2948	26.2032	25.3859	24.4796	23.9900	24.5779	25.2180	26.1878	27.3018	28.2115 (42b)
Average daily hot water use (litres/day)	39.8677	38.4180	36.9682	35.5185	34.0688	32.6190	32.6190	34.0688	35.5185	36.9682	38.4180	39.8677 (42c)
												122.9136 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	133.7141	130.8591	127.3821	122.0947	117.8011	113.1851	111.4110	114.8730	118.5242	123.3702	128.7390	133.3673 (44)
Energy content (annual)	211.7705	186.3416	195.7815	167.1416	158.5830	139.1743	134.7420	142.2367	146.1522	167.4122	183.4124	208.8210 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2041.5689
Water storage loss (or HIU loss):	31.7656	27.9512	29.3672	25.0712	23.7874	20.8761	20.2113	21.3355	21.9228	25.1118	27.5119	31.3232 (46)
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6900 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9126 (55)
Total storage loss	28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906 (56)
If cylinder contains dedicated solar storage												
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (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 (61)
Total heat required for water heating calculated for each month	263.3235	232.9056	247.3345	217.0316	210.1360	189.0643	186.2950	193.7897	196.0422	218.9652	233.3024	260.3740 (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	263.3235	232.9056	247.3345	217.0316	210.1360	189.0643	186.2950	193.7897	196.0422	218.9652	233.3024	260.3740 (64)
	Total per year (kWh/year) = Sum(64)m =											2648.5639 (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	111.6561	99.2098	106.3398	95.4866	93.9712	86.1875	86.0441	88.5361	88.5076	96.9070	100.8966	110.6754 (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	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.0005	25.7580	20.9478	15.8588	11.8547	10.0082	10.8142	14.0567	18.8669	23.9559	27.9600	29.8065	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.7726	331.1739	322.6028	304.3561	281.3228	259.6748	245.2126	241.8114	250.3824	268.6292	291.6624	313.3104	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	(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)	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	(71)
Water heating gains (Table 5)	150.0754	147.6336	142.9298	132.6202	126.3054	119.7048	115.6507	119.0002	122.9272	130.2513	140.1342	148.7572	(72)
Total internal gains	608.3867	606.1036	588.0186	554.3733	521.0211	490.9260	473.2157	476.4064	493.7147	524.3745	561.2948	593.4123	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d		Gains W	
North				3.6700	10.6334	0.4000	0.7500		0.7700		8.1132 (74)	
East				2.5700	19.6403	0.4000	0.7500		0.7700		10.4939 (76)	
South				6.1500	46.7521	0.4000	0.7500		0.7700		59.7765 (78)	
West				0.5800	19.6403	0.4000	0.7500		0.7700		2.3683 (80)	
Solar gains	80.7518	138.5643	192.4883	243.6959	277.9427	278.1894	267.2604	241.3229	210.1388	153.9048	96.9018	68.9931 (83)
Total gains	689.1385	744.6679	780.5069	798.0692	798.9638	769.1154	740.4761	717.7293	703.8535	678.2793	658.1966	662.4055 (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	49.3743	49.5527	49.7325	50.6511	50.8389	51.7993	51.7993	51.9957	51.4108	50.8389	50.4647	50.0959
alpha	4.2916	4.3035	4.3155	4.3767	4.3893	4.4533	4.4533	4.4664	4.4274	4.3893	4.3643	4.3397
util living area	0.9329	0.9062	0.8599	0.7741	0.6462	0.4783	0.3469	0.3721	0.5571	0.7779	0.8971	0.9403 (86)
Living	20.2508	20.3777	20.5491	20.7370	20.8584	20.9162	20.9278	20.9270	20.9014	20.7621	20.4927	20.2294
Non living	19.4039	19.5621	19.7730	20.0056	20.1424	20.2114	20.2207	20.2227	20.1937	20.0402	19.7168	19.3855
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	20.6168	20.3777	20.5491	20.7370	20.8584	20.9162	20.9278	20.9270	20.9014	20.7621	20.4927	20.3372 (87)
Th 2	20.2798	20.2822	20.2846	20.2968	20.2992	20.3113	20.3113	20.3138	20.3065	20.2992	20.2943	20.2895 (88)
util rest of house	0.9236	0.8939	0.8419	0.7468	0.6075	0.4300	0.2935	0.3178	0.5074	0.7461	0.8817	0.9319 (89)
MIT 2	19.9306	19.5621	19.7730	20.0056	20.1424	20.2114	20.2207	20.2227	20.1937	20.0402	19.7168	19.5484 (90)
Living area fraction									FLA =	Living area / (4) =		0.1859 (91)
MIT	20.0582	19.7138	19.9173	20.1416	20.2755	20.3424	20.3522	20.3537	20.3253	20.1744	19.8610	19.6950 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0582	19.7138	19.9173	20.1416	20.2755	20.3424	20.3522	20.3537	20.3253	20.1744	19.8610	19.6950 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9204	0.8828	0.8318	0.7404	0.6061	0.4322	0.2967	0.3210	0.5088	0.7401	0.8711	0.9238	(94)
Useful gains	634.2902	657.3778	649.1927	590.9199	484.2638	332.4340	219.6997	230.3610	358.1343	501.9704	573.3340	611.9382	(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	971.0961	909.6095	820.8854	675.2965	513.2404	337.3104	220.4022	231.3614	368.4379	573.0248	769.4052	941.1247	(97)
Space heating kWh	250.5836	169.4997	127.7394	60.7512	21.5586	0.0000	0.0000	0.0000	0.0000	52.8645	141.1713	244.9147	(98a)
Space heating requirement - total per year (kWh/year)												1069.0828	
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	250.5836	169.4997	127.7394	60.7512	21.5586	0.0000	0.0000	0.0000	0.0000	52.8645	141.1713	244.9147	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1069.0828	
Space heating per m2												(98c) / (4) =	13.3502 (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 %)	249.2900	(206)

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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	250.5836	169.4997	127.7394	60.7512	21.5586	0.0000	0.0000	0.0000	0.0000	52.8645	141.1713	244.9147	(98)
Space heating efficiency (main heating system 1)	249.2900	249.2900	249.2900	249.2900	249.2900	0.0000	0.0000	0.0000	0.0000	249.2900	249.2900	249.2900	(210)
Space heating fuel (main heating system)	100.5189	67.9930	51.2413	24.3697	8.6480	0.0000	0.0000	0.0000	0.0000	21.2060	56.6293	98.2449	(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													
Water heating requirement	263.3235	232.9056	247.3345	217.0316	210.1360	189.0643	186.2950	193.7897	196.0422	218.9652	233.3024	260.3740	(64)
Efficiency of water heater (217)m	282.2137	282.2137	282.2137	282.2137	282.2137	282.2137	282.2137	282.2137	282.2137	282.2137	282.2137	282.2137	(216)
Fuel for water heating, kWh/month	93.3064	82.5281	87.6409	76.9033	74.4599	66.9933	66.0120	68.6677	69.4658	77.5884	82.6687	92.2613	(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	19.5303	17.6403	19.5303	18.9003	19.5303	18.9003	19.5303	19.5303	18.9003	19.5303	18.9003	19.5303	(231)
Lighting	25.3839	20.3639	18.3355	13.4334	10.3763	8.4775	9.4656	12.3038	15.9814	20.9684	23.6838	26.0894	(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												428.8511	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												282.2137	
Water heating fuel used												938.4957	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.9625)													
mechanical ventilation fans (SFP = 0.9625)												229.9534	(230a)
Total electricity for the above, kWh/year												229.9534	(231)
Electricity for lighting (calculated in Appendix L)												204.8629	(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												1802.1631	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price £/kWh	Fuel cost £/year	
Space heating - main system 1	428.8511	16.4900	70.7175	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	938.4957	16.4900	154.7579	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	229.9534	16.4900	37.9193	(249)
Energy for lighting	204.8629	16.4900	33.7819	(250)
Additional standing charges			0.0000	(251)
Total energy cost			297.1767	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)		0.8553	(257)
SAP value	[(255) x (256)] / [(4) + 45.0] =	86.1352	
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	428.8511	0.1566	67.1787	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	938.4957	0.1409	132.2541	(264)
Space and water heating			199.4328	(265)
Pumps, fans and electric keep-hot	229.9534	0.1387	31.8974	(267)
Energy for lighting	204.8629	0.1443	29.5681	(268)
Total CO2, kg/year			260.8982	(272)
CO2 emissions per m2			3.2600	(273)
EI value			97.2050	

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EI rating
EI band

97 (274)
A

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	41.2600 (1b)	x 2.3000 (2b)	= 94.8980 (1b) - (3b)
First floor	38.8200 (1c)	x 2.6000 (2c)	= 100.9320 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.0800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 195.8300 (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		2.9700	(17)
Infiltration rate		0.1485	(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) =	0.1374	(21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	4.1000	3.8000	3.7000	3.5000	3.5000	3.2000	3.3000	3.1000	3.1000	3.4000	3.3000	3.7000
Wind factor	1.0250	0.9500	0.9250	0.8750	0.8750	0.8000	0.8250	0.7750	0.7750	0.8500	0.8250	0.9250
Adj infilt rate	0.1408	0.1305	0.1271	0.1202	0.1202	0.1099	0.1133	0.1065	0.1065	0.1168	0.1133	0.1271
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.9000 (23c)
Effective ac	0.2313	0.2210	0.2176	0.2107	0.2107	0.2004	0.2038	0.1970	0.1970	0.2073	0.2038	0.2176

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
Main dwelling							
Window			12.9700	1.2357	16.0276		(27)
Door			2.1000	1.4000	2.9400		(26)
Ground Floor			41.2600	0.1300	5.3638	110.0000	4538.6000 (28a)
External Walls	92.3200	15.0700	77.2500	0.1500	11.5875	18.0000	1390.5000 (29a)
External Roof	41.2600		41.2600	0.1100	4.5386	9.0000	371.3400 (30)
Total net area of external elements Aum(A, m ²)			174.8400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.4575		(33)
Main dwelling							
Party Walls			37.6500	0.0000	0.0000	70.0000	2635.5001 (32)
Internal Walls			53.4100			9.0000	480.6900 (32c)
Internal Walls			54.3200			9.0000	488.8800 (32c)
Internal Floor			38.8200			18.0000	698.7600 (32d)
Internal Ceiling			38.8200			9.0000	349.3800 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10953.6501 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		136.7838 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.6900	0.0930	1.0872
E3 Sill	10.6900	-0.0590	-0.6307
E4 Jamb	29.8700	-0.0650	-1.9416
E5 Ground floor (normal)	19.4500	0.0300	0.5835
E6 Intermediate floor within a dwelling	17.8400	0.0180	0.3211
P1 Party wall - Ground floor	7.6200	0.1010	0.7696
E16 Corner (normal)	15.0800	0.1170	1.7644
E17 Corner (inverted - internal area greater than external area)	5.1000	0.0400	0.2040
E12 Gable (insulation at ceiling level)	7.6200	0.0390	0.2972
P4 Party wall - Roof (insulation at ceiling level)	7.6200	0.1010	0.7696
E10 Eaves (insulation at ceiling level)	11.8300	0.0430	0.5087
E18 Party wall between dwellings	4.9600	0.0540	0.2678

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		4.0008 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	44.4583 (37)

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

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(38)m	Jan 14.9473	Feb 14.2815	Mar 14.0596	Apr 13.6158	May 13.6158	Jun 12.9500	Jul 13.1719	Aug 12.7281	Sep 12.7281	Oct 13.3938	Nov 13.1719	Dec 14.0596	(38)
Heat transfer coeff	59.4056	58.7398	58.5179	58.0741	58.0741	57.4083	57.6302	57.1864	57.1864	57.8521	57.6302	58.5179	(39)
Average = Sum(39)m / 12 =												58.0186	

HLP	Jan 0.7418	Feb 0.7335	Mar 0.7307	Apr 0.7252	May 0.7252	Jun 0.7169	Jul 0.7197	Aug 0.7141	Sep 0.7141	Oct 0.7224	Nov 0.7197	Dec 0.7307	(40)
HLP (average)												0.7245	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.4644	(42)
Hot water usage for mixer showers	65.5392	64.5543	63.1191	60.3730	58.3465	56.0865	54.8020	56.2263	57.7877	60.2142	63.0193	65.2881	(42a)	
Hot water usage for baths	28.3072	27.8868	27.2948	26.2032	25.3859	24.4796	23.9900	24.5779	25.2180	26.1878	27.3018	28.2115	(42b)	
Hot water usage for other uses	39.8677	38.4180	36.9682	35.5185	34.0688	32.6190	32.6190	34.0688	35.5185	36.9682	38.4180	39.8677	(42c)	
Average daily hot water use (litres/day)												122.9136	(43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	133.7141	130.8591	127.3821	122.0947	117.8011	113.1851	111.4110	114.8730	118.5242	123.3702	128.7390	133.3673	(44)	
Energy content (annual)	211.7705	186.3416	195.7815	167.1416	158.5830	139.1743	134.7420	142.2367	146.1522	167.4122	183.4124	208.8210	(45)	
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2041.5689		
	31.7656	27.9512	29.3672	25.0712	23.7874	20.8761	20.2113	21.3355	21.9228	25.1118	27.5119	31.3232	(46)	
Water storage loss (or HIU loss):														
Store volume												200.0000	(47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.6900	(48)	
Temperature factor from Table 2b												0.5400	(49)	
Enter (49) or (54) in (55)												0.9126	(55)	
Total storage loss														
	28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906	(56)	
If cylinder contains dedicated solar storage														
	28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906	(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														
	263.3235	232.9056	247.3345	217.0316	210.1360	189.0643	186.2950	193.7897	196.0422	218.9652	233.3024	260.3740	(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														
	263.3235	232.9056	247.3345	217.0316	210.1360	189.0643	186.2950	193.7897	196.0422	218.9652	233.3024	260.3740	(64)	
										Total per year (kWh/year) = Sum(64)m =		2648.5639	(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														
	111.6561	99.2098	106.3398	95.4866	93.9712	86.1875	86.0441	88.5361	88.5076	96.9070	100.8966	110.6754	(65)	

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

Metabolic gains (Table 5), Watts													
(66)m	Jan 147.8626	Feb 147.8626	Mar 147.8626	Apr 147.8626	May 147.8626	Jun 147.8626	Jul 147.8626	Aug 147.8626	Sep 147.8626	Oct 147.8626	Nov 147.8626	Dec 147.8626	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
29.0005	25.7580	20.9478	15.8588	11.8547	10.0082	10.8142	14.0567	18.8669	23.9559	27.9600	29.8065	29.8065	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
327.7726	331.1739	322.6028	304.3561	281.3228	259.6748	245.2126	241.8114	250.3824	268.6292	291.6624	313.3104	313.3104	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	(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)													
-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	(71)
Water heating gains (Table 5)													
150.0754	147.6336	142.9298	132.6202	126.3054	119.7048	115.6507	119.0002	122.9272	130.2513	140.1342	148.7572	148.7572	(72)
Total internal gains	608.3867	606.1036	588.0186	554.3733	521.0211	490.9260	473.2157	476.4064	493.7147	524.3745	561.2948	593.4123	(73)

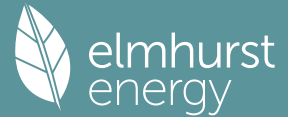
6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North				3.6700	12.6762		0.4000		0.7500		0.7700		9.6718 (74)
East				2.5700	23.6925		0.4000		0.7500		0.7700		12.6590 (76)
South				6.1500	53.2576		0.4000		0.7500		0.7700		68.0944 (78)
West				0.5800	23.6925		0.4000		0.7500		0.7700		2.8569 (80)
Solar gains	93.2821	142.4248	197.8588	262.8020	292.1814	317.7494	298.7572	269.3626	231.8494	169.3320	113.0395	80.1623	(83)
Total gains	701.6687	748.5284	785.8773	817.1754	813.2025	808.6754	771.9729	745.7691	725.5642	693.7065	674.3343	673.5746	(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 51.2188	Feb 51.7993	Mar 51.9957	Apr 52.3931	May 52.3931	Jun 53.0007	Jul 52.7966	Aug 53.2064	Sep 53.2064	Oct 52.5941	Nov 52.7966	Dec 51.9957		
alpha	4.4146	4.4533	4.4664	4.4929	4.4929	4.5334	4.5198	4.5471	4.5471	4.5063	4.5198	4.4664		
util living area	0.9150	0.8887	0.8308	0.7314	0.5800	0.4006	0.2977	0.2906	0.4930	0.7073	0.8618	0.9228	(86)	

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Living	20.3844	20.4852	20.6459	20.7960	20.8920	20.9260	20.9303	20.9310	20.9172	20.8368	20.6220	20.3721
Non living	19.5897	19.7186	19.9143	20.0923	20.1955	20.2344	20.2351	20.2406	20.2299	20.1425	19.8977	19.5833
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	20.6851	20.4852	20.6459	20.7960	20.8920	20.9260	20.9303	20.9310	20.9172	20.8368	20.6220	20.4600 (87)
Th 2	20.3040	20.3113	20.3138	20.3186	20.3186	20.3259	20.3235	20.3284	20.3284	20.3211	20.3235	20.3138 (88)
util rest of house	0.9036	0.8745	0.8104	0.7020	0.5396	0.3546	0.2478	0.2396	0.4447	0.6702	0.8425	0.9122 (89)
MIT 2	20.0193	19.7186	19.9143	20.0923	20.1955	20.2344	20.2351	20.2406	20.2299	20.1425	19.8977	19.7149 (90)
Living area fraction									FLA = Living area / (4) =			0.1859 (91)
MIT	20.1431	19.8612	20.0503	20.2232	20.3250	20.3630	20.3644	20.3690	20.3577	20.2716	20.0324	19.8534 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1431	19.8612	20.0503	20.2232	20.3250	20.3630	20.3644	20.3690	20.3577	20.2716	20.0324	19.8534 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9007	0.8642	0.8019	0.6976	0.5400	0.3572	0.2508	0.2427	0.4469	0.6673	0.8333	0.9041 (94)
Useful gains	631.9700	646.9125	630.2032	570.0991	439.1286	288.8509	193.6065	181.0013	324.2482	462.9316	561.9440	609.0119 (95)
Ext temp.	5.0000	5.4000	7.1000	9.4000	12.5000	15.3000	17.0000	17.2000	14.6000	11.6000	7.9000	5.0000 (96)
Heat loss rate W	899.5822	849.4459	757.8258	628.5465	454.4302	290.6575	193.8884	181.2220	329.2611	501.6695	699.1910	869.1915 (97)
Space heating kWh	199.1035	136.1024	94.9512	42.0821	11.3843	0.0000	0.0000	0.0000	0.0000	28.8210	98.8178	193.5737 (98a)
Space heating requirement - total per year (kWh/year)												804.8361
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	199.1035	136.1024	94.9512	42.0821	11.3843	0.0000	0.0000	0.0000	0.0000	28.8210	98.8178	193.5737 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												804.8361
Space heating per m2										(98c) / (4) =		10.0504 (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 %)												247.4595 (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	199.1035	136.1024	94.9512	42.0821	11.3843	0.0000	0.0000	0.0000	0.0000	28.8210	98.8178	193.5737 (98)
Space heating efficiency (main heating system 1)	247.4595	247.4595	247.4595	247.4595	247.4595	0.0000	0.0000	0.0000	0.0000	247.4595	247.4595	247.4595 (210)
Space heating fuel (main heating system)	80.4590	54.9999	38.3704	17.0057	4.6005	0.0000	0.0000	0.0000	0.0000	11.6468	39.9329	78.2244 (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	263.3235	232.9056	247.3345	217.0316	210.1360	189.0643	186.2950	193.7897	196.0422	218.9652	233.3024	260.3740 (64)
Efficiency of water heater	282.5266	282.5266	282.5266	282.5266	282.5266	282.5266	282.5266	282.5266	282.5266	282.5266	282.5266	282.5266 (216)
Fuel for water heating, kWh/month	93.2031	82.4367	87.5438	76.8181	74.3774	66.9191	65.9389	68.5917	69.3889	77.5025	82.5771	92.1591 (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	19.5303	17.6403	19.5303	18.9003	19.5303	18.9003	19.5303	19.5303	18.9003	19.5303	18.9003	19.5303 (221)
Lighting	25.3839	20.3639	18.3355	13.4334	10.3763	8.4775	9.4656	12.3038	15.9814	20.9684	23.6838	26.0894 (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												325.2395 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												282.5266
Water heating fuel used												937.4564 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.9625)												
mechanical ventilation fans (SFP = 0.9625)												229.9534 (230a)
Total electricity for the above, kWh/year												229.9534 (231)
Electricity for lighting (calculated in Appendix L)												204.8629 (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)

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Energy used
Total delivered energy for all uses

0.0000 (237)
1697.5121 (238)

10a. Fuel costs - using BEDF prices (599)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	325.2395	26.0000	84.5623 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	937.4564	26.0000	243.7387 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0000	0.0000 (247a)
Pumps, fans and electric keep-hot	229.9534	26.0000	59.7879 (249)
Energy for lighting	204.8629	26.0000	53.2644 (250)
Additional standing charges			0.0000 (251)
Total energy cost			441.3532 (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	325.2395	0.1574	51.1889 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	937.4564	0.1409	132.1076 (264)
Space and water heating			183.2966 (265)
Pumps, fans and electric keep-hot	229.9534	0.1387	31.8974 (267)
Energy for lighting	204.8629	0.1443	29.5681 (268)
Total CO2, kg/year			244.7620 (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	325.2395	1.5826	514.7386 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	937.4564	1.5211	1425.9435 (278)
Space and water heating			1940.6821 (279)
Pumps, fans and electric keep-hot	229.9534	1.5128	347.8735 (281)
Energy for lighting	204.8629	1.5338	314.2256 (282)
Total Primary energy kWh/year			2602.7811 (286)

SAP 10 EPC IMPROVEMENTS

00001

Current energy efficiency rating: B 86
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	+ 1.2	-£ 51	-24 kg (9.8%)
U Solar photovoltaic panels	+ 6.3	-£ 226	-117 kg (53.0%)

Recommended measures	Typical annual savings		Energy efficiency	Environmental impact
Solar water heating	£51	0.30 kg/m²	B 87	A 97
Solar photovoltaic panels	£226	1.46 kg/m²	A 94	A 99
Total Savings	£277	1.76 kg/m²		

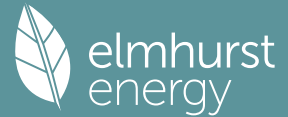
Potential energy efficiency rating: A 94
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 599 TEST (30 Sep 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, South East England):

	Current £441	Potential £390	Saving £51
Electricity			
Space heating	£144	£165	-£21
Water heating	£244	£172	£72
Lighting	£53	£53	£0
Generated (PV)	-£0	-£226	£226
Total cost of fuels	£441	£164	£277
Total cost of uses	£441	£164	£277
Delivered energy	21 kWh/m²	8 kWh/m²	13 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.1 tonnes	0.1 tonnes
CO2 emissions per m²	3 kg/m²	1 kg/m²	2 kg/m²
Primary energy	33 kWh/m²	13 kWh/m²	20 kWh/m²

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1. Overall dwelling characteristics

Main dwelling	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	41.2600 (1b)	x 2.3000 (2b)	= 94.8980 (1b) - (3b)
First floor	38.8200 (1c)	x 2.6000 (2c)	= 100.9320 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.0800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 195.8300 (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) =	
Pressure test	0.0000 / (5) =	0.0000 (8)
Pressure Test Method		Yes
Measured/design AP50		Blower Door
Infiltration rate		2.9700 (17)
Number of sides sheltered		0.1485 (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) =	0.1374 (21)

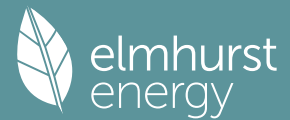
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1751	0.1717	0.1683	0.1511	0.1477	0.1305	0.1305	0.1271	0.1374	0.1477	0.1545	0.1614 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.9000 (23c)
Effective ac	0.2656	0.2622	0.2588	0.2416	0.2382	0.2210	0.2210	0.2176	0.2279	0.2382	0.2450	0.2519 (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
Main dwelling							
Window			12.9700	1.2357	16.0276		(27)
Door			2.1000	1.4000	2.9400		(26)
Ground Floor			41.2600	0.1300	5.3638	110.0000	4538.6000 (28a)
External Walls	92.3200	15.0700	77.2500	0.1500	11.5875	18.0000	1390.5000 (29a)
External Roof	41.2600		41.2600	0.1100	4.5386	9.0000	371.3400 (30)
Total net area of external elements Aum(A, m2)			174.8400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	40.4575			(33)
Main dwelling							
Party Walls			37.6500	0.0000	0.0000	70.0000	2635.5001 (32)
Internal Walls			53.4100			9.0000	480.6900 (32c)
Internal Walls			54.3200			9.0000	488.8800 (32c)
Internal Floor			38.8200			18.0000	698.7600 (32d)
Internal Ceiling			38.8200			9.0000	349.3800 (32e)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =				10953.6501 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							136.7838 (35)
List of Thermal Bridges							
K1 Element			Length	Psi-value	Total		
E2 Other lintels (including other steel lintels)			11.6900	0.0930	1.0872		
E3 Sill			10.6900	-0.0590	-0.6307		
E4 Jamb			29.8700	-0.0650	-1.9416		
E5 Ground floor (normal)			19.4500	0.0300	0.5835		
E6 Intermediate floor within a dwelling			17.8400	0.0180	0.3211		
P1 Party wall - Ground floor			7.6200	0.1010	0.7696		
E16 Corner (normal)			15.0800	0.1170	1.7644		
E17 Corner (inverted - internal area greater than external area)			5.1000	0.0400	0.2040		
E12 Gable (insulation at ceiling level)			7.6200	0.0390	0.2972		
P4 Party wall - Roof (insulation at ceiling level)			7.6200	0.1010	0.7696		
E10 Eaves (insulation at ceiling level)			11.8300	0.0430	0.5087		
E18 Party wall between dwellings			4.9600	0.0540	0.2678		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.0008 (36)
Point Thermal bridges							0.0000 (36a)
Total fabric heat loss			(33) + (36) + (36a) =				44.4583 (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	17.1665	16.9446	16.7227	15.6131	15.3911	14.2815	14.2815	14.0596	14.7254	15.3911	15.8350	16.2788 (38)
Average = Sum(39)m / 12 =	61.6248	61.4029	61.1810	60.0714	59.8494	58.7398	58.7398	58.5179	59.1837	59.8494	60.2933	60.7371 (39)
												60.0159
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7695	0.7668	0.7640	0.7501	0.7474	0.7335	0.7335	0.7307	0.7391	0.7474	0.7529	0.7585 (40)
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												2.4644 (42)
Hot water usage for mixer showers												65.2881 (42a)
Hot water usage for baths												28.2115 (42b)
Hot water usage for other uses												39.8677 (42c)
Average daily hot water use (litres/day)												122.9136 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	133.7141	130.8591	127.3821	122.0947	117.8011	113.1851	111.4110	114.8730	118.5242	123.3702	128.7390	133.3673 (44)
Energy content (annual)	211.7705	186.3416	195.7815	167.1416	158.5830	139.1743	134.7420	142.2367	146.1522	167.4122	183.4124	208.8210 (45)
Distribution loss (46)m = 0.15 x (45)m												31.3232 (46)
Water storage loss (or HIU loss):												200.0000 (47)
Store volume												1.6900 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.9126 (55)
Enter (49) or (54) in (55)												
Total storage loss	28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906 (56)
If cylinder contains dedicated solar storage	28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906 (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	263.3235	232.9056	245.9388	210.2780	197.3416	176.4576	173.2680	181.6933	190.6393	217.5695	233.3024	260.3740 (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												617.6306 (H24)
Heat delivered to space heating												0.0000 (H29)
Solar input												617.6306
Solar input	-0.0000	-16.2153	-58.1405	-79.7243	-103.8042	-95.6059	-94.8632	-83.1134	-57.5189	-28.6449	-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	263.3235	216.6903	187.7982	130.5537	93.5375	80.8517	78.4048	98.5799	133.1204	188.9245	233.3024	260.3740 (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	111.6561	99.2098	105.2232	90.0837	83.7358	76.1021	75.6225	78.8590	84.1853	95.7904	100.8966	110.6754 (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	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.0005	25.7580	20.9478	15.8588	11.8547	10.0082	10.8142	14.0567	18.8669	23.9559	27.9600	29.8065 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.7726	331.1739	322.6028	304.3561	281.3228	259.6748	245.2126	241.8114	250.3824	268.6292	291.6624	313.3104 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506 (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)	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751 (71)
Water heating gains (Table 5)	150.0754	147.6336	141.4290	125.1162	112.5481	105.6973	101.6432	105.9932	116.9240	128.7505	140.1342	148.7572 (72)
Total internal gains	608.3867	606.1036	586.5178	546.8693	507.2637	476.9185	459.2082	463.3995	487.7115	522.8737	561.2948	593.4123 (73)

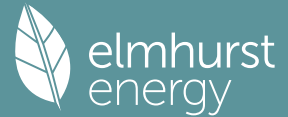
6. Solar gains

[Jan]												
				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d	Gains W
North				3.6700	10.6334		0.4000		0.7500		0.7700	8.1132 (74)
East				2.5700	19.6403		0.4000		0.7500		0.7700	10.4939 (76)
South				6.1500	46.7521		0.4000		0.7500		0.7700	59.7765 (78)
West				0.5800	19.6403		0.4000		0.7500		0.7700	2.3683 (80)
Solar gains	80.7518	138.5643	192.4883	243.6959	277.9427	278.1894	267.2604	241.3229	210.1388	153.9048	96.9018	68.9931 (83)
Total gains	689.1385	744.6679	779.0061	790.5652	785.2065	755.1079	726.4686	704.7224	697.8503	676.7785	658.1966	662.4055 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

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tau	49.3743	49.5527	49.7325	50.6511	50.8389	51.7993	51.7993	51.9957	51.4108	50.8389	50.4647	50.0959
alpha	4.2916	4.3035	4.3155	4.3767	4.3893	4.4533	4.4533	4.4664	4.4274	4.3893	4.3643	4.3397
util living area	0.9329	0.9062	0.8606	0.7783	0.6548	0.4864	0.3535	0.3787	0.5612	0.7788	0.8971	0.9403 (86)
Living	20.2508	20.3777	20.5477	20.7326	20.8547	20.9152	20.9276	20.9267	20.9006	20.7613	20.4927	20.2294
Non living	19.4039	19.5621	19.7714	20.0007	20.1387	20.2106	20.2206	20.2226	20.1930	20.0392	19.7168	19.3855
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	20.6168	20.3777	20.5477	20.7326	20.8547	20.9152	20.9276	20.9267	20.9006	20.7613	20.4927	20.3372 (87)
Th 2	20.2798	20.2822	20.2846	20.2968	20.2992	20.3113	20.3113	20.3138	20.3065	20.2992	20.2943	20.2895 (88)
util rest of house	0.9236	0.8939	0.8426	0.7512	0.6160	0.4375	0.2991	0.3235	0.5114	0.7471	0.8817	0.9319 (89)
MIT 2	19.9306	19.5621	19.7714	20.0007	20.1387	20.2106	20.2206	20.2226	20.1930	20.0392	19.7168	19.5484 (90)
Living area fraction									fLA = Living area / (4) =			0.1859 (91)
MIT	20.0582	19.7138	19.9158	20.1368	20.2718	20.3416	20.3520	20.3535	20.3246	20.1735	19.8610	19.6950 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0582	19.7138	19.9158	20.1368	20.2718	20.3416	20.3520	20.3535	20.3246	20.1735	19.8610	19.6950 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9204	0.8828	0.8324	0.7447	0.6145	0.4397	0.3023	0.3268	0.5127	0.7411	0.8711	0.9238 (94)
Useful gains	634.2902	657.3778	648.4823	588.6972	482.4804	332.0446	219.6355	230.2745	357.7842	501.5318	573.3340	611.9382 (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	971.0961	909.6095	820.7900	675.0101	513.0183	337.2630	220.3940	231.3506	368.3949	572.9683	769.4052	941.1247 (97)
Space heating kWh	250.5836	169.4997	128.1969	62.1453	22.7202	0.0000	0.0000	0.0000	0.0000	53.1488	141.1713	244.9147 (98a)
Space heating requirement - total per year (kWh/year)												1072.3804
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	250.5836	169.4997	128.1969	62.1453	22.7202	0.0000	0.0000	0.0000	0.0000	53.1488	141.1713	244.9147 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1072.3804
Space heating per m2										(98c) / (4) =		13.3914 (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 %)												249.2900 (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
	250.5836	169.4997	128.1969	62.1453	22.7202	0.0000	0.0000	0.0000	0.0000	53.1488	141.1713	244.9147 (98)
Space heating efficiency (main heating system 1)	249.2900	249.2900	249.2900	249.2900	249.2900	0.0000	0.0000	0.0000	0.0000	249.2900	249.2900	249.2900 (210)
Space heating fuel (main heating system)	100.5189	67.9930	51.4248	24.9289	9.1140	0.0000	0.0000	0.0000	0.0000	21.3201	56.6293	98.2449 (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	263.3235	216.6903	187.7982	130.5537	93.5375	80.8517	78.4048	98.5799	133.1204	188.9245	233.3024	260.3740 (64)
Efficiency of water heater	282.2137	282.2137	282.2137	282.2137	282.2137	282.2137	282.2137	282.2137	282.2137	282.2137	282.2137	282.2137 (216)
Fuel for water heating, kWh/month	93.3064	76.7823	66.5447	46.2606	33.1442	28.6491	27.7821	34.9309	47.1701	66.9438	82.6687	92.2613 (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	26.3248	23.7772	26.3248	25.4756	26.3248	25.4756	26.3248	26.3248	25.4756	26.3248	25.4756	26.3248 (231)
Lighting	25.3839	20.3639	18.3355	13.4334	10.3763	8.4775	9.4656	12.3038	15.9814	20.9684	23.6838	26.0894 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-36.5620	-53.4967	-78.8468	-89.4439	-95.9059	-89.0612	-87.9711	-82.9544	-73.5511	-61.1694	-40.6198	-31.3215 (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												430.1739 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												282.2137
Water heating fuel used												696.4441 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.9625)												
mechanical ventilation fans (SFP = 0.9625)												229.9534 (230a)
pump for solar water heating												80.0000 (230g)
Total electricity for the above, kWh/year												309.9534 (231)
Electricity for lighting (calculated in Appendix L)												204.8629 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-820.9037 (233)

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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	820.5305 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	430.1739	16.4900	70.9357 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	696.4441	16.4900	114.8436 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	229.9534	16.4900	37.9193 (249)
Pump for solar water heating	80.0000	16.4900	13.1920 (249)
Energy for lighting	204.8629	16.4900	33.7819 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-820.9037	16.4900	-135.3670
PV Unit electricity exported	0.0000	5.5900	0.0000
Total			-135.3670 (252)
Total energy cost			135.3055 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.3894 (257)
SAP value		93.6873
SAP rating (Section 12)		94 (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	430.1739	0.1566	67.3638 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	696.4441	0.1457	101.4804 (264)
Space and water heating			168.8442 (265)
Pumps, fans and electric keep-hot	309.9534	0.1387	42.9944 (267)
Energy for lighting	204.8629	0.1443	29.5681 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-820.9037	0.1344	-110.3070
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-110.3070 (269)
Total CO2, kg/year			131.0996 (272)
CO2 emissions per m2			1.6400 (273)
EI value			98.5955
EI rating			99 (274)
EI band			A

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

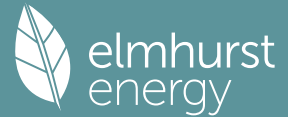
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	41.2600 (1b)	x 2.3000 (2b)	= 94.8980 (1b) - (3b)
First floor	38.8200 (1c)	x 2.6000 (2c)	= 100.9320 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.0800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	195.8300 (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	
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 2.9700 (17)
Infiltration rate 0.1485 (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) = 0.1374 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	4.1000	3.8000	3.7000	3.5000	3.5000	3.2000	3.3000	3.1000	3.1000	3.4000	3.3000	3.7000 (22)
Adj infilt rate	1.0250	0.9500	0.9250	0.8750	0.8750	0.8000	0.8250	0.7750	0.7750	0.8500	0.8250	0.9250 (22a)
Balanced mechanical ventilation with heat recovery	0.1408	0.1305	0.1271	0.1202	0.1202	0.1099	0.1133	0.1065	0.1065	0.1168	0.1133	0.1271 (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)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.9000 (23c)
Effective ac	0.2313	0.2210	0.2176	0.2107	0.2107	0.2004	0.2038	0.1970	0.1970	0.2073	0.2038	0.2176 (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
Main dwelling							
Window			12.9700	1.2357	16.0276		(27)
Door			2.1000	1.4000	2.9400		(26)
Ground Floor			41.2600	0.1300	5.3638	110.0000	4538.6000 (28a)
External Walls	92.3200	15.0700	77.2500	0.1500	11.5875	18.0000	1390.5000 (29a)
External Roof	41.2600		41.2600	0.1100	4.5386	9.0000	371.3400 (30)
Total net area of external elements Aum(A, m2)			174.8400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 40.4575		(33)
Main dwelling							
Party Walls			37.6500	0.0000	0.0000	70.0000	2635.5001 (32)
Internal Walls			53.4100			9.0000	480.6900 (32c)
Internal Walls			54.3200			9.0000	488.8800 (32c)
Internal Floor			38.8200			18.0000	698.7600 (32d)
Internal Ceiling			38.8200			9.0000	349.3800 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 10953.6501 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 136.7838 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	11.6900	0.0930	1.0872
E2 Other lintels (including other steel lintels)	10.6900	-0.0590	-0.6307
E3 Sill	29.8700	-0.0650	-1.9416
E4 Jamb	19.4500	0.0300	0.5835
E5 Ground floor (normal)	17.8400	0.0180	0.3211
E6 Intermediate floor within a dwelling	7.6200	0.1010	0.7696
P1 Party wall - Ground floor	15.0800	0.1170	1.7644
E16 Corner (normal)	5.1000	0.0400	0.2040
E17 Corner (inverted - internal area greater than external area)	7.6200	0.0390	0.2972
E12 Gable (insulation at ceiling level)	7.6200	0.1010	0.7696
P4 Party wall - Roof (insulation at ceiling level)	11.8300	0.0430	0.5087
E10 Eaves (insulation at ceiling level)	4.9600	0.0540	0.2678
E18 Party wall between dwellings			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			4.0008 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 44.4583 (37)

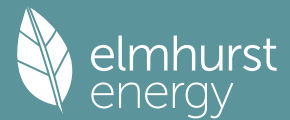
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
Jan 14.9473 Feb 14.2815 Mar 14.0596 Apr 13.6158 May 13.6158 Jun 12.9500 Jul 13.1719 Aug 12.7281 Sep 12.7281 Oct 13.3938 Nov 13.1719 Dec 14.0596 (38)
Heat transfer coeff 59.4056 58.7398 58.5179 58.0741 58.0741 57.4083 57.6302 57.1864 57.1864 57.8521 57.6302 58.5179 (39)
Average = Sum(39)m / 12 = 58.0186

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7418	0.7335	0.7307	0.7252	0.7252	0.7169	0.7197	0.7141	0.7141	0.7224	0.7197	0.7307 (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													2.4644 (42)
Hot water usage for mixer showers	65.5392	64.5543	63.1191	60.3730	58.3465	56.0865	54.8020	56.2263	57.7877	60.2142	63.0193	65.2881	(42a)
Hot water usage for baths	28.3072	27.8868	27.2948	26.2032	25.3859	24.4796	23.9900	24.5779	25.2180	26.1878	27.3018	28.2115	(42b)
Hot water usage for other uses	39.8677	38.4180	36.9682	35.5185	34.0688	32.6190	32.6190	34.0688	35.5185	36.9682	38.4180	39.8677	(42c)
Average daily hot water use (litres/day)												122.9136	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.7141	130.8591	127.3821	122.0947	117.8011	113.1851	111.4110	114.8730	118.5242	123.3702	128.7390	133.3673	(44)
Energy content (annual)	211.7705	186.3416	195.7815	167.1416	158.5830	139.1743	134.7420	142.2367	146.1522	167.4122	183.4124	208.8210	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2041.5689	
Water storage loss (or HIU loss):	31.7656	27.9512	29.3672	25.0712	23.7874	20.8761	20.2113	21.3355	21.9228	25.1118	27.5119	31.3232	(46)
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6900	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9126	(55)
Total storage loss	28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906	(56)
If cylinder contains dedicated solar storage	28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906	(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	263.3235	232.9056	245.9388	210.2780	197.3416	176.4576	173.2680	181.6933	190.6393	217.5695	233.3024	260.3740	(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)

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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												717.6578 (H24)
Heat delivered to space heating												0.0000 (H29)
Solar input												717.6578
Solar input	-0.4383	-19.7388	-63.6601	-90.2800	-111.8166	-111.7705	-108.3284	-97.1753	-69.2051	-38.9911	-6.2538	-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	262.8852	213.1668	182.2787	119.9980	85.5250	64.6871	64.9396	84.5180	121.4342	178.5783	227.0486	260.3740 (64)
												Total per year (kWh/year) = Sum(64)m = 1865.4337 (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	111.6561	99.2098	105.2232	90.0837	83.7358	76.1021	75.6225	78.8590	84.1853	95.7904	100.8966	110.6754 (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
	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	29.0005	25.7580	20.9478	15.8588	11.8547	10.0082	10.8142	14.0567	18.8669	23.9559	27.9600	29.8065 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	327.7726	331.1739	322.6028	304.3561	281.3228	259.6748	245.2126	241.8114	250.3824	268.6292	291.6624	313.3104 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506 (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)												
	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751 (71)
Water heating gains (Table 5)												
	150.0754	147.6336	141.4290	125.1162	112.5481	105.6973	101.6432	105.9932	116.9240	128.7505	140.1342	148.7572 (72)
Total internal gains	608.3867	606.1036	586.5178	546.8693	507.2637	476.9185	459.2082	463.3995	487.7115	522.8737	561.2948	593.4123 (73)

6. Solar gains

[Jan]												Gains
					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d			W
North					3.6700	12.6762	0.4000	0.7500	0.7700			9.6718 (74)
East					2.5700	23.6925	0.4000	0.7500	0.7700			12.6590 (76)
South					6.1500	53.2576	0.4000	0.7500	0.7700			68.0944 (78)
West					0.5800	23.6925	0.4000	0.7500	0.7700			2.8569 (80)

Solar gains	93.2821	142.4248	197.8588	262.8020	292.1814	317.7494	298.7572	269.3626	231.8494	169.3320	113.0395	80.1623 (83)
Total gains	701.6687	748.5284	784.3765	809.6714	799.4451	794.6679	757.9655	732.7621	719.5610	692.2057	674.3343	673.5746 (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	51.2188	51.7993	51.9957	52.3931	52.3931	53.0007	52.7966	53.2064	53.2064	52.5941	52.7966	51.9957
alpha	4.4146	4.4533	4.4664	4.4929	4.4929	4.5334	4.5198	4.5471	4.5471	4.5063	4.5198	4.4664
util living area	0.9150	0.8887	0.8316	0.7358	0.5883	0.4074	0.3032	0.2957	0.4968	0.7084	0.8618	0.9228 (86)
Living	20.3844	20.4852	20.6448	20.7926	20.8897	20.9256	20.9302	20.9309	20.9168	20.8362	20.6220	20.3721
Non living	19.5897	19.7186	19.9129	20.0887	20.1934	20.2341	20.2350	20.2406	20.2295	20.1419	19.8977	19.5833
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	20.6851	20.4852	20.6448	20.7926	20.8897	20.9256	20.9302	20.9309	20.9168	20.8362	20.6220	20.4600 (87)
Th 2	20.3040	20.3113	20.3138	20.3186	20.3186	20.3259	20.3235	20.3284	20.3284	20.3211	20.3235	20.3138 (88)
util rest of house												
	0.9036	0.8745	0.8112	0.7065	0.5477	0.3607	0.2523	0.2438	0.4482	0.6713	0.8425	0.9122 (89)
MIT 2	20.0193	19.7186	19.9129	20.0887	20.1934	20.2341	20.2350	20.2406	20.2295	20.1419	19.8977	19.7149 (90)
Living area fraction												
MIT	20.1431	19.8612	20.0490	20.2196	20.3229	20.3627	20.3643	20.3689	20.3573	20.2710	20.0324	19.8534 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1431	19.8612	20.0490	20.2196	20.3229	20.3627	20.3643	20.3689	20.3573	20.2710	20.0324	19.8534 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9007	0.8642	0.8027	0.7020	0.5480	0.3633	0.2554	0.2470	0.4504	0.6684	0.8333	0.9041 (94)
Useful gains	631.9700	646.9125	629.6025	568.4080	438.0970	288.7034	193.5808	180.9818	324.0684	462.6555	561.9440	609.0119 (95)
Ext temp.	5.0000	5.4000	7.1000	9.4000	12.5000	15.3000	17.0000	17.2000	14.6000	11.6000	7.9000	5.0000 (96)
Heat loss rate W	899.5822	849.4459	757.7487	628.3370	454.3059	290.6397	193.8851	181.2195	329.2396	501.6355	699.1910	869.1915 (97)
Space heating kWh	199.1035	136.1024	95.3407	43.1489	12.0594	0.0000	0.0000	0.0000	0.0000	29.0012	98.8178	193.5737 (98a)
Space heating requirement - total per year (kWh/year)												807.1477
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)

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Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	199.1035	136.1024	95.3407	43.1489	12.0594	0.0000	0.0000	0.0000	0.0000	29.0012	98.8178	193.5737 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												807.1477
Space heating per m2										(98c) / (4) =		10.0793 (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 %)												247.4595 (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	199.1035	136.1024	95.3407	43.1489	12.0594	0.0000	0.0000	0.0000	0.0000	29.0012	98.8178	193.5737 (98)
Space heating efficiency (main heating system 1)	247.4595	247.4595	247.4595	247.4595	247.4595	0.0000	0.0000	0.0000	0.0000	247.4595	247.4595	247.4595 (210)
Space heating fuel (main heating system)	80.4590	54.9999	38.5278	17.4368	4.8733	0.0000	0.0000	0.0000	0.0000	11.7196	39.9329	78.2244 (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	262.8852	213.1668	182.2787	119.9980	85.5250	64.6871	64.9396	84.5180	121.4342	178.5783	227.0486	260.3740 (64)
Efficiency of water heater	282.5266	282.5266	282.5266	282.5266	282.5266	282.5266	282.5266	282.5266	282.5266	282.5266	282.5266	282.5266 (216)
Fuel for water heating, kWh/month	93.0479	75.4502	64.5174	42.4732	30.2715	22.8959	22.9853	29.9151	42.9815	63.2076	80.3636	92.1591 (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	26.3248	23.7772	26.3248	25.4756	26.3248	25.4756	26.3248	26.3248	25.4756	26.3248	25.4756	26.3248 (231)
Lighting	25.3839	20.3639	18.3355	13.4334	10.3763	8.4775	9.4656	12.3038	15.9814	20.9684	23.6838	26.0894 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-41.7512	-55.2377	-80.7082	-93.2429	-97.8972	-94.3306	-92.4575	-87.8233	-78.5136	-65.7893	-46.3516	-36.0172 (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												326.1736 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												282.5266
Water heating fuel used												660.2683 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.9625)												
mechanical ventilation fans (SFP = 0.9625)												229.9534 (230a)
pump for solar water heating												80.0000 (230g)
Total electricity for the above, kWh/year												309.9534 (231)
Electricity for lighting (calculated in Appendix L)												204.8629 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-870.1203 (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												631.1378 (238)

10a. Fuel costs - using BEDF prices (599)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	326.1736	26.0000	84.8051 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	660.2683	26.0000	171.6698 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0000	0.0000 (247a)
Pumps, fans and electric keep-hot	229.9534	26.0000	59.7879 (249)
Pump for solar water heating	80.0000	26.0000	20.8000 (249)
Energy for lighting	204.8629	26.0000	53.2644 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-870.1203	26.0000	-226.2313
PV Unit electricity exported	0.0000	5.8100	0.0000
Total			-226.2313 (252)
Total energy cost			164.0958 (255)

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

Energy	Emission factor	Emissions
--------	-----------------	-----------

Full SAP Calculation Printout



	kWh/year	kg CO2/kWh	kg CO2/year
Space heating - main system 1	326.1736	0.1573	51.3206 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	660.2683	0.1466	96.8257 (264)
Space and water heating			148.1463 (265)
Pumps, fans and electric keep-hot	309.9534	0.1387	42.9944 (267)
Energy for lighting	204.8629	0.1443	29.5681 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-870.1203	0.1345	-117.0626
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-117.0626 (269)
Total CO2, kg/year			103.6461 (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	326.1736	1.5825	516.1602 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	660.2683	1.5425	1018.4623 (278)
Space and water heating			1534.6224 (279)
Pumps, fans and electric keep-hot	309.9534	1.5128	468.8975 (281)
Energy for lighting	204.8629	1.5338	314.2256 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-870.1203	1.4972	-1302.7549
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-1302.7549 (283)
Total Primary energy kWh/year			1014.9906 (286)

Energy performance certificate (EPC)

2 Malthouse Cottages
Malthouse Lane
Hurstpierpoint
HASSOCKS
BN6 9PE

Energy rating

B

Valid until:

1 October 2036

Certificate number:

0124-3967-3300-4246-0200

Property type

Semi-detached house

Total floor area

80 square metres

Rules on letting this property

Properties can be let if they have an energy rating from A to E.

You can read [guidance for landlords on the regulations and exemptions \(https://www.gov.uk/guidance/domestic-private-rented-property-minimum-energy-efficiency-standard-landlord-guidance\)](https://www.gov.uk/guidance/domestic-private-rented-property-minimum-energy-efficiency-standard-landlord-guidance).

Energy rating and score

This property's energy rating is B. It has the potential to be A.

[See how to improve this property's energy efficiency.](#)

The graph shows this property's current and potential energy rating.

Properties get a rating from A (best) to G (worst) and a score. The better the rating and score, the lower your energy bills are likely to be.

For properties in England and Wales:

the average energy rating is D
the average energy score is 60

Score	Energy rating	Current	Potential
92+	A		94 A
81-91	B	86 B	
69-80	C		
55-68	D		
39-54	E		
21-38	F		
1-20	G		

Breakdown of property's energy performance

Features in this property

Features get a rating from very good to very poor, based on how energy efficient they are. Ratings are not based on how well features work or their condition.

Assumed ratings are based on the property's age and type. They are used for features the assessor could not inspect.

Feature	Description	Rating
Walls	Average thermal transmittance 0.15 W/m ² K	Very good
Roof	Average thermal transmittance 0.11 W/m ² K	Very good
Floor	Average thermal transmittance 0.13 W/m ² K	Very good
Windows	High performance glazing	Good
Main heating	Air source heat pump, radiators and underfloor, electric	Average
Main heating control	Time and temperature zone control	Very good
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 2.7 m ³ /h.m ² (as tested)	Very good
Secondary heating	None	N/A

Low and zero carbon energy sources

Low and zero carbon energy sources release very little or no CO₂. Installing these sources may help reduce energy bills as well as cutting carbon emissions. The following low or zero carbon energy sources are installed in this property:

- Air source heat pump

Primary energy use

The primary energy use for this property per year is 32 kilowatt hours per square metre (kWh/m²).

Smart meters

This property had a **smart meter for electricity** when it was assessed.

Smart meters help you understand your energy use and how you could save money. They may help you access better energy deals.

[Find out about using your smart meter \(https://www.smartenergygb.org/using-your-smart-meter\)](https://www.smartenergygb.org/using-your-smart-meter)

How this affects your energy bills

An average household would need to spend **£438 per year on heating, hot water and lighting** in this property. These costs usually make up the majority of your energy bills.

You could **save £51 per year** if you complete the suggested steps for improving this property's energy rating.

This is **based on average costs in 2026** when this EPC was created. People living at the property may use different amounts of energy for heating, hot water and lighting.

Impact on the environment

This property's environmental impact rating is A. It has the potential to be A.

Properties get a rating from A (best) to G (worst) on how much carbon dioxide (CO2) they produce each year.

Carbon emissions

An average household produces 6 tonnes of CO2

This property produces	0.2 tonnes of CO2
This property's potential production	0.1 tonnes of CO2

You could improve this property's CO2 emissions by making the suggested changes. This will help to protect the environment.

These ratings are based on assumptions about average occupancy and energy use. People living at the property may use different amounts of energy.

Steps you could take to save energy

Step	Typical installation cost	Typical yearly saving
1. Solar water heating	£4,000 - £7,000	£51
2. Solar photovoltaic panels	£8,000 - £10,000	£277

Advice on making energy saving improvements

[Get detailed recommendations and cost estimates \(www.gov.uk/improve-energy-efficiency\)](http://www.gov.uk/improve-energy-efficiency)

Who to contact about this certificate

Contacting the assessor

If you're unhappy about your property's energy assessment or certificate, you can complain to the assessor who created it.

Assessor's name	Daniel Watt
Telephone	0161 228 6757
Email	dan.watt@team-civic.com

Contacting the accreditation scheme

If you're still unhappy after contacting the assessor, you should contact the assessor's accreditation scheme.

Accreditation scheme	Elmhurst Energy Systems Ltd
Assessor's ID	EES/027301
Telephone	01455 883 250
Email	enquiries@elmhurstenergy.co.uk

About this assessment

Assessor's declaration	No related party
Date of assessment	2 October 2026
Date of certificate	2 October 2026
Type of assessment	SAP

Energy Report



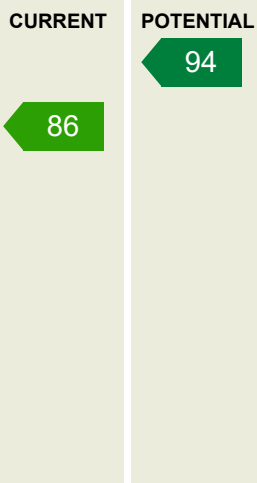
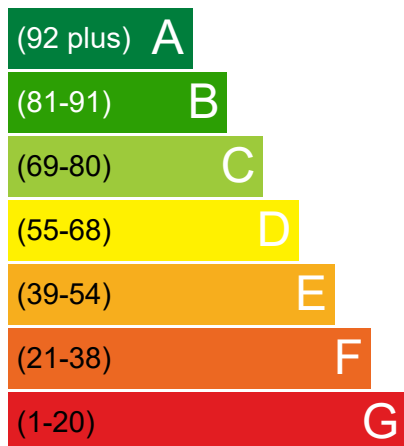
Dwelling Address	2 Malthouse Cottages, Malthouse Lane, Hurstpierpoint, HASSECKS, BN6 9PE
Reference	Plot 2-00001
SAP Version	10.2
Assessment Date	11/02/2026
Submission Date	02/10/2026
Property Type	House, Semi-Detached
Total Floor Area	80

This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

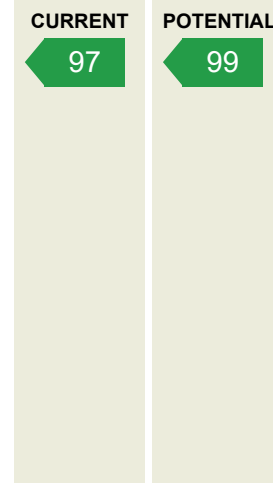
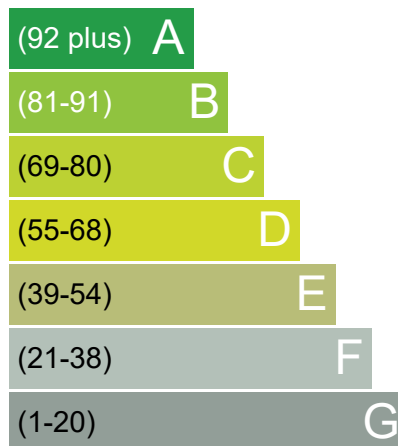
Energy Efficiency Rating

Most energy efficient - lower running costs



Carbon Dioxide (CO2) Emissions Rating

Very environmentally friendly - lower CO2 emissions



Additional ratings for your home

	Primary Energy	Energy	Carbon	Cost	HTC
CURRENT	32.20 kWh	1682 kWh	242 kg	437.35 £	59 W/K
POTENTIAL	12.38 kWh	616 kWh	101 kg	160.26 £	59 W/K

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good
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Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.15 W/m²K	Very Good
Roof	Average thermal transmittance 0.11 W/m²K	Very Good
Floor	Average thermal transmittance 0.13 W/m²K	Very Good
Windows	High performance glazing	Good
Main heating	Air source heat pump, radiators and underfloor, electric	Average
Main heating controls	Time and temperature zone control	Very Good
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 2.7 m³/h.m² (as tested)	Very Good

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling. To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed. Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating
Solar water heating	£51	B 88	£4,000 - £7,000	£51	A 97
Photovoltaic	£277	A 94	£8,000 - £10,000	£226	A 99

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

	Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting 	£54	£54	
Heating 	£140	£161	
Hot Water 	£244	£172	
New Technologies e.g. Impact of PV	£0	-(£226)	
TOTAL	£437	£160	

Estimated energy use and potential savings



Space Heating

309

kWh per year



Water Heating

937

kWh per year

About this document

Created by:	Mr. Daniel Watt
Company/Trading name:	CIVIC MEP Ltd
Phone number:	0161 228 6757
Email address:	dan.watt@team-civic.com

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g.heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO ₂)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Fri 02 Oct 2026 12:41:38

Project Information			
Assessed By	Daniel Watt	Building Type	House, Semi-detached
OCDEA Registration	EES/027301	Assessment Date	2026-10-02

Dwelling Details			
Assessment Type	As built	Total Floor Area	80 m ²
Site Reference	Plot 2	Plot Reference	00001
Address	2 Malthouse Cottages, Malthouse Lane, Hurstpierpoint, HASSOCKS, BN6 9PE		

Client Details	
Name	.
Company	.
Address	., ., .

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate			
Fuel for main heating system	Electricity		
Target carbon dioxide emission rate	11.18 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	3.32 kgCO ₂ /m ²		OK

1b Target primary energy rate and dwelling primary energy			
Target primary energy	58.34 kWh _{PE} /m ²		
Dwelling primary energy	35.19 kWh _{PE} /m ²		OK

1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	35.4 kWh/m ²		
Dwelling fabric energy efficiency	32.0 kWh/m ²		OK

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m ² K]	Dwelling average U-Value [W/m ² K]	Element with highest individual U-Value	
External walls	0.26	0.15	Walls (1) (0.15)	OK
Party walls	0.2	0	Party Wall (1) (0)	N/A
Curtain walls	1.6	0	N/A	N/A
Floors	0.18	0.13	Ground Floor (0.13)	OK
Roofs	0.16	0.11	Roof (1) (0.11)	OK
Windows, doors, and roof windows	1.6	1.31	Front Door (1.4)	OK
Rooflights	2.2	N/A	N/A	N/A

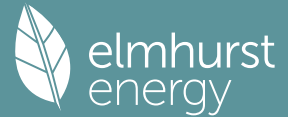
2b Envelope elements (better than typically expected values are flagged with a subsequent (!))			
Name	Net area [m ²]	U-Value [W/m ² K]	
Exposed wall: Walls (1)	77.913774	0.15	
Party wall: Party Wall (1)	37.65	0 (!)	
Ground floor: Ground Floor, Ground Floor	41.26	0.13	
Exposed roof: Roof (1)	41.26	0.11	

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
North Windows, Window	2.330686	North	0.75	1.3
North Windows, Window	1.335	North	0.75	1.3
Front Door, Door	2.1	North	N/A	1.4
West Windows, Window	0.6615	East	0.75	1.3
West Windows, Window	0.6615	East	0.75	1.3
West Windows, Window	0.58457	East	0.75	1.3
South Windows, Window	2.8314	South	0.75	1.3
South Windows, Window	1.209	South	0.75	1.3
South Windows, Window	0.7812	South	0.75	1.3
South Windows, Window	1.3268	South	0.75	1.3
East Window, Window	0.58457	East	0.75	1.3

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))				
Building part 1: Thermal bridging calculated from linear thermal transmittances for each junction				
Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.093	
External wall	E3: Sill	Calculated by person with suitable expertise	-0.059	
External wall	E4: Jamb	Calculated by person with suitable expertise	-0.065	
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.03 (!)	
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.018 (!)	
Party wall	P1: Ground floor	Calculated by person with suitable expertise	0.101	
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.117	
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	0.04	
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.039 (!)	
Party wall	P4: Roof (insulation at ceiling level)	Calculated by person with suitable expertise	0.101	
External wall	E10: Eaves (insulation at ceiling level)	Calculated by person with suitable expertise	0.043	
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.054	
3 Air permeability (better than typically expected values are flagged with a subsequent (!))				
Maximum permitted air permeability at 50Pa		8 m³/hm²		
Dwelling air permeability at 50Pa		2.72 m³/hm², Measured value (!)		OK
Air permeability test certificate reference				
4 Space heating				
Main heating system 1: Heat pump with radiators or underfloor heating - Electricity				
Efficiency		248.0%		
Emitter type		Both radiators and underfloor		
Flow temperature		35°C		
System type		Heat Pump		
Manufacturer		Vaillant Group UK Ltd		
Model		aroTHERM 12kW		
Commissioning				
Secondary heating system: N/A				
Fuel		N/A		
Efficiency		N/A		
Commissioning				
5 Hot water				
Cylinder/store - type: Cylinder				
Capacity		200 litres		
Declared heat loss		1.69 kWh/day		
Primary pipework insulated		Yes		
Manufacturer				
Model				
Commissioning				
Waste water heat recovery system 1 - type: N/A				
Efficiency				
Manufacturer				
Model				

6 Controls		
Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: Cylinder thermostat and HW separately timed		
Manufacturer		
Model		
7 Lighting		
Minimum permitted light source efficacy	75 lm/W	
Lowest light source efficacy	75 lm/W	OK
External lights control	N/A	
8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	1.5 W/(l/s)	
Specific fan power	0.77 W/(l/s)	OK
Minimum permitted heat recovery efficiency	73%	
Heat recovery efficiency	91%	OK
Manufacturer/Model	Komfort EC LB400, S25	
Commissioning		
9 Local generation		
N/A		
10 Heat networks		
N/A		
11 Supporting documentary evidence		
Documentary evidence identified in 11.1 and 11.2 is needed to confirm the data values used for any calculations undertaken, manufacturer declarations made, and tests performed as reflected in this "As built" BREL Compliance Report are correct. 11.1 SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required. 11.2 Indicative photographic evidence of key stages during construction (guidance within Approved Document L, Volume 1 – Appendix B) that confirms the products identified in this BREL Compliance Report are used in this dwelling, and workmanship is of sufficient quality to support the calculated values claimed in 2a to 2d.		
12 Declarations		
a. Assessor Declaration		
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design and construction information submitted for this dwelling for the purpose of carrying out the assessment, and that the supporting documentary evidence (identified in 11.1 and 11.2) pursuant to Part L of the Building Regulations 2010 (as amended) has been reviewed in the course of preparing this BREL Compliance Report.		
Signed:	Assessor ID:	
Name:	Date:	
b. Client Declaration		
This declaration by the client is confirmation that the dwelling has been constructed and completed according to the specifications set out in this BREL Compliance Report, and that photographic evidence of key stages, as described in 11.2, has been provided to the Assessor for this dwelling.		
Signed:	Organisation:	
Name:	Date:	

Full SAP Calculation Printout



Plot Reference	Plot 2			Issued on Date	02/10/2026
Assessment Reference	00001	Plot Type Ref			
Plot Address	2 Malthouse Cottages, Malthouse Lane, Hurstpierpoint, HASSOCKS, BN6 9PE			SAP Version	10.2
SAP Rating	86 B	DER	3.32	TER	11.18
Environmental	97 A	% DER < TER			70.30
CO ₂ Emissions (t/year)	0.24	DFEE	31.97	TFEE	35.38
Compliance Check	See BREL	% DFEE < TFEE			9.64
% DPER < TPER	39.69	DPER	35.19	TPER	58.34
Assessor Details	Mr. Daniel Watt			Assessor ID	AV75-0001
Client	..				

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	41.2600 (1b)	x 2.3000 (2b)	= 94.8980 (1b) - (3b)
First floor	38.8200 (1c)	x 2.6000 (2c)	= 100.9320 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.0800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 195.8300 (5)

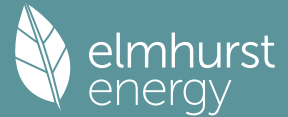
2. Ventilation rate

	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	2.7200 (17)
Infiltration rate	0.1360 (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) = 0.1258 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 4.7000 (22)
Wind factor	1.2750 1.2500 1.2250 1.1000 1.0750 0.9500 0.9500 0.9250 1.0000 1.0750 1.1250 1.1750 (22a)
Adj infilt rate	0.1604 0.1573 0.1541 0.1384 0.1352 0.1195 0.1195 0.1164 0.1258 0.1352 0.1415 0.1478 (22b)
Balanced mechanical ventilation with heat recovery	
If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	81.9000 (23c)
Effective ac	0.2509 0.2477 0.2446 0.2289 0.2257 0.2100 0.2100 0.2069 0.2163 0.2257 0.2320 0.2383 (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
Main dwelling							
Window			12.3100	1.2357	15.2120		(27)
Door			2.1000	1.4000	2.9400		(26)
Ground Floor			41.2600	0.1300	5.3638	110.0000	4538.6000 (28a)
External Walls	92.3200	14.4100	77.9100	0.1500	11.6865	18.0000	1402.3800 (29a)
External Roof	41.2600		41.2600	0.1100	4.5386	9.0000	371.3400 (30)
Total net area of external elements Aum(A, m ²)			174.8400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.7409		(33)
Main dwelling							
Party Walls			37.6500	0.0000	0.0000	70.0000	2635.5001 (32)
Internal Walls			53.4100			9.0000	480.6900 (32c)
Internal Walls			54.3200			9.0000	488.8800 (32c)
Internal Floor			38.8200			18.0000	698.7600 (32d)
Internal Ceiling			38.8200			9.0000	349.3800 (32e)

Full SAP Calculation Printout



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

(28)...(30) + (32) + (32a)...(32e) = 10965.5301 (34)
136.9322 (35)

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.0600	0.0930	1.0286
E3 Sill	10.0600	-0.0590	-0.5935
E4 Jamb	27.7700	-0.0650	-1.8051
E5 Ground floor (normal)	19.4500	0.0300	0.5835
E6 Intermediate floor within a dwelling	17.8400	0.0180	0.3211
P1 Party wall - Ground floor	7.6200	0.1010	0.7696
E16 Corner (normal)	15.0800	0.1170	1.7644
E17 Corner (inverted - internal area greater than external area)	5.1000	0.0400	0.2040
E12 Gable (insulation at ceiling level)	7.6200	0.0390	0.2972
P4 Party wall - Roof (insulation at ceiling level)	7.6200	0.1010	0.7696
E10 Eaves (insulation at ceiling level)	11.8300	0.0430	0.5087
E18 Party wall between dwellings	4.9600	0.0540	0.2678
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			4.1159 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	43.8568 (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	16.2138	16.0106	15.8073	14.7911	14.5879	13.5717	13.5717	13.3684	13.9781	14.5879	14.9944	15.4008	(38)
Average = Sum(39)m / 12 =	60.0706	59.8674	59.6641	58.6479	58.4447	57.4285	57.4285	57.2252	57.8349	58.4447	58.8512	59.2576	(39)
												58.5971	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.7501	0.7476	0.7451	0.7324	0.7298	0.7171	0.7171	0.7146	0.7222	0.7298	0.7349	0.7400	(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													2.4644 (42)
Hot water usage for mixer showers	65.5392	64.5543	63.1191	60.3730	58.3465	56.0865	54.8020	56.2263	57.7877	60.2142	63.0193	65.2881	(42a)
Hot water usage for baths	28.3072	27.8868	27.2948	26.2032	25.3859	24.4796	23.9900	24.5779	25.2180	26.1878	27.3018	28.2115	(42b)
Hot water usage for other uses	39.8677	38.4180	36.9682	35.5185	34.0688	32.6190	32.6190	34.0688	35.5185	36.9682	38.4180	39.8677	(42c)
Average daily hot water use (litres/day)												122.9136	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	133.7141	130.8591	127.3821	122.0947	117.8011	113.1851	111.4110	114.8730	118.5242	123.3702	128.7390	133.3673	(44)
Energy content (annual)	211.7705	186.3416	195.7815	167.1416	158.5830	139.1743	134.7420	142.2367	146.1522	167.4122	183.4124	208.8210	(45)
Distribution loss (46)m = 0.15 x (45)m	31.7656	27.9512	29.3672	25.0712	23.7874	20.8761	20.2113	21.3355	21.9228	25.1118	27.5119	31.3232	(46)
Water storage loss (or HIU loss):												200.0000	(47)
Store volume												1.6900	(48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400	(49)
Temperature factor from Table 2b												0.9126	(55)
Enter (49) or (54) in (55)													
Total storage loss	28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906	(56)
If cylinder contains dedicated solar storage	28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906	(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	263.3235	232.9056	247.3345	217.0316	210.1360	189.0643	186.2950	193.7897	196.0422	218.9652	233.3024	260.3740	(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	263.3235	232.9056	247.3345	217.0316	210.1360	189.0643	186.2950	193.7897	196.0422	218.9652	233.3024	260.3740	(64)
12Total per year (kWh/year)												2648.5639	(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	111.6561	99.2098	106.3398	95.4866	93.9712	86.1875	86.0441	88.5361	88.5076	96.9070	100.8966	110.6754	(65)

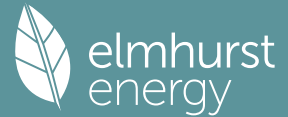
5. Internal gains (see Table 5 and 5a)

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	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	114.9142	127.2264	114.9142	118.7446	114.9142	118.7446	114.9142	114.9142	118.7446	114.9142	118.7446	114.9142	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	219.6077	221.8865	216.1439	203.9186	188.4863	173.9821	164.2925	162.0136	167.7562	179.9815	195.4138	209.9180	(68)
Pumps, fans	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	(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)	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	(71)
Total internal gains	150.0754	147.6336	142.9298	132.6202	126.3054	119.7048	115.6507	119.0002	122.9272	130.2513	140.1342	148.7572	(72)
	544.5629	556.7121	533.9535	515.2491	489.6715	472.3972	454.8230	455.8936	469.3937	485.1127	514.2583	533.5550	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g Specific data or Table 6c	FF Specific data or Table 6c	Access factor Table 6d	Gains W
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North			3.6700		10.6334		0.4000		0.7500		0.7700		8.1132 (74)
East			2.4900		19.6403		0.4000		0.7500		0.7700		10.1672 (76)
South			6.1500		46.7521		0.4000		0.7500		0.7700		59.7765 (78)

Solar gains	78.0569	133.2924	183.8063	231.0338	262.4248	262.3041	252.1369	228.3321	200.0413	147.6493	93.5415	66.7770 (83)
Total gains	622.6198	690.0046	717.7598	746.2829	752.0964	734.7013	706.9599	684.2257	669.4350	632.7619	607.7998	600.3320 (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	50.7067	50.8788	51.0521	51.9367	52.1173	53.0396	53.0396	53.2279	52.6668	52.1173	51.7574	51.4023	
alpha	4.3804	4.3919	4.4035	4.4624	4.4745	4.5360	4.5360	4.5485	4.5111	4.4745	4.4505	4.4268	
util living area	0.9491	0.9216	0.8822	0.7958	0.6663	0.4892	0.3553	0.3816	0.5713	0.8005	0.9146	0.9548 (86)	
Living	20.2029	20.3511	20.5204	20.7255	20.8556	20.9174	20.9291	20.9282	20.9019	20.7512	20.4662	20.1834	
Non living	19.3590	19.5445	19.7542	20.0079	20.1551	20.2273	20.2367	20.2385	20.2094	20.0432	19.6990	19.3421	
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	20.5922	20.3511	20.5204	20.7255	20.8556	20.9174	20.9291	20.9282	20.9019	20.7512	20.4662	20.2976 (87)	
Th 2	20.2968	20.2990	20.3012	20.3123	20.3146	20.3257	20.3257	20.3280	20.3213	20.3146	20.3101	20.3057 (88)	
util rest of house	0.9418	0.9108	0.8662	0.7699	0.6281	0.4410	0.3017	0.3271	0.5219	0.7705	0.9012	0.9482 (89)	
MIT 2	19.9229	19.5445	19.7542	20.0079	20.1551	20.2273	20.2367	20.2385	20.2094	20.0432	19.6990	19.5157 (90)	
Living area fraction									fLA = Living area / (4) =			0.1859 (91)	
MIT	20.0474	19.6945	19.8966	20.1413	20.2854	20.3556	20.3654	20.3667	20.3382	20.1749	19.8416	19.6611 (92)	
Temperature adjustment												0.0000	
adjusted MIT	20.0474	19.6945	19.8966	20.1413	20.2854	20.3556	20.3654	20.3667	20.3382	20.1749	19.8416	19.6611 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9388	0.9002	0.8559	0.7630	0.6264	0.4432	0.3049	0.3303	0.5231	0.7639	0.8909	0.9410 (94)	
Useful gains	584.5431	621.1723	614.3581	569.4169	471.1195	325.6198	215.5460	225.9922	350.2023	483.3453	541.4752	564.9054 (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	945.9542	885.7079	799.2992	659.2799	501.7688	330.5335	216.2433	226.9976	360.7849	559.5995	749.8596	916.1877 (97)	
Space heating kWh	268.8898	177.7679	137.5962	64.7013	22.8031	0.0000	0.0000	0.0000	0.0000	56.7331	150.0368	261.3541 (98a)	
Space heating requirement - total per year (kWh/year)												1139.8823	
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	268.8898	177.7679	137.5962	64.7013	22.8031	0.0000	0.0000	0.0000	0.0000	56.7331	150.0368	261.3541 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1139.8823	
Space heating per m2										(98c) / (4) =		14.2343 (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 %)													247.9998 (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	268.8898	177.7679	137.5962	64.7013	22.8031	0.0000	0.0000	0.0000	0.0000	56.7331	150.0368	261.3541 (98)	
Space heating efficiency (main heating system 1)	247.9998	247.9998	247.9998	247.9998	247.9998	0.0000	0.0000	0.0000	0.0000	247.9998	247.9998	247.9998 (210)	
Space heating fuel (main heating system)	108.4234	71.6807	55.4824	26.0893	9.1948	0.0000	0.0000	0.0000	0.0000	22.8763	60.4987	105.3848 (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	263.3235	232.9056	247.3345	217.0316	210.1360	189.0643	186.2950	193.7897	196.0422	218.9652	233.3024	260.3740 (64)	
Efficiency of water heater	282.4337	282.4337	282.4337	282.4337	282.4337	282.4337	282.4337	282.4337	282.4337	282.4337	282.4337	282.4337 (216)	
Fuel for water heating, kWh/month	93.2337	82.4638	87.5726	76.8434	74.4019	66.9411	65.9606	68.6142	69.4117	77.5280	82.6043	92.1894 (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	19.5303	17.6403	19.5303	18.9003	19.5303	18.9003	19.5303	19.5303	18.9003	19.5303	18.9003	19.5303 (221)	
Lighting	25.6267	20.5587	18.5108	13.5618	10.4755	8.5586	9.5561	12.4214	16.1342	21.1690	23.9103	26.3390 (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)	

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Annual totals kWh/year	
Space heating fuel - main system 1	459.6304 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	282.4337
Water heating fuel used	937.7647 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.9625)	
mechanical ventilation fans (SFP = 0.9625)	229.9534 (230a)
Total electricity for the above, kWh/year	229.9534 (231)
Electricity for lighting (calculated in Appendix L)	206.8223 (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	1834.1708 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	459.6304	0.1566	71.9994 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	937.7647	0.1409	132.1511 (264)
Space and water heating			204.1505 (265)
Pumps, fans and electric keep-hot	229.9534	0.1387	31.8974 (267)
Energy for lighting	206.8223	0.1443	29.8508 (268)
Total CO2, kg/year			265.8987 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.3200 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	459.6304	1.5799	726.1675 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	937.7647	1.5211	1426.4125 (278)
Space and water heating			2152.5800 (279)
Pumps, fans and electric keep-hot	229.9534	1.5128	347.8735 (281)
Energy for lighting	206.8223	1.5338	317.2309 (282)
Total Primary energy kWh/year			2817.6844 (286)
Dwelling Primary energy Rate (DPER)			35.1900 (287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)

CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

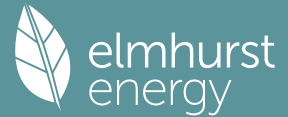
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	41.2600 (1b)	x 2.3000 (2b)	= 94.8980 (1b) - (3b)
First floor	38.8200 (1c)	x 2.6000 (2c)	= 100.9320 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.0800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	195.8300 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1532 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4032 (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) = 0.3730 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)

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Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.4755	0.4662	0.4569	0.4103	0.4009	0.3543	0.3543	0.3450	0.3730	0.4009	0.4196	0.4382 (22b)
Effective ac	0.6131	0.6087	0.6044	0.5842	0.5804	0.5628	0.5628	0.5595	0.5695	0.5804	0.5880	0.5960 (25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.1000	1.0000	2.1000			(26)
TER Opening Type			12.3100	1.1450	14.0954			(27)
Ground Floor			41.2600	0.1300	5.3638			(28a)
External Walls	92.3200	14.4100	77.9100	0.1800	14.0238			(29a)
External Roof	41.2600		41.2600	0.1100	4.5386			(30)
Total net area of external elements Aum(A, m2)			174.8400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.1216			(33)
Main dwelling								
Party Walls			37.6500	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								136.9322 (35)
List of Thermal Bridges								
K1 Element				Length	Psi-value	Total		
E2 Other lintels (including other steel lintels)				11.0600	0.0500	0.5530		
E3 Sill				10.0600	0.0500	0.5030		
E4 Jamb				27.7700	0.0500	1.3885		
E5 Ground floor (normal)				19.4500	0.1600	3.1120		
E6 Intermediate floor within a dwelling				17.8400	0.0000	0.0000		
P1 Party wall - Ground floor				7.6200	0.0800	0.6096		
E16 Corner (normal)				15.0800	0.0900	1.3572		
E17 Corner (inverted - internal area greater than external area)				5.1000	-0.0900	-0.4590		
E12 Gable (insulation at ceiling level)				7.6200	0.0600	0.4572		
P4 Party wall - Roof (insulation at ceiling level)				7.6200	0.1200	0.9144		
E10 Eaves (insulation at ceiling level)				11.8300	0.0600	0.7098		
E18 Party wall between dwellings				4.9600	0.0600	0.2976		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								9.4433 (36)
Point Thermal bridges						(36a) =		0.0000
Total fabric heat loss						(33) + (36) + (36a) =		49.5649 (37)

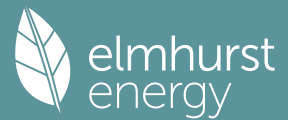
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.4644 (42)
Hot water usage for mixer showers	65.5392	64.5543	63.1191	60.3730	58.3465	56.0865	54.8020	56.2263	57.7877	60.2142	63.0193	65.2881	(42a)
Hot water usage for baths	28.3072	27.8868	27.2948	26.2032	25.3859	24.4796	23.9900	24.5779	25.2180	26.1878	27.3018	28.2115	(42b)
Hot water usage for other uses	39.8677	38.4180	36.9682	35.5185	34.0688	32.6190	32.6190	34.0688	35.5185	36.9682	38.4180	39.8677	(42c)
Average daily hot water use (litres/day)													122.9136 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.7141	130.8591	127.3821	122.0947	117.8011	113.1851	111.4110	114.8730	118.5242	123.3702	128.7390	133.3673	(44)
Energy content (annual)	211.7705	186.3416	195.7815	167.1416	158.5830	139.1743	134.7420	142.2367	146.1522	167.4122	183.4124	208.8210	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2041.5689	
Water storage loss (or HIU loss):	31.7656	27.9512	29.3672	25.0712	23.7874	20.8761	20.2113	21.3355	21.9228	25.1118	27.5119	31.3232	(46)
Store volume													200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6525 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8924 (55)
Total storage loss	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(56)
If cylinder contains dedicated solar storage	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(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	262.6966	232.3393	246.7076	216.4249	209.5090	188.4576	185.6680	193.1628	195.4355	218.3383	232.6956	259.7471	(62)
WWHRS	-29.9618	-26.4985	-27.7477	-22.9762	-21.4130	-18.3232	-17.1751	-18.2640	-18.9579	-22.3493	-25.3190	-29.4069	(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	232.7348	205.8409	218.9599	193.4487	188.0961	170.1344	168.4929	174.8988	176.4776	195.9890	207.3766	230.3401	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2362.7899	(64)
Electric shower(s)												2363	(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)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.1545	98.7568	105.8382	95.0012	93.4697	85.7021	85.5426	88.0346	88.0222	96.4054	100.4112	110.1738	(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
123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												

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116.4971	128.9789	116.4971	120.3803	116.4971	120.3803	116.4971	116.4971	120.3803	116.4971	120.3803	116.4971	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
219.6077	221.8865	216.1439	203.9186	188.4863	173.9821	164.2925	162.0136	167.7562	179.9815	195.4138	209.9180	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	(71)
Water heating gains (Table 5)												
149.4013	146.9595	142.2557	131.9461	125.6313	119.0307	114.9766	118.3260	122.2531	129.5772	139.4601	148.0831	(72)
Total internal gains												
548.4717	560.7906	537.8623	519.2107	493.5804	473.3588	455.7318	456.8024	470.3553	489.0215	518.2199	537.4639	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				3.6700	10.6334	0.6300	0.7000	0.7700	11.9264 (74)			
East				2.4900	19.6403	0.6300	0.7000	0.7700	14.9458 (76)			
South				6.1500	46.7521	0.6300	0.7000	0.7700	87.8714 (78)			
Solar gains	114.7436	195.9399	270.1953	339.6197	385.7645	385.5870	370.6413	335.6481	294.0607	217.0444	137.5060	98.1621 (83)
Total gains	663.2153	756.7304	808.0576	858.8304	879.3448	858.9458	826.3730	792.4505	764.4160	706.0659	655.7259	635.6260 (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	34.1542	34.2632	34.3707	34.8849	34.9828	35.4460	35.4460	35.5331	35.2661	34.9828	34.7853	34.5812
alpha	3.2769	3.2842	3.2914	3.3257	3.3322	3.3631	3.3631	3.3689	3.3511	3.3322	3.3190	3.3054
util living area	0.9596	0.9378	0.9066	0.8413	0.7365	0.5803	0.4390	0.4726	0.6668	0.8543	0.9364	0.9641 (86)
MIT	19.2043	19.4793	19.8347	20.2921	20.6561	20.8902	20.9674	20.9578	20.8167	20.3586	19.7228	19.1676 (87)
Th 2	19.9897	19.9926	19.9954	20.0087	20.0112	20.0229	20.0229	20.0250	20.0184	20.0112	20.0062	20.0009 (88)
util rest of house	0.9525	0.9273	0.8904	0.8132	0.6894	0.5084	0.3488	0.3818	0.5991	0.8228	0.9238	0.9578 (89)
MIT 2	17.9162	18.2618	18.7056	19.2702	19.6916	19.9428	20.0066	20.0026	19.8732	19.3621	18.5814	17.8774 (90)
Living area fraction	18.1557	18.4882	18.9155	19.4602	19.8710	20.1190	20.1853	20.1802	20.0486	19.5474	18.7936	18.1173 (91)
MIT	18.1557	18.4882	18.9155	19.4602	19.8710	20.1190	20.1853	20.1802	20.0486	19.5474	18.7936	18.1173 (92)
Temperature adjustment	18.1557	18.4882	18.9155	19.4602	19.8710	20.1190	20.1853	20.1802	20.0486	19.5474	18.7936	18.1173 (93)
adjusted MIT	18.1557	18.4882	18.9155	19.4602	19.8710	20.1190	20.1853	20.1802	20.0486	19.5474	18.7936	18.1173 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9352	0.9071	0.8690	0.7953	0.6821	0.5159	0.3642	0.3968	0.6014	0.8055	0.9041	0.9416	(94)
Useful gains	620.2291	686.4053	702.2193	683.0658	599.8150	443.1097	301.0003	314.4379	459.6956	568.7083	592.8303	598.5216	(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													
	1235.6963	1207.9832	1100.2796	922.0676	711.4517	474.2611	308.0950	324.0482	513.7892	779.0533	1023.9544	1225.8642	(97)
Space heating kWh													
	457.9076	350.5004	296.1569	172.0813	83.0578	0.0000	0.0000	0.0000	0.0000	156.4967	310.4093	466.7429	(98a)
Space heating requirement - total per year (kWh/year)												2293.3528	
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													
	457.9076	350.5004	296.1569	172.0813	83.0578	0.0000	0.0000	0.0000	0.0000	156.4967	310.4093	466.7429	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2293.3528	
Space heating per m2													
											(98c) / (4) =	28.6383	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	457.9076	350.5004	296.1569	172.0813	83.0578	0.0000	0.0000	0.0000	0.0000	156.4967	310.4093	466.7429 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	496.1079	379.7404	320.8633	186.4369	89.9867	0.0000	0.0000	0.0000	0.0000	169.5522	336.3048	505.6803 (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	232.7348	205.8409	218.9599	193.4487	188.0961	170.1344	168.4929	174.8988	176.4776	195.9890	207.3766	230.3401 (64)
Efficiency of water heater (217)m	85.5487	85.2430	84.7377	83.7983	82.3568	79.8000	79.8000	79.8000	79.8000	83.5600	84.9623	85.6096 (217)
Fuel for water heating, kWh/month	272.0496	241.4755	258.3974	230.8504	228.3917	213.2010	211.1440	219.1715	221.1498	234.5487	244.0809	269.0588 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)

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Lighting	24.2058	19.4188	17.4845	12.8099	9.8947	8.0841	9.0263	11.7327	15.2396	19.9952	22.5846	24.8785	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-38.1976	-53.6406	-76.8033	-86.0067	-92.4482	-86.1824	-85.1143	-80.4962	-72.2991	-61.1748	-41.9183	-33.0487	(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	-22.2152	-46.6643	-92.6264	-138.9441	-183.5541	-184.3731	-182.2046	-154.3467	-113.2300	-66.6766	-29.6413	-17.5724	(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												2484.6726	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2843.5193	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												195.3546	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2039.3788	(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												3570.1677	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2484.6726	0.2100	521.7812 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2843.5193	0.2100	597.1391 (264)
Space and water heating			1118.9203 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	195.3546	0.1443	28.1957 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-807.3300	0.1347	-108.7237
PV Unit electricity exported	-1232.0488	0.1259	-155.1554
Total			-263.8791 (269)
Total CO2, kg/year			895.1662 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.1800 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2484.6726	1.1300	2807.6800 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2843.5193	1.1300	3213.1768 (278)
Space and water heating			6020.8568 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	195.3546	1.5338	299.6415 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-807.3300	1.4977	-1209.1582
PV Unit electricity exported	-1232.0488	0.4623	-569.5290
Total			-1778.6872 (283)
Total Primary energy kWh/year			4671.9119 (286)
Target Primary Energy Rate (TPER)			58.3400 (287)

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

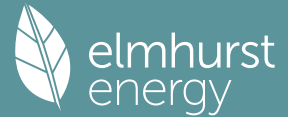
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	41.2600 (1b)	x 2.3000 (2b)	= 94.8980 (1b) - (3b)
First floor	38.8200 (1c)	x 2.6000 (2c)	= 100.9320 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.0800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 195.8300 (5)

2. Ventilation rate

m3 per hour

Full SAP Calculation Printout



Number of open chimneys 0 * 80 = 0.0000 (6a)
Number of open flues 0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire 0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler 0 * 20 = 0.0000 (6d)
Number of flues attached to other heater 0 * 35 = 0.0000 (6e)
Number of blocked chimneys 0 * 20 = 0.0000 (6f)
Number of intermittent extract fans 3 * 10 = 30.0000 (7a)
Number of passive vents 0 * 10 = 0.0000 (7b)
Number of flueless gas fires 0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 30.0000 / (5) = 0.1532 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 2.7200 (17)
Infiltration rate 0.2892 (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) = 0.2675 (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	0.3411	0.3344	0.3277	0.2943	0.2876	0.2541	0.2541	0.2474	0.2675	0.2876	0.3009	0.3143 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5582	0.5559	0.5537	0.5433	0.5413	0.5323	0.5323	0.5306	0.5358	0.5413	0.5453	0.5494 (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
Main dwelling							
Window			12.3100	1.2357	15.2120		(27)
Door			2.1000	1.4000	2.9400		(26)
Ground Floor			41.2600	0.1300	5.3638	110.0000	4538.6000 (28a)
External Walls	92.3200	14.4100	77.9100	0.1500	11.6865	18.0000	1402.3800 (29a)
External Roof	41.2600		41.2600	0.1100	4.5386	9.0000	371.3400 (30)
Total net area of external elements Aum(A, m2)			174.8400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.7409		(33)
Main dwelling							
Party Walls			37.6500	0.0000	0.0000	70.0000	2635.5001 (32)
Internal Walls			53.4100			9.0000	480.6900 (32c)
Internal Walls			54.3200			9.0000	488.8800 (32c)
Internal Floor			38.8200			18.0000	698.7600 (32d)
Internal Ceiling			38.8200			9.0000	349.3800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	10965.5301 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							136.9322 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				11.0600	0.0930	1.0286	
E3 Sill				10.0600	-0.0590	-0.5935	
E4 Jamb				27.7700	-0.0650	-1.8051	
E5 Ground floor (normal)				19.4500	0.0300	0.5835	
E6 Intermediate floor within a dwelling				17.8400	0.0180	0.3211	
P1 Party wall - Ground floor				7.6200	0.1010	0.7696	
E16 Corner (normal)				15.0800	0.1170	1.7644	
E17 Corner (inverted - internal area greater than external area)				5.1000	0.0400	0.2040	
E12 Gable (insulation at ceiling level)				7.6200	0.0390	0.2972	
P4 Party wall - Roof (insulation at ceiling level)				7.6200	0.1010	0.7696	
E10 Eaves (insulation at ceiling level)				11.8300	0.0430	0.5087	
E18 Party wall between dwellings				4.9600	0.0540	0.2678	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.1159 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	43.8568 (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	36.0707	35.9248	35.7817	35.1097	34.9840	34.3987	34.3987	34.2903	34.6241	34.9840	35.2383	35.5042 (38)
Heat transfer coeff	79.9275	79.7816	79.6385	78.9665	78.8408	78.2555	78.2555	78.1471	78.4809	78.8408	79.0951	79.3610 (39)
Average = Sum(39)m / 12 =												78.9659

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9981	0.9963	0.9945	0.9861	0.9845	0.9772	0.9772	0.9759	0.9800	0.9845	0.9877	0.9910 (40)
HLP (average)												0.9861
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

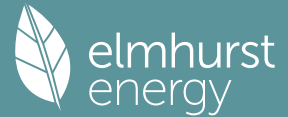
4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4644 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	28.3072	27.8868	27.2948	26.2032	25.3859	24.4796	23.9900	24.5779	25.2180	26.1878	27.3018	28.2115 (42b)
Hot water usage for other uses	39.8677	38.4180	36.9682	35.5185	34.0688	32.6190	32.6190	34.0688	35.5185	36.9682	38.4180	39.8677 (42c)
Average daily hot water use (litres/day)												62.4886 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	68.1749	66.3048	64.2630	61.7217	59.4546	57.0986	56.6090	58.6467	60.7365	63.1560	65.7198	68.0792 (44)
Energy conte	107.9724	94.4171	98.7699	84.4940	80.0374	70.2094	68.4637	72.6168	74.8941	85.7021	93.6299	106.5956 (45)
Energy content (annual)										Total = Sum(45)m =		1037.8024
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss (or HIU loss):												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

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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 (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	0.0000 (59)
Total heat required for water heating calculated for each month	91.7765	80.2546	83.9544	71.8199	68.0318	59.6780	58.1942	61.7243	63.6600	72.8468	79.5854	90.6063	0.0000 (61)
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 (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	91.7765	80.2546	83.9544	71.8199	68.0318	59.6780	58.1942	61.7243	63.6600	72.8468	79.5854	90.6063	0.0000 (63d)
12Total per year (kWh/year)													
Electric shower(s)	52.4860	46.7654	51.0661	48.7317	49.6462	47.3576	48.9362	49.6462	48.7317	51.0661	50.1058	52.4860	882.1321 (64)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													882 (64)
Heat gains from water heating, kWh/month	36.0656	31.7550	33.7551	30.1379	29.4195	26.7589	26.7826	27.8426	28.0979	30.9782	32.4228	35.7731	597.0250 (64a)
													597.0250 (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	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	114.9142	127.2264	114.9142	118.7446	114.9142	118.7446	114.9142	114.9142	118.7446	114.9142	118.7446	114.9142	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.6077	221.8865	216.1439	203.9186	188.4863	173.9821	164.2925	162.0136	167.7562	179.9815	195.4138	209.9180	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	(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)	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	(71)
Water heating gains (Table 5)	48.4753	47.2545	45.3698	41.8582	39.5423	37.1651	35.9981	37.4229	39.0249	41.6374	45.0317	48.0821	(72)
Total internal gains	442.9628	456.3330	436.3935	424.4871	402.9084	389.8576	375.1704	374.3163	385.4914	396.4988	419.1558	432.8799	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g or Table 6c	FF or Table 6c	Access factor Table 6d	Gains W		
North				3.6700	10.6334	0.4000		0.7500	0.7700	8.1132 (74)		
East				2.4900	19.6403	0.4000		0.7500	0.7700	10.1672 (76)		
South				6.1500	46.7521	0.4000		0.7500	0.7700	59.7765 (78)		
Solar gains	78.0569	133.2924	183.8063	231.0338	262.4248	262.3041	252.1369	228.3321	200.0413	147.6493	93.5415	66.7770 (83)
Total gains	521.0197	589.6254	620.1998	655.5208	665.3333	652.1616	627.3073	602.6484	585.5327	544.1480	512.6973	499.6568 (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	38.1093	38.1790	38.2476	38.5731	38.6346	38.9235	38.9235	38.9775	38.8117	38.6346	38.5103	38.3813	
alpha	3.5406	3.5453	3.5498	3.5715	3.5756	3.5949	3.5949	3.5985	3.5874	3.5756	3.5674	3.5588	
util living area	0.9779	0.9648	0.9458	0.9005	0.8177	0.6698	0.5183	0.5552	0.7505	0.9083	0.9638	0.9808	(86)
MIT	19.2030	19.4410	19.7616	20.2020	20.5865	20.8598	20.9579	20.9454	20.7765	20.2880	19.6780	19.1602	(87)
Th 2	20.0849	20.0864	20.0879	20.0949	20.0962	20.1024	20.1024	20.1035	20.1000	20.0962	20.0936	20.0908	(88)
util rest of house	0.9739	0.9585	0.9357	0.8808	0.7795	0.6010	0.4241	0.4618	0.6902	0.8863	0.9562	0.9773	(89)
MIT 2	18.4427	18.6781	18.9942	19.4249	19.7828	20.0177	20.0847	20.0791	19.9539	19.5138	18.9197	18.4046	(90)
Living area fraction	18.5841	18.8200	19.1369	19.5694	19.9323	20.1743	20.2471	20.2402	20.1068	19.6578	19.0607	18.5451	(91)
MIT	18.5841	18.8200	19.1369	19.5694	19.9323	20.1743	20.2471	20.2402	20.1068	19.6578	19.0607	18.5451	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5841	18.8200	19.1369	19.5694	19.9323	20.1743	20.2471	20.2402	20.1068	19.6578	19.0607	18.5451	(93)

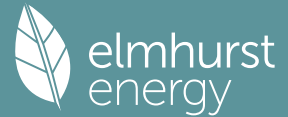
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9652	0.9473	0.9226	0.8673	0.7717	0.6069	0.4399	0.4768	0.6907	0.8735	0.9452	0.9693	(94)
Ext temp.	502.8895	558.5697	572.2107	568.5329	513.4120	395.8264	275.9831	287.3257	404.4216	475.2994	484.5780	484.3368	(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	1141.6907	1110.5560	1006.3822	842.5227	649.0383	436.2197	285.4057	300.1000	471.4217	714.1235	946.0341	1138.4417	(97)
Space heating requirement - total per year (kWh/year)	475.2681	370.9348	323.0236	197.2727	100.9060	0.0000	0.0000	0.0000	0.0000	177.6851	332.2484	486.6540	(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)	475.2681	370.9348	323.0236	197.2727	100.9060	0.0000	0.0000	0.0000	0.0000	177.6851	332.2484	486.6540	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)													2463.9927
Space heating per m ²													30.7691 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	735.6018	579.0907	593.9181	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7711	0.8444	0.8227	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	567.2474	488.9800	488.6454	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	715.0219	688.3187	661.7759	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	106.3976	148.3080	128.8091	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									FC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	26.5994	37.0770	32.2023	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												95.8787 (107)
Energy for space heating												30.7691 (99)
Energy for space cooling												1.1973 (108)
Total												31.9664 (109)
Fabric Energy Efficiency (DFEE)												32.0 (109)

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

1. Overall dwelling characteristics

Main dwelling	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	41.2600 (1b)	x 2.3000 (2b)	= 94.8980 (1b) - (3b)
First floor	38.8200 (1c)	x 2.6000 (2c)	= 100.9320 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.0800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 195.8300 (5)

2. Ventilation rate

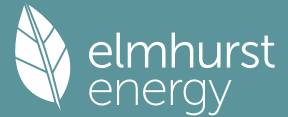
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	30.0000 / (5) =	0.1532 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.4032	(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) =	0.3730 (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)
	0.4755	0.4662	0.4569	0.4103	0.4009	0.3543	0.3543	0.3450	0.3730	0.4009	0.4196	0.4382 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.6131	0.6087	0.6044	0.5842	0.5804	0.5628	0.5628	0.5595	0.5695	0.5804	0.5880	0.5960 (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
Main dwelling							
TER Opaque door			2.1000	1.0000	2.1000		(26)
TER Opening Type			12.3100	1.1450	14.0954		(27)
Ground Floor			41.2600	0.1300	5.3638		(28a)
External Walls	92.3200	14.4100	77.9100	0.1800	14.0238		(29a)
External Roof	41.2600		41.2600	0.1100	4.5386		(30)
Total net area of external elements Aum(A, m ²)			174.8400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.1216		(33)
Main dwelling							
Party Walls			37.6500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							136.9322 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value		Total
E2 Other lintels (including other steel lintels)				11.0600	0.0500		0.5530
E3 Sill				10.0600	0.0500		0.5030
E4 Jamb				27.7700	0.0500		1.3885
E5 Ground floor (normal)				19.4500	0.1600		3.1120
E6 Intermediate floor within a dwelling				17.8400	0.0000		0.0000
P1 Party wall - Ground floor				7.6200	0.0800		0.6096
E16 Corner (normal)				15.0800	0.0900		1.3572
E17 Corner (inverted - internal area greater than external area)				5.1000	-0.0900		-0.4590
E12 Gable (insulation at ceiling level)				7.6200	0.0600		0.4572

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P4 Party wall - Roof (insulation at ceiling level)	7.6200	0.1200	0.9144
E10 Eaves (insulation at ceiling level)	11.8300	0.0600	0.7098
E18 Party wall between dwellings	4.9600	0.0600	0.2976
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			9.4433 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	49.5649 (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	
39.6182	39.3345	39.0564	37.7502	37.5058	36.3682	36.3682	36.1575	36.8064	37.5058	38.0002	38.5171	(38)
Heat transfer coeff	89.1831	88.8994	88.6213	87.3151	87.0707	85.9331	85.9331	85.7224	86.3713	87.0707	87.5651	88.0820 (39)
Average = Sum(39)m / 12 =												87.3140
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1137	1.1101	1.1067	1.0903	1.0873	1.0731	1.0731	1.0705	1.0786	1.0873	1.0935	1.0999 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

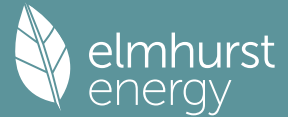
4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.4644 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths												28.3072 (42b)
Hot water usage for other uses												39.8677 (42c)
Average daily hot water use (litres/day)												62.4886 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	68.1749	66.3048	64.2630	61.7217	59.4546	57.0986	56.6090	58.6467	60.7365	63.1560	65.7198	68.0792 (44)
Energy content (annual)	107.9724	94.4171	98.7699	84.4940	80.0374	70.2094	68.4637	72.6168	74.8941	85.7021	93.6299	106.5956 (45)
Distribution loss (46)m = 0.15 x (45)m												1037.8024
Water storage loss (or HIU loss):												0.0000 (46)
Total storage loss												0.0000 (56)
If cylinder contains dedicated solar storage												0.0000 (57)
Primary loss												0.0000 (59)
Combi loss												0.0000 (61)
Total heat required for water heating calculated for each month												
WWHRS	91.7765	80.2546	83.9544	71.8199	68.0318	59.6780	58.1942	61.7243	63.6600	72.8468	79.5854	90.6063 (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	91.7765	80.2546	83.9544	71.8199	68.0318	59.6780	58.1942	61.7243	63.6600	72.8468	79.5854	90.6063 (64)
12Total per year (kWh/year)												882.1321 (64)
Electric shower(s)												882 (64)
Heat gains from water heating, kWh/month												
	52.4860	46.7654	51.0661	48.7317	49.6462	47.3576	48.9362	49.6462	48.7317	51.0661	50.1058	52.4860 (64a)
	36.0656	31.7550	33.7551	30.1379	29.4195	26.7589	26.7826	27.8426	28.0979	30.9782	32.4228	35.7731 (65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 597.0250 (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	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189	123.2189 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	116.4971	128.9789	116.4971	120.3803	116.4971	120.3803	116.4971	116.4971	120.3803	116.4971	120.3803	116.4971 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	219.6077	221.8865	216.1439	203.9186	188.4863	173.9821	164.2925	162.0136	167.7562	179.9815	195.4138	209.9180 (68)
Pumps, fans	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219	35.3219 (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)	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751 (71)
Total internal gains	48.4753	47.2545	45.3698	41.8582	39.5423	37.1651	35.9981	37.4229	39.0249	41.6374	45.0317	48.0821 (72)
	444.5457	458.0856	437.9764	426.1228	404.4914	391.4933	376.7533	375.8992	387.1271	398.0817	420.7915	434.4628 (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			3.6700	10.6334	0.6300	0.7000	0.7700	11.9264 (74)				
East			2.4900	19.6403	0.6300	0.7000	0.7700	14.9458 (76)				
South			6.1500	46.7521	0.6300	0.7000	0.7700	87.8714 (78)				
Solar gains	114.7436	195.9399	270.1953	339.6197	385.7645	385.5870	370.6413	335.6481	294.0607	217.0444	137.5060	98.1621 (83)
Total gains	559.2894	654.0254	708.1717	765.7424	790.2559	777.0802	747.3946	711.5474	681.1878	615.1261	558.2975	532.6249 (84)

7. Mean internal temperature (heating season)												
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

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tau	34.1542	34.2632	34.3707	34.8849	34.9828	35.4460	35.4460	35.5331	35.2661	34.9828	34.7853	34.5812
alpha	3.2769	3.2842	3.2914	3.3257	3.3322	3.3631	3.3631	3.3689	3.3511	3.3322	3.3190	3.3054
util living area	0.9744	0.9570	0.9315	0.8744	0.7785	0.6247	0.4793	0.5176	0.7163	0.8912	0.9578	0.9779 (86)
MIT	19.0118	19.3028	19.6809	20.1800	20.5872	20.8625	20.9576	20.9445	20.7702	20.2420	19.5550	18.9732 (87)
Th 2	19.9897	19.9926	19.9954	20.0087	20.0112	20.0229	20.0229	20.0250	20.0184	20.0112	20.0062	20.0009 (88)
util rest of house	0.9697	0.9493	0.9187	0.8502	0.7342	0.5515	0.3830	0.4212	0.6501	0.8652	0.9489	0.9738 (89)
MIT 2	18.1856	18.4734	18.8450	19.3328	19.7070	19.9431	20.0061	20.0015	19.8731	19.4019	18.7348	18.1555 (90)
Living area fraction									FLA = Living area / (4) =			
MIT	18.3392	18.6276	19.0004	19.4903	19.8706	20.1141	20.1830	20.1768	20.0399	19.5581	18.8873	18.3075 (92)
Temperature adjustment												0.0000
adjusted MIT	18.3392	18.6276	19.0004	19.4903	19.8706	20.1141	20.1830	20.1768	20.0399	19.5581	18.8873	18.3075 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9593	0.9357	0.9031	0.8354	0.7272	0.5588	0.3994	0.4370	0.6517	0.8509	0.9358	0.9643 (94)
Useful gains	536.4984	611.9927	639.5312	639.7103	574.7020	434.2351	298.5289	310.9168	443.9281	523.4033	522.4323	513.6278 (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	1252.0628	1220.3760	1107.8016	924.6956	711.4236	473.8420	307.8983	323.7601	513.0346	779.9905	1032.1592	1242.6195 (97)
Space heating kWh	532.3799	408.8336	348.3932	205.1894	101.7208	0.0000	0.0000	0.0000	0.0000	190.9009	367.0033	542.3699 (98a)
Space heating requirement - total per year (kWh/year)												2696.7910
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	532.3799	408.8336	348.3932	205.1894	101.7208	0.0000	0.0000	0.0000	0.0000	190.9009	367.0033	542.3699 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2696.7910
Space heating per m2											(98c) / (4) =	33.6762 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	807.7711	635.9049	651.4904	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7940	0.8600	0.8381	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	641.3809	546.8909	545.9920	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	859.2573	826.9799	787.4047	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	156.8710	208.3862	179.6111	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	39.2177	52.0966	44.9028	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												136.2171 (107)
Energy for space heating												33.6762 (99)
Energy for space cooling												1.7010 (108)
Total												35.3772 (109)
Fabric Energy Efficiency (TFEE)												35.4 (109)

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

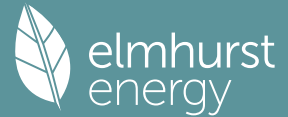
1. Overall dwelling characteristics

Main dwelling	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	41.2600 (1b)	x 2.3000 (2b)	= 94.8980 (1b) - (3b)
First floor	38.8200 (1c)	x 2.6000 (2c)	= 100.9320 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.0800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	195.8300 (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)+(7a)+(7b)+(7c) =	
Pressure test	0.0000 / (5) =	0.0000 (8)
Pressure Test Method	Yes	
Measured/design AP50	Blower Door	2.7200 (17)
Infiltration rate		0.1360 (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

$$(21) = (18) \times (20) = 0.1258 \quad (21)$$

	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	0.1604	0.1573	0.1541	0.1384	0.1352	0.1195	0.1195	0.1164	0.1258	0.1352	0.1415	0.1478	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation													0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													81.9000 (23c)
Effective ac	0.2509	0.2477	0.2446	0.2289	0.2257	0.2100	0.2100	0.2069	0.2163	0.2257	0.2320	0.2383	(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	
Main dwelling								
Window			12.3100	1.2357	15.2120			(27)
Door			2.1000	1.4000	2.9400			(26)
Ground Floor			41.2600	0.1300	5.3638	110.0000	4538.6000	(28a)
External Walls	92.3200	14.4100	77.9100	0.1500	11.6865	18.0000	1402.3800	(29a)
External Roof	41.2600		41.2600	0.1100	4.5386	9.0000	371.3400	(30)
Total net area of external elements Aum (A, m2)			174.8400					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 39.7409			(33)
Main dwelling								
Party Walls			37.6500	0.0000	0.0000	70.0000	2635.5001	(32)
Internal Walls			53.4100			9.0000	480.6900	(32c)
Internal Walls			54.3200			9.0000	488.8800	(32c)
Internal Floor			38.8200			18.0000	698.7600	(32d)
Internal Ceiling			38.8200			9.0000	349.3800	(32e)

Heat capacity Cm = Sum(A x k)

$$(28)...(30) + (32) + (32a)...(32e) = 10965.5301 \quad (34)$$

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

$$136.9322 \quad (35)$$

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.0600	0.0930	1.0286
E3 Sill	10.0600	-0.0590	-0.5935
E4 Jamb	27.7700	-0.0650	-1.8051
E5 Ground floor (normal)	19.4500	0.0300	0.5835
E6 Intermediate floor within a dwelling	17.8400	0.0180	0.3211
P1 Party wall - Ground floor	7.6200	0.1010	0.7696
E16 Corner (normal)	15.0800	0.1170	1.7644
E17 Corner (inverted - internal area greater than external area)	5.1000	0.0400	0.2040
E12 Gable (insulation at ceiling level)	7.6200	0.0390	0.2972
P4 Party wall - Roof (insulation at ceiling level)	7.6200	0.1010	0.7696
E10 Eaves (insulation at ceiling level)	11.8300	0.0430	0.5087
E18 Party wall between dwellings	4.9600	0.0540	0.2678

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

$$4.1159 \quad (36)$$

Point Thermal bridges

$$(36a) = 0.0000$$

Total fabric heat loss

$$(33) + (36) + (36a) = 43.8568 \quad (37)$$

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

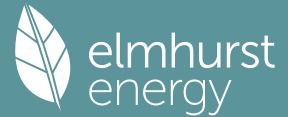
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	16.2138	16.0106	15.8073	14.7911	14.5879	13.5717	13.5717	13.3684	13.9781	14.5879	14.9944	15.4008	(38)
Heat transfer coeff	60.0706	59.8674	59.6641	58.6479	58.4447	57.4285	57.4285	57.2252	57.8349	58.4447	58.8512	59.2576	(39)
Average = Sum(39)m / 12 =													58.5971

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7501	0.7476	0.7451	0.7324	0.7298	0.7171	0.7171	0.7146	0.7222	0.7298	0.7349	0.7400	(40)
HLP (average)													0.7317
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.4644 (42)
Hot water usage for mixer showers													
65.5392	64.5543	63.1191	60.3730	58.3465	56.0865	54.8020	56.2263	57.7877	60.2142	63.0193	65.2881	65.2881	(42a)
Hot water usage for baths													
28.3072	27.8868	27.2948	26.2032	25.3859	24.4796	23.9900	24.5779	25.2180	26.1878	27.3018	28.2115	28.2115	(42b)
Hot water usage for other uses													
39.8677	38.4180	36.9682	35.5185	34.0688	32.6190	32.6190	34.0688	35.5185	36.9682	38.4180	39.8677	39.8677	(42c)
Average daily hot water use (litres/day)													122.9136 (43)
Daily hot water use													
133.7141	130.8591	127.3821	122.0947	117.8011	113.1851	111.4110	114.8730	118.5242	123.3702	128.7390	133.3673	133.3673	(44)
Energy conte	211.7705	186.3416	195.7815	167.1416	158.5830	139.1743	134.7420	142.2367	146.1522	167.4122	183.4124	208.8210	(45)
Energy content (annual)													2041.5689
Distribution loss (46)m = 0.15 x (45)m													
31.7656	27.9512	29.3672	25.0712	23.7874	20.8761	20.2113	21.3355	21.9228	25.1118	27.5119	31.3232	31.3232	(46)
Water storage loss (or HIU loss):													
Store volume													200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6900 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.9126 (55)
Total storage loss													
28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	(56)
If cylinder contains dedicated solar storage													
28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
263.3235	232.9056	247.3345	217.0316	210.1360	189.0643	186.2950	193.7897	196.0422	218.9652	233.3024	260.3740	260.3740	(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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263.3235	232.9056	247.3345	217.0316	210.1360	189.0643	186.2950	193.7897	196.0422	218.9652	233.3024	260.3740 (64)
Total per year (kWh/year) = Sum(64)m =											2648.5639 (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											
111.6561	99.2098	106.3398	95.4866	93.9712	86.1875	86.0441	88.5361	88.5076	96.9070	100.8966	110.6754 (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	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	29.2778	26.0043	21.1481	16.0105	11.9680	10.1039	10.9176	14.1912	19.0473	24.1850	28.2274	30.0916 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	327.7726	331.1739	322.6028	304.3561	281.3228	259.6748	245.2126	241.8114	250.3824	268.6292	291.6624	313.3104 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506 (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)												
	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751 (71)
Water heating gains (Table 5)												
	150.0754	147.6336	142.9298	132.6202	126.3054	119.7048	115.6507	119.0002	122.9272	130.2513	140.1342	148.7572 (72)
Total internal gains												
	608.6640	606.3500	588.2189	554.5250	521.1345	491.0217	473.3191	476.5409	493.8952	524.6036	561.5622	593.6974 (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		3.6700	10.6334	0.4000	0.7500	0.7700	8.1132 (74)
East		2.4900	19.6403	0.4000	0.7500	0.7700	10.1672 (76)
South		6.1500	46.7521	0.4000	0.7500	0.7700	59.7765 (78)

Solar gains	78.0569	133.2924	183.8063	231.0338	262.4248	262.3041	252.1369	228.3321	200.0413	147.6493	93.5415	66.7770 (83)
Total gains	686.7209	739.6424	772.0252	785.5588	783.5593	753.3258	725.4560	704.8729	693.9365	672.2529	655.1037	660.4744 (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	50.7067	50.8788	51.0521	51.9367	52.1173	53.0396	53.0396	53.2279	52.6668	52.1173	51.7574	51.4023
alpha	4.3804	4.3919	4.4035	4.4624	4.4745	4.5360	4.5360	4.5485	4.5111	4.4745	4.4505	4.4268
util living area												
	0.9311	0.9043	0.8581	0.7732	0.6459	0.4781	0.3464	0.3708	0.5539	0.7739	0.8944	0.9387 (86)
Living												
	20.2882	20.4093	20.5721	20.7494	20.8644	20.9186	20.9293	20.9286	20.9053	20.7756	20.5194	20.2660
Non living												
	19.4643	19.6151	19.8152	20.0343	20.1637	20.2282	20.2369	20.2387	20.2123	20.0695	19.7627	19.4445
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												
	20.6359	20.4093	20.5721	20.7494	20.8644	20.9186	20.9293	20.9286	20.9053	20.7756	20.5194	20.3687 (87)
Th 2												
	20.2968	20.2990	20.3012	20.3123	20.3146	20.3257	20.3257	20.3280	20.3213	20.3146	20.3101	20.3057 (88)
util rest of house												
	0.9217	0.8919	0.8402	0.7462	0.6077	0.4307	0.2941	0.3177	0.5052	0.7424	0.8789	0.9302 (89)
MIT 2												
	19.9649	19.6151	19.8152	20.0343	20.1637	20.2282	20.2369	20.2387	20.2123	20.0695	19.7627	19.5997 (90)
Living area fraction												
										fLA = Living area / (4) =		0.1859 (91)
MIT												
	20.0897	19.7628	19.9559	20.1673	20.2940	20.3566	20.3656	20.3670	20.3411	20.2008	19.9034	19.7427 (92)
Temperature adjustment												
												0.0000
adjusted MIT												
	20.0897	19.7628	19.9559	20.1673	20.2940	20.3566	20.3656	20.3670	20.3411	20.2008	19.9034	19.7427 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9186	0.8812	0.8305	0.7402	0.6065	0.4329	0.2972	0.3208	0.5067	0.7368	0.8687	0.9223 (94)
Useful gains	630.8307	651.7800	641.1798	581.4401	475.2543	326.1218	215.6260	226.1227	351.6236	495.3268	569.0985	609.1579 (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												
	948.4947	889.7970	802.8355	660.8025	502.2745	330.5936	216.2533	227.0137	360.9563	561.1157	753.4949	921.0215 (97)
Space heating kWh												
	236.3420	159.9474	120.2718	57.1409	20.1030	0.0000	0.0000	0.0000	0.0000	48.9469	132.7654	232.0265 (98a)
Space heating requirement - total per year (kWh/year)												1007.5440
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												
	236.3420	159.9474	120.2718	57.1409	20.1030	0.0000	0.0000	0.0000	0.0000	48.9469	132.7654	232.0265 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1007.5440
Space heating per m2												
										(98c) / (4) =		12.5817 (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 %)												247.9998 (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)	236.3420	159.9474	120.2718	57.1409	20.1030	0.0000	0.0000	0.0000	0.0000	48.9469	132.7654	232.0265 (98)
Space heating fuel (main heating system)	247.9998	247.9998	247.9998	247.9998	247.9998	0.0000	0.0000	0.0000	0.0000	247.9998	247.9998	247.9998 (210)
Space heating efficiency (main heating system 2)	95.2993	64.4950	48.4968	23.0407	8.1061	0.0000	0.0000	0.0000	0.0000	19.7367	53.5345	93.5592 (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)
Water heating 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 (215)
Efficiency of water heater (217)m	263.3235	232.9056	247.3345	217.0316	210.1360	189.0643	186.2950	193.7897	196.0422	218.9652	233.3024	260.3740 (64)
Fuel for water heating, kWh/month	282.4337	282.4337	282.4337	282.4337	282.4337	282.4337	282.4337	282.4337	282.4337	282.4337	282.4337	282.4337 (216)
Space cooling fuel requirement (221)m	93.2337	82.4638	87.5726	76.8434	74.4019	66.9411	65.9606	68.6142	69.4117	77.5280	82.6043	92.1894 (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	19.5303	17.6403	19.5303	18.9003	19.5303	18.9003	19.5303	19.5303	18.9003	19.5303	18.9003	19.5303 (231)
Electricity generated by PVs (Appendix M) (negative quantity)	25.6267	20.5587	18.5108	13.5618	10.4755	8.5586	9.5561	12.4214	16.1342	21.1690	23.9103	26.3390 (232)
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 (233a)
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 (234a)
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 (235a)
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 (235c)
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 (233b)
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 (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 (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												406.2681 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												282.4337
Water heating fuel used												937.7647 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.9625)												
mechanical ventilation fans (SFP = 0.9625)												229.9534 (230a)
Total electricity for the above, kWh/year												229.9534 (231)
Electricity for lighting (calculated in Appendix L)												206.8223 (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												1780.8085 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	406.2681	16.4900	66.9936 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	937.7647	16.4900	154.6374 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	229.9534	16.4900	37.9193 (249)
Energy for lighting	206.8223	16.4900	34.1050 (250)
Additional standing charges			0.0000 (251)
Total energy cost			293.6553 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)		0.8452 (257)
SAP value		86.2995
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	406.2681	0.1567	63.6558 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	937.7647	0.1409	132.1511 (264)
Space and water heating			195.8069 (265)
Pumps, fans and electric keep-hot	229.9534	0.1387	31.8974 (267)
Energy for lighting	206.8223	0.1443	29.8508 (268)
Total CO2, kg/year			257.5551 (272)
CO2 emissions per m2			3.2200 (273)
EI value			97.2408
EI rating			97 (274)
EI band			A

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

1. Overall dwelling characteristics

Main dwelling	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	41.2600 (1b)	x 2.3000 (2b)	= 94.8980 (1b) - (3b)
First floor	38.8200 (1c)	x 2.6000 (2c)	= 100.9320 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.0800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 195.8300 (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	2.7200	(17)
Infiltration rate	0.1360	(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) =	0.1258 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.1000	3.8000	3.7000	3.5000	3.5000	3.2000	3.3000	3.1000	3.1000	3.4000	3.3000	3.7000 (22)
Wind factor	1.0250	0.9500	0.9250	0.8750	0.8750	0.8000	0.8250	0.7750	0.7750	0.8500	0.8250	0.9250 (22a)
Adj infilt rate	0.1289	0.1195	0.1164	0.1101	0.1101	0.1006	0.1038	0.0975	0.0975	0.1069	0.1038	0.1164 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												81.9000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2194	0.2100	0.2069	0.2006	0.2006	0.1911	0.1943	0.1880	0.1880	0.1974	0.1943	0.2069 (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
Main dwelling							
Window			12.3100	1.2357	15.2120		(27)
Door			2.1000	1.4000	2.9400		(26)
Ground Floor			41.2600	0.1300	5.3638	110.0000	4538.6000 (28a)
External Walls	92.3200	14.4100	77.9100	0.1500	11.6865	18.0000	1402.3800 (28a)
External Roof	41.2600		41.2600	0.1100	4.5386	9.0000	371.3400 (30)
Total net area of external elements Aum(A, m ²)			174.8400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.7409		(33)
Main dwelling							
Party Walls			37.6500	0.0000	0.0000	70.0000	2635.5001 (32)
Internal Walls			53.4100			9.0000	480.6900 (32c)
Internal Walls			54.3200			9.0000	488.8800 (32c)
Internal Floor			38.8200			18.0000	698.7600 (32d)
Internal Ceiling			38.8200			9.0000	349.3800 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 10965.5301 (34)

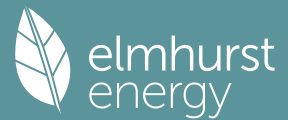
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 136.9322 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.0600	0.0930	1.0286
E3 Sill	10.0600	-0.0590	-0.5935
E4 Jamb	27.7700	-0.0650	-1.8051
E5 Ground floor (normal)	19.4500	0.0300	0.5835
E6 Intermediate floor within a dwelling	17.8400	0.0180	0.3211
P1 Party wall - Ground floor	7.6200	0.1010	0.7696
E16 Corner (normal)	15.0800	0.1170	1.7644
E17 Corner (inverted - internal area greater than external area)	5.1000	0.0400	0.2040
E12 Gable (insulation at ceiling level)	7.6200	0.0390	0.2972
P4 Party wall - Roof (insulation at ceiling level)	7.6200	0.1010	0.7696
E10 Eaves (insulation at ceiling level)	11.8300	0.0430	0.5087
E18 Party wall between dwellings	4.9600	0.0540	0.2678
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			4.1159 (36)
Point Thermal Bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 43.8568 (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	14.1814	13.5717	13.3684	12.9619	12.9619	12.3522	12.5555	12.1490	12.1490	12.7587	12.5555	13.3684 (38)
Average = Sum(39)m / 12 =	58.0382	57.4285	57.2252	56.8187	56.8187	56.2090	56.4123	56.0058	56.0058	56.6155	56.4123	57.2252 (39)
												56.7679

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HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7248	0.7171	0.7146	0.7095	0.7095	0.7019	0.7044	0.6994	0.6994	0.7070	0.7044	0.7146 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	0.7089 31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4644 (42)
Hot water usage for mixer showers	65.5392	64.5543	63.1191	60.3730	58.3465	56.0865	54.8020	56.2263	57.7877	60.2142	63.0193	65.2881 (42a)
Hot water usage for baths	28.3072	27.8868	27.2948	26.2032	25.3859	24.4796	23.9900	24.5779	25.2180	26.1878	27.3018	28.2115 (42b)
Hot water usage for other uses	39.8677	38.4180	36.9682	35.5185	34.0688	32.6190	32.6190	34.0688	35.5185	36.9682	38.4180	39.8677 (42c)
Average daily hot water use (litres/day)												122.9136 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	133.7141	130.8591	127.3821	122.0947	117.8011	113.1851	111.4110	114.8730	118.5242	123.3702	128.7390	133.3673 (44)
Energy content (annual)	211.7705	186.3416	195.7815	167.1416	158.5830	139.1743	134.7420	142.2367	146.1522	167.4122	183.4124	208.8210 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 2041.5689
Water storage loss (or HIU loss):	31.7656	27.9512	29.3672	25.0712	23.7874	20.8761	20.2113	21.3355	21.9228	25.1118	27.5119	31.3232 (46)
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6900 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9126 (55)
Total storage loss	28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906 (56)
If cylinder contains dedicated solar storage	28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906 (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	263.3235	232.9056	247.3345	217.0316	210.1360	189.0643	186.2950	193.7897	196.0422	218.9652	233.3024	260.3740 (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	263.3235	232.9056	247.3345	217.0316	210.1360	189.0643	186.2950	193.7897	196.0422	218.9652	233.3024	260.3740 (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	111.6561	99.2098	106.3398	95.4866	93.9712	86.1875	86.0441	88.5361	88.5076	96.9070	100.8966	110.6754 (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	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.2778	26.0043	21.1481	16.0105	11.9680	10.1039	10.9176	14.1912	19.0473	24.1850	28.2274	30.0916 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.7726	331.1739	322.6028	304.3561	281.3228	259.6748	245.2126	241.8114	250.3824	268.6292	291.6624	313.3104 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506 (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)	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751 (71)
Water heating gains (Table 5)	150.0754	147.6336	142.9298	132.6202	126.3054	119.7048	115.6507	119.0002	122.9272	130.2513	140.1342	148.7572 (72)
Total internal gains	608.6640	606.3500	588.2189	554.5250	521.1345	491.0217	473.3191	476.5409	493.8952	524.6036	561.5622	593.6974 (73)

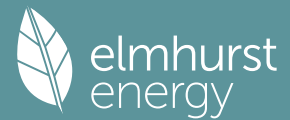
6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c	Access factor Table 6d		Gains W	
North				3.6700	12.6762	0.4000		0.7500	0.7700		9.6718 (74)	
East				2.4900	23.6925	0.4000		0.7500	0.7700		12.2649 (76)	
South				6.1500	53.2576	0.4000		0.7500	0.7700		68.0944 (78)	
Solar gains	90.0311	136.7727	188.6082	248.8108	275.6308	299.4170	281.6460	254.5699	220.3502	162.1651	108.9463	77.4737 (83)
Total gains	698.6951	743.1227	776.8271	803.3358	796.7653	790.4387	754.9652	731.1108	714.2453	686.7687	670.5086	671.1711 (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	52.4824	53.0396	53.2279	53.6087	53.6087	54.1903	53.9950	54.3869	54.3869	53.8012	53.9950	53.2279
alpha	4.4988	4.5360	4.5485	4.5739	4.5739	4.6127	4.5997	4.6258	4.6258	4.5867	4.5997	4.5485
util living area	0.9129	0.8867	0.8293	0.7313	0.5804	0.4016	0.2981	0.2904	0.4913	0.7036	0.8589	0.9209 (86)
Living	20.4146	20.5098	20.6625	20.8044	20.8957	20.9276	20.9316	20.9322	20.9197	20.8450	20.6410	20.4015
Non living	19.6395	19.7611	19.9467	20.1149	20.2130	20.2494	20.2500	20.2551	20.2453	20.1644	19.9323	19.6315
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

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MIT	20.7005	20.5098	20.6625	20.8044	20.8957	20.9276	20.9316	20.9322	20.9197	20.8450	20.6410	20.4853 (87)
Th 2	20.3190	20.3257	20.3280	20.3324	20.3324	20.3391	20.3369	20.3414	20.3414	20.3347	20.3369	20.3280 (88)
util rest of house												
	0.9014	0.8726	0.8090	0.7022	0.5407	0.3563	0.2490	0.2404	0.4440	0.6669	0.8395	0.9101 (89)
MIT 2	20.0481	19.7611	19.9467	20.1149	20.2130	20.2494	20.2500	20.2551	20.2453	20.1644	19.9323	19.7570 (90)
Living area fraction									flA = Living area / (4) =			0.1859 (91)
MIT	20.1694	19.9003	20.0798	20.2431	20.3399	20.3755	20.3768	20.3810	20.3707	20.2909	20.0641	19.8924 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1694	19.9003	20.0798	20.2431	20.3399	20.3755	20.3768	20.3810	20.3707	20.2909	20.0641	19.8924 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8986	0.8627	0.8009	0.6981	0.5411	0.3588	0.2520	0.2434	0.4461	0.6644	0.8308	0.9024 (94)	
Useful gains	627.8521	641.0757	622.1795	560.8479	431.1513	283.6259	190.2388	177.9594	318.6229	456.2574	557.0491	605.6353 (95)	
Ext temp.	5.0000	5.4000	7.1000	9.4000	12.5000	15.3000	17.0000	17.2000	14.6000	11.6000	7.9000	5.0000 (96)	
Heat loss rate W													
	880.4069	832.7294	742.7705	616.0925	445.4555	285.2884	190.4917	178.1558	323.1921	492.0405	686.2015	852.2226 (97)	
Space heating kWh													
	187.9008	128.7913	89.7197	39.7761	10.6423	0.0000	0.0000	0.0000	0.0000	26.6226	92.9898	183.4609 (98a)	
Space heating requirement - total per year (kWh/year)												759.9034	
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													
	187.9008	128.7913	89.7197	39.7761	10.6423	0.0000	0.0000	0.0000	0.0000	26.6226	92.9898	183.4609 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												759.9034	
Space heating per m2												9.4893 (99)	
										(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 %)													246.2625 (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													
	187.9008	128.7913	89.7197	39.7761	10.6423	0.0000	0.0000	0.0000	0.0000	26.6226	92.9898	183.4609 (98)	
Space heating efficiency (main heating system 1)													
	246.2625	246.2625	246.2625	246.2625	246.2625	0.0000	0.0000	0.0000	0.0000	246.2625	246.2625	246.2625 (210)	
Space heating fuel (main heating system)													
	76.3010	52.2984	36.4325	16.1519	4.3215	0.0000	0.0000	0.0000	0.0000	10.8107	37.7604	74.4981 (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													
	263.3235	232.9056	247.3345	217.0316	210.1360	189.0643	186.2950	193.7897	196.0422	218.9652	233.3024	260.3740 (64)	
Efficiency of water heater (217)m													
	282.7341	282.7341	282.7341	282.7341	282.7341	282.7341	282.7341	282.7341	282.7341	282.7341	282.7341	282.7341 (216)	
Fuel for water heating, kWh/month													
	93.1347	82.3762	87.4795	76.7617	74.3228	66.8700	65.8905	68.5413	69.3380	77.4456	82.5165	92.0915 (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													
	19.5303	17.6403	19.5303	18.9003	19.5303	18.9003	19.5303	19.5303	18.9003	19.5303	18.9003	19.5303 (231)	
Lighting													
	25.6267	20.5587	18.5108	13.5618	10.4755	8.5586	9.5561	12.4214	16.1342	21.1690	23.9103	26.3390 (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													308.5745 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													282.7341
Water heating fuel used													936.7683 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.9625)													
mechanical ventilation fans (SFP = 0.9625)													229.9534 (230a)
Total electricity for the above, kWh/year													229.9534 (231)
Electricity for lighting (calculated in Appendix L)													206.8223 (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													1682.1185 (238)

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10a. Fuel costs - using BEDF prices (599)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	308.5745	26.0000	80.2294 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	936.7683	26.0000	243.5598 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0000	0.0000 (247a)
Pumps, fans and electric keep-hot	229.9534	26.0000	59.7879 (249)
Energy for lighting	206.8223	26.0000	53.7738 (250)
Additional standing charges			0.0000 (251)
Total energy cost			437.3508 (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	308.5745	0.1574	48.5744 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	936.7683	0.1409	132.0107 (264)
Space and water heating			180.5851 (265)
Pumps, fans and electric keep-hot	229.9534	0.1387	31.8974 (267)
Energy for lighting	206.8223	0.1443	29.8508 (268)
Total CO2, kg/year			242.3333 (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	308.5745	1.5827	488.3952 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	936.7683	1.5211	1424.8969 (278)
Space and water heating			1913.2921 (279)
Pumps, fans and electric keep-hot	229.9534	1.5128	347.8735 (281)
Energy for lighting	206.8223	1.5338	317.2309 (282)
Total Primary energy kWh/year			2578.3965 (286)

SAP 10 EPC IMPROVEMENTS

00001

Current energy efficiency rating: B 86
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	+ 1.2	-£ 51	-24 kg (9.9%)
U Solar photovoltaic panels	+ 6.3	-£ 226	-117 kg (53.6%)

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
Solar water heating	£51	0.30 kg/m²	B 88 A 97
Solar photovoltaic panels	£226	1.46 kg/m²	A 94 A 99
Total Savings	£277	1.76 kg/m²	

Potential energy efficiency rating: A 94
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 599 TEST (30 Sep 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, South East England):

	Current £437	Potential £386	Saving £51
Electricity			
Space heating	£140	£161	-£21
Water heating	£244	£172	£72
Lighting	£54	£54	£0
Generated (PV)	-£0	-£226	£226
Total cost of fuels	£437	£160	£277
Total cost of uses	£438	£161	£277
Delivered energy	21 kWh/m²	8 kWh/m²	13 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.1 tonnes	0.1 tonnes
CO2 emissions per m²	3 kg/m²	1 kg/m²	2 kg/m²
Primary energy	32 kWh/m²	12 kWh/m²	20 kWh/m²

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

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1. Overall dwelling characteristics

Main dwelling	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	41.2600 (1b)	x 2.3000 (2b)	= 94.8980 (1b) - (3b)
First floor	38.8200 (1c)	x 2.6000 (2c)	= 100.9320 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.0800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 195.8300 (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	2.7200 (17)
Infiltration rate	0.1360 (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) = 0.1258 (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	0.1604	0.1573	0.1541	0.1384	0.1352	0.1195	0.1195	0.1164	0.1258	0.1352	0.1415	0.1478 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.9000 (23c)
Effective ac	0.2509	0.2477	0.2446	0.2289	0.2257	0.2100	0.2100	0.2069	0.2163	0.2257	0.2320	0.2383 (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
Main dwelling							
Window			12.3100	1.2357	15.2120		(27)
Door			2.1000	1.4000	2.9400		(26)
Ground Floor			41.2600	0.1300	5.3638	110.0000	4538.6000 (28a)
External Walls	92.3200	14.4100	77.9100	0.1500	11.6865	18.0000	1402.3800 (29a)
External Roof	41.2600		41.2600	0.1100	4.5386	9.0000	371.3400 (30)
Total net area of external elements Aum(A, m ²)			174.8400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.7409		(33)
Main dwelling							
Party Walls			37.6500	0.0000	0.0000	70.0000	2635.5001 (32)
Internal Walls			53.4100			9.0000	480.6900 (32c)
Internal Walls			54.3200			9.0000	488.8800 (32c)
Internal Floor			38.8200			18.0000	698.7600 (32d)
Internal Ceiling			38.8200			9.0000	349.3800 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10965.5301 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		136.9322 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.0600	0.0930	1.0286
E3 Sill	10.0600	-0.0590	-0.5935
E4 Jamb	27.7700	-0.0650	-1.8051
E5 Ground floor (normal)	19.4500	0.0300	0.5835
E6 Intermediate floor within a dwelling	17.8400	0.0180	0.3211
P1 Party wall - Ground floor	7.6200	0.1010	0.7696
E16 Corner (normal)	15.0800	0.1170	1.7644
E17 Corner (inverted - internal area greater than external area)	5.1000	0.0400	0.2040
E12 Gable (insulation at ceiling level)	7.6200	0.0390	0.2972
P4 Party wall - Roof (insulation at ceiling level)	7.6200	0.1010	0.7696
E10 Eaves (insulation at ceiling level)	11.8300	0.0430	0.5087
E18 Party wall between dwellings	4.9600	0.0540	0.2678

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		4.1159 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	43.8568 (37)

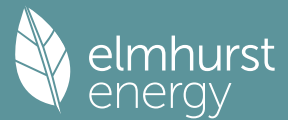
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)		
(38)m	Jan 16.2138	Feb 16.0106
Heat transfer coeff	Mar 15.8073	Apr 14.7911
Average = Sum(39)m / 12 =	May 14.5879	Jun 13.5717
	Jul 13.5717	Aug 13.3684
	Sep 13.9781	Oct 14.5879
	Nov 14.9944	Dec 15.4008 (38)

Days in mont	Jan 31	Feb 28	Mar 31	Apr 30	May 31	Jun 30	Jul 31	Aug 31	Sep 30	Oct 31	Nov 30	Dec 31
HLP	0.7501	0.7476	0.7451	0.7324	0.7298	0.7171	0.7171	0.7146	0.7222	0.7298	0.7349	0.7400 (40)
HLP (average)												0.7317

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4644 (42)
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Hot water usage for mixer showers	65.5392	64.5543	63.1191	60.3730	58.3465	56.0865	54.8020	56.2263	57.7877	60.2142	63.0193	65.2881 (42a)
Hot water usage for baths	28.3072	27.8868	27.2948	26.2032	25.3859	24.4796	23.9900	24.5779	25.2180	26.1878	27.3018	28.2115 (42b)
Hot water usage for other uses	39.8677	38.4180	36.9682	35.5185	34.0688	32.6190	32.6190	34.0688	35.5185	36.9682	38.4180	39.8677 (42c)
Average daily hot water use (litres/day)												122.9136 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	133.7141	130.8591	127.3821	122.0947	117.8011	113.1851	111.4110	114.8730	118.5242	123.3702	128.7390	133.3673 (44)
Energy content (annual)	211.7705	186.3416	195.7815	167.1416	158.5830	139.1743	134.7420	142.2367	146.1522	167.4122	183.4124	208.8210 (45)
Distribution loss (46)m = 0.15 x (45)m	31.7656	27.9512	29.3672	25.0712	23.7874	20.8761	20.2113	21.3355	21.9228	25.1118	27.5119	31.3232 (46)
Water storage loss (or HIU loss):												
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6900 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9126 (55)
Total storage loss	28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906 (56)
If cylinder contains dedicated solar storage	28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906 (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	263.3235	232.9056	245.9388	210.2780	197.3416	176.4576	173.2680	181.6933	190.6393	217.5695	233.3024	260.3740 (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												617.6306 (H24)
Heat delivered to space heating												0.0000 (H29)
Solar input												617.6306
Solar input	-0.0000	-16.2153	-58.1405	-79.7243	-103.8042	-95.6059	-94.8632	-83.1134	-57.5189	-28.6449	-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	263.3235	216.6903	187.7982	130.5537	93.5375	80.8517	78.4048	98.5799	133.1204	188.9245	233.3024	260.3740 (64)
												1965.4609 (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	111.6561	99.2098	105.2232	90.0837	83.7358	76.1021	75.6225	78.8590	84.1853	95.7904	100.8966	110.6754 (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	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.2778	26.0043	21.1481	16.0105	11.9680	10.1039	10.9176	14.1912	19.0473	24.1850	28.2274	30.0916 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.7726	331.1739	322.6028	304.3561	281.3228	259.6748	245.2126	241.8114	250.3824	268.6292	291.6624	313.3104 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506 (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)	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751 (71)
Water heating gains (Table 5)	150.0754	147.6336	141.4290	125.1162	112.5481	105.6973	101.6432	105.9932	116.9240	128.7505	140.1342	148.7572 (72)
Total internal gains	608.6640	606.3500	586.7181	547.0210	507.3771	477.0143	459.3117	463.5339	487.8920	523.1028	561.5622	593.6974 (73)

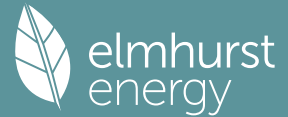
6. Solar gains

[Jan]					Area m2	Solar flux Table 6a		g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d		Gains W	
North					3.6700	10.6334		0.4000	0.7500		0.7700		8.1132 (74)	
East					2.4900	19.6403		0.4000	0.7500		0.7700		10.1672 (76)	
South					6.1500	46.7521		0.4000	0.7500		0.7700		59.7765 (78)	
Solar gains	78.0569	133.2924	183.8063	231.0338	262.4248	262.3041	252.1369	228.3321	200.0413	147.6493	93.5415	66.7770 (83)		
Total gains	686.7209	739.6424	770.5244	778.0548	769.8020	739.3183	711.4486	691.8660	687.9333	670.7521	655.1037	660.4744 (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	50.7067	50.8788	51.0521	51.9367	52.1173	53.0396	53.0396	53.2279	52.6668	52.1173	51.7574	51.4023
alpha	4.3804	4.3919	4.4035	4.4624	4.4745	4.5360	4.5360	4.5485	4.5111	4.4745	4.4505	4.4268
util living area	0.9311	0.9043	0.8588	0.7775	0.6547	0.4864	0.3531	0.3776	0.5581	0.7749	0.8944	0.9387 (86)
Living	20.2882	20.4093	20.5707	20.7451	20.8607	20.9177	20.9291	20.9284	20.9046	20.7747	20.5194	20.2660
Non living	19.4643	19.6151	19.8136	20.0295	20.1601	20.2275	20.2367	20.2386	20.2116	20.0686	19.7627	19.4445

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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	20.6359	20.4093	20.5707	20.7451	20.8607	20.9177	20.9291	20.9284	20.9046	20.7747	20.5194	20.3687 (87)
Th 2	20.2968	20.2990	20.3012	20.3123	20.3146	20.3257	20.3257	20.3280	20.3213	20.3146	20.3101	20.3057 (88)
util rest of house	0.9217	0.8919	0.8409	0.7507	0.6165	0.4384	0.2998	0.3236	0.5092	0.7435	0.8789	0.9302 (89)
MIT 2	19.9649	19.6151	19.8136	20.0295	20.1601	20.2275	20.2367	20.2386	20.2116	20.0686	19.7627	19.5997 (90)
Living area fraction									FLA = Living area / (4) =			0.1859 (91)
MIT	20.0897	19.7628	19.9544	20.1626	20.2904	20.3558	20.3655	20.3669	20.3405	20.1999	19.9034	19.7427 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0897	19.7628	19.9544	20.1626	20.2904	20.3558	20.3655	20.3669	20.3405	20.1999	19.9034	19.7427 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9186	0.8812	0.8312	0.7445	0.6151	0.4406	0.3030	0.3267	0.5107	0.7378	0.8687	0.9223 (94)
Useful gains	630.8307	651.7800	640.4813	579.2589	473.5176	325.7495	215.5663	226.0427	351.2942	494.9037	569.0985	609.1579 (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	948.4947	889.7970	802.7437	660.5271	502.0624	330.5491	216.2459	227.0039	360.9166	561.0624	753.4949	921.0215 (97)
Space heating kWh	236.3420	159.9474	120.7232	58.5131	21.2373	0.0000	0.0000	0.0000	0.0000	49.2221	132.7654	232.0265 (98a)
Space heating requirement - total per year (kWh/year)												1010.7771
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	236.3420	159.9474	120.7232	58.5131	21.2373	0.0000	0.0000	0.0000	0.0000	49.2221	132.7654	232.0265 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1010.7771
Space heating per m2										(98c) / (4) =		12.6221 (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 %)	247.9998 (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	236.3420	159.9474	120.7232	58.5131	21.2373	0.0000	0.0000	0.0000	0.0000	49.2221	132.7654	232.0265 (98)
Space heating efficiency (main heating system 1)	247.9998	247.9998	247.9998	247.9998	247.9998	0.0000	0.0000	0.0000	0.0000	247.9998	247.9998	247.9998 (210)
Space heating fuel (main heating system)	95.2993	64.4950	48.6788	23.5940	8.5634	0.0000	0.0000	0.0000	0.0000	19.8476	53.5345	93.5592 (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	263.3235	216.6903	187.7982	130.5537	93.5375	80.8517	78.4048	98.5799	133.1204	188.9245	233.3024	260.3740 (64)
Efficiency of water heater (217)m	282.4337	282.4337	282.4337	282.4337	282.4337	282.4337	282.4337	282.4337	282.4337	282.4337	282.4337	282.4337 (216)
Fuel for water heating, kWh/month	93.2337	76.7225	66.4928	46.2245	33.1184	28.6268	27.7604	34.9037	47.1333	66.8916	82.6043	92.1894 (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	26.3248	23.7772	26.3248	25.4756	26.3248	25.4756	26.3248	25.4756	26.3248	25.4756	26.3248	26.3248 (231)
Lighting	25.6267	20.5587	18.5108	13.5618	10.4755	8.5586	9.5561	12.4214	16.1342	21.1690	23.9103	26.3390 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-36.5030	-53.4002	-78.6977	-89.3194	-95.8371	-89.0708	-87.9823	-82.9669	-73.5626	-61.1039	-40.5638	-31.2787 (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												407.5718 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												282.4337
Water heating fuel used												695.9016 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.9625)												
mechanical ventilation fans (SFP = 0.9625)												229.9534 (230a)
pump for solar water heating												80.0000 (230g)
Total electricity for the above, kWh/year												309.9534 (231)
Electricity for lighting (calculated in Appendix L)												206.8223 (232)

Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-820.2863 (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												799.9627 (238)

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10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	407.5718	16.4900	67.2086 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	695.9016	16.4900	114.7542 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	229.9534	16.4900	37.9193 (249)
Pump for solar water heating	80.0000	16.4900	13.1920 (249)
Energy for lighting	206.8223	16.4900	34.1050 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-820.2863	16.4900	-135.2652
PV Unit electricity exported	0.0000	5.5900	0.0000
Total			-135.2652 (252)
Total energy cost			131.9139 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.3797 (257)
SAP value		93.8456
SAP rating (Section 12)		94 (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	407.5718	0.1566	63.8383 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	695.9016	0.1457	101.4013 (264)
Space and water heating			165.2396 (265)
Pumps, fans and electric keep-hot	309.9534	0.1387	42.9944 (267)
Energy for lighting	206.8223	0.1443	29.8508 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-820.2863	0.1344	-110.2131
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-110.2131 (269)
Total CO2, kg/year			127.8717 (272)
CO2 emissions per m2			1.6000 (273)
EI value			98.6301
EI rating			99 (274)
EI band			A

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

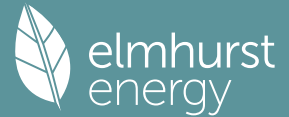
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	41.2600 (1b)	x 2.3000 (2b)	= 94.8980 (1b) - (3b)
First floor	38.8200 (1c)	x 2.6000 (2c)	= 100.9320 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.0800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	195.8300 (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	2.7200 (17)
Infiltration rate	0.1360 (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) = 0.1258 (21)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.1000	3.8000	3.7000	3.5000	3.5000	3.2000	3.3000	3.1000	3.1000	3.4000	3.3000	3.7000	(22)
Wind factor	1.0250	0.9500	0.9250	0.8750	0.8750	0.8000	0.8250	0.7750	0.7750	0.8500	0.8250	0.9250	(22a)
Adj infilt rate													
	0.1289	0.1195	0.1164	0.1101	0.1101	0.1006	0.1038	0.0975	0.0975	0.1069	0.1038	0.1164	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation													0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													81.9000 (23c)
Effective ac	0.2194	0.2100	0.2069	0.2006	0.2006	0.1911	0.1943	0.1880	0.1880	0.1974	0.1943	0.2069	(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	
Main dwelling								
Window			12.3100	1.2357	15.2120			(27)
Door			2.1000	1.4000	2.9400			(26)
Ground Floor			41.2600	0.1300	5.3638	110.0000	4538.6000	(28a)
External Walls	92.3200	14.4100	77.9100	0.1500	11.6865	18.0000	1402.3800	(29a)
External Roof	41.2600		41.2600	0.1100	4.5386	9.0000	371.3400	(30)
Total net area of external elements Aum(A, m2)			174.8400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.7409			(33)
Main dwelling								
Party Walls			37.6500	0.0000	0.0000	70.0000	2635.5001	(32)
Internal Walls			53.4100			9.0000	480.6900	(32c)
Internal Walls			54.3200			9.0000	488.8800	(32c)
Internal Floor			38.8200			18.0000	698.7600	(32d)
Internal Ceiling			38.8200			9.0000	349.3800	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 10965.5301 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 136.9322 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.0600	0.0930	1.0286
E3 Sill	10.0600	-0.0590	-0.5935
E4 Jamb	27.7700	-0.0650	-1.8051
E5 Ground floor (normal)	19.4500	0.0300	0.5835
E6 Intermediate floor within a dwelling	17.8400	0.0180	0.3211
P1 Party wall - Ground floor	7.6200	0.1010	0.7696
E16 Corner (normal)	15.0800	0.1170	1.7644
E17 Corner (inverted - internal area greater than external area)	5.1000	0.0400	0.2040
E12 Gable (insulation at ceiling level)	7.6200	0.0390	0.2972
P4 Party wall - Roof (insulation at ceiling level)	7.6200	0.1010	0.7696
E10 Eaves (insulation at ceiling level)	11.8300	0.0430	0.5087
E18 Party wall between dwellings	4.9600	0.0540	0.2678

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.1159 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 43.8568 (37)

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

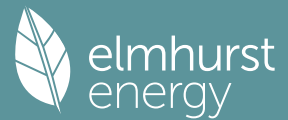
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	14.1814	13.5717	13.3684	12.9619	12.9619	12.3522	12.5555	12.1490	12.1490	12.7587	12.5555	13.3684	(38)
Heat transfer coeff	58.0382	57.4285	57.2252	56.8187	56.8187	56.2090	56.4123	56.0058	56.0058	56.6155	56.4123	57.2252	(39)
Average = Sum(39)m / 12 =													56.7679

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7248	0.7171	0.7146	0.7095	0.7095	0.7019	0.7044	0.6994	0.6994	0.7070	0.7044	0.7146	(40)
HLP (average)													0.7089
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.4644 (42)
Hot water usage for mixer showers													
65.5392	64.5543	63.1191	60.3730	58.3465	56.0865	54.8020	56.2263	57.7877	60.2142	63.0193	65.2881	65.2881	(42a)
Hot water usage for baths													
28.3072	27.8868	27.2948	26.2032	25.3859	24.4796	23.9900	24.5779	25.2180	26.1878	27.3018	28.2115	28.2115	(42b)
Hot water usage for other uses													
39.8677	38.4180	36.9682	35.5185	34.0688	32.6190	32.6190	34.0688	35.5185	36.9682	38.4180	39.8677	39.8677	(42c)
Average daily hot water use (litres/day)													122.9136 (43)
Daily hot water use													
133.7141	130.8591	127.3821	122.0947	117.8011	113.1851	111.4110	114.8730	118.5242	123.3702	128.7390	133.3673	133.3673	(44)
Energy conte	211.7705	186.3416	195.7815	167.1416	158.5830	139.1743	134.7420	142.2367	146.1522	167.4122	183.4124	208.8210	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
31.7656	27.9512	29.3672	25.0712	23.7874	20.8761	20.2113	21.3355	21.9228	25.1118	27.5119	31.3232	31.3232	(46)
Water storage loss (or HIU loss):													
Store volume													200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6900 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.9126 (55)
Total storage loss													
28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	(56)
If cylinder contains dedicated solar storage													
28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	(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													
263.3235	232.9056	245.9388	210.2780	197.3416	176.4576	173.2680	181.6933	190.6393	217.5695	233.3024	260.3740	260.3740	(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)

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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												717.6578 (H24)
Heat delivered to space heating												0.0000 (H29)
Solar input												717.6578
Solar input	-0.4383	-19.7388	-63.6601	-90.2800	-111.8166	-111.7705	-108.3284	-97.1753	-69.2051	-38.9911	-6.2538	-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	262.8852	213.1668	182.2787	119.9980	85.5250	64.6871	64.9396	84.5180	121.4342	178.5783	227.0486	260.3740 (64)
												Total per year (kWh/year) = Sum(64)m = 1865.4337 (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												
	111.6561	99.2098	105.2232	90.0837	83.7358	76.1021	75.6225	78.8590	84.1853	95.7904	100.8966	110.6754 (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	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626	147.8626 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	29.2778	26.0043	21.1481	16.0105	11.9680	10.1039	10.9176	14.1912	19.0473	24.1850	28.2274	30.0916 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	327.7726	331.1739	322.6028	304.3561	281.3228	259.6748	245.2126	241.8114	250.3824	268.6292	291.6624	313.3104 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506	52.2506 (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)												
	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751	-98.5751 (71)
Water heating gains (Table 5)												
	150.0754	147.6336	141.4290	125.1162	112.5481	105.6973	101.6432	105.9932	116.9240	128.7505	140.1342	148.7572 (72)
Total internal gains	608.6640	606.3500	586.7181	547.0210	507.3771	477.0143	459.3117	463.5339	487.8920	523.1028	561.5622	593.6974 (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											
North	3.6700											9.6718 (74)
East	2.4900											12.2649 (76)
South	6.1500											68.0944 (78)
Solar gains	90.0311	136.7727	188.6082	248.8108	275.6308	299.4170	281.6460	254.5699	220.3502	162.1651	108.9463	77.4737 (83)
Total gains	698.6951	743.1227	775.3263	795.8318	783.0080	776.4312	740.9577	718.1038	708.2421	685.2679	670.5086	671.1711 (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	52.4824	53.0396	53.2279	53.6087	53.6087	54.1903	53.9950	54.3869	54.3869	53.8012	53.9950	53.2279
alpha	4.4988	4.5360	4.5485	4.5739	4.5739	4.6127	4.5997	4.6258	4.6258	4.5867	4.5997	4.5485
util living area	0.9129	0.8867	0.8301	0.7358	0.5890	0.4085	0.3036	0.2956	0.4951	0.7047	0.8589	0.9209 (86)
Living	20.4146	20.5098	20.6613	20.8011	20.8935	20.9272	20.9315	20.9321	20.9192	20.8445	20.6410	20.4015
Non living	19.6395	19.7611	19.9454	20.1113	20.2109	20.2491	20.2500	20.2551	20.2450	20.1638	19.9323	19.6315
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	20.7005	20.5098	20.6613	20.8011	20.8935	20.9272	20.9315	20.9321	20.9192	20.8445	20.6410	20.4853 (87)
Th 2	20.3190	20.3257	20.3280	20.3324	20.3324	20.3391	20.3369	20.3414	20.3414	20.3347	20.3369	20.3280 (88)
util rest of house												
	0.9014	0.8726	0.8098	0.7069	0.5490	0.3626	0.2537	0.2447	0.4475	0.6680	0.8395	0.9101 (89)
MIT 2	20.0481	19.7611	19.9454	20.1113	20.2109	20.2491	20.2500	20.2551	20.2450	20.1638	19.9323	19.7570 (90)
Living area fraction												
FLA = Living area / (4) =												0.1859 (91)
MIT	20.1694	19.9003	20.0785	20.2396	20.3378	20.3752	20.3767	20.3810	20.3703	20.2904	20.0641	19.8924 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1694	19.9003	20.0785	20.2396	20.3378	20.3752	20.3767	20.3810	20.3703	20.2904	20.0641	19.8924 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.8986	0.8627	0.8017	0.7026	0.5494	0.3651	0.2567	0.2478	0.4496	0.6654	0.8308	0.9024 (94)
Useful gains	627.8521	641.0757	621.5892	559.1849	430.1465	283.4845	190.2148	177.9413	318.4531	455.9928	557.0491	605.6353 (95)
Ext temp.	5.0000	5.4000	7.1000	9.4000	12.5000	15.3000	17.0000	17.2000	14.6000	11.6000	7.9000	5.0000 (96)
Heat loss rate W	880.4069	832.7294	742.6961	615.8903	445.3366	285.2716	190.4887	178.1535	323.1721	492.0085	686.2015	852.2226 (97)
Space heating kWh	187.9008	128.7913	90.1036	40.8278	11.3014	0.0000	0.0000	0.0000	0.0000	26.7957	92.9898	183.4609 (98a)
Space heating requirement - total per year (kWh/year)												762.1714
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	187.9008	128.7913	90.1036	40.8278	11.3014	0.0000	0.0000	0.0000	0.0000	26.7957	92.9898	183.4609 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												762.1714
Space heating per m ²												(98c) / (4) = 9.5176 (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)
Efficiency of main space heating system 1 (in %)												246.2625	(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	187.9008	128.7913	90.1036	40.8278	11.3014	0.0000	0.0000	0.0000	0.0000	26.7957	92.9898	183.4609	(98)
Space heating efficiency (main heating system 1)	246.2625	246.2625	246.2625	246.2625	246.2625	0.0000	0.0000	0.0000	0.0000	246.2625	246.2625	246.2625	(210)
Space heating fuel (main heating system)	76.3010	52.2984	36.5884	16.5790	4.5892	0.0000	0.0000	0.0000	0.0000	10.8810	37.7604	74.4981	(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	262.8852	213.1668	182.2787	119.9980	85.5250	64.6871	64.9396	84.5180	121.4342	178.5783	227.0486	260.3740	(64)
Efficiency of water heater	282.7341	282.7341	282.7341	282.7341	282.7341	282.7341	282.7341	282.7341	282.7341	282.7341	282.7341	282.7341	(216)
Fuel for water heating, kWh/month	92.9796	75.3948	64.4700	42.4420	30.2493	22.8791	22.9684	29.8931	42.9500	63.1612	80.3046	92.0915	(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	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	26.3248	23.7772	26.3248	25.4756	26.3248	25.4756	26.3248	26.3248	25.4756	26.3248	25.4756	26.3248	(231)
Lighting	25.6267	20.5587	18.5108	13.5618	10.4755	8.5586	9.5561	12.4214	16.1342	21.1690	23.9103	26.3390	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-41.6897	-55.1557	-80.5941	-93.1555	-97.8646	-94.3429	-92.4713	-87.8385	-78.5275	-65.7483	-46.3003	-35.9722	(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												309.4955	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												282.7341	
Water heating fuel used												659.7837	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.9625)													
mechanical ventilation fans (SFP = 0.9625)												229.9534	(230a)
pump for solar water heating												80.0000	(230g)
Total electricity for the above, kWh/year												309.9534	(231)
Electricity for lighting (calculated in Appendix L)												206.8223	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-869.6608	(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												616.3940	(238)

10a. Fuel costs - using BEDF prices (599)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	309.4955	26.0000	80.4688	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	659.7837	26.0000	171.5438	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0000	0.0000	(247a)
Pumps, fans and electric keep-hot	229.9534	26.0000	59.7879	(249)
Pump for solar water heating	80.0000	26.0000	20.8000	(249)
Energy for lighting	206.8223	26.0000	53.7738	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-869.6608	26.0000	-226.1118	
PV Unit electricity exported	0.0000	5.8100	0.0000	
Total			-226.1118	(252)
Total energy cost			160.2624	(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	309.4955	0.1574	48.7042	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	659.7837	0.1466	96.7546	(264)
Space and water heating			145.4588	(265)
Pumps, fans and electric keep-hot	309.9534	0.1387	42.9944	(267)
Energy for lighting	206.8223	0.1443	29.8508	(268)

Full SAP Calculation Printout



Energy saving/generation technologies			
PV Unit electricity used in dwelling	-869.6608	0.1345	-116.9909
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-116.9909 (269)
Total CO2, kg/year			101.3131 (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	309.4955	1.5826	489.7968 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	659.7837	1.5425	1017.7148 (278)
Space and water heating			1507.5116 (279)
Pumps, fans and electric keep-hot	309.9534	1.5128	468.8975 (281)
Energy for lighting	206.8223	1.5338	317.2309 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-869.6608	1.4972	-1302.0299
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-1302.0299 (283)
Total Primary energy kWh/year			991.6101 (286)

Energy performance certificate (EPC)

3 Malthouse Cottages
Malthouse Lane
Hurstpierpoint
HASSOCKS
BN6 9PE

Energy rating

B

Valid until:

1 October 2036

Certificate number:

7836-3030-4609-0412-7202

Property type

Semi-detached house

Total floor area

106 square metres

Rules on letting this property

Properties can be let if they have an energy rating from A to E.

You can read [guidance for landlords on the regulations and exemptions \(https://www.gov.uk/guidance/domestic-private-rented-property-minimum-energy-efficiency-standard-landlord-guidance\)](https://www.gov.uk/guidance/domestic-private-rented-property-minimum-energy-efficiency-standard-landlord-guidance).

Energy rating and score

This property's energy rating is B. It has the potential to be A.

[See how to improve this property's energy efficiency.](#)

The graph shows this property's current and potential energy rating.

Properties get a rating from A (best) to G (worst) and a score. The better the rating and score, the lower your energy bills are likely to be.

For properties in England and Wales:

the average energy rating is D
the average energy score is 60

Score	Energy rating	Current	Potential
92+	A		93 A
81-91	B	86 B	
69-80	C		
55-68	D		
39-54	E		
21-38	F		
1-20	G		

Breakdown of property's energy performance

Features in this property

Features get a rating from very good to very poor, based on how energy efficient they are. Ratings are not based on how well features work or their condition.

Assumed ratings are based on the property's age and type. They are used for features the assessor could not inspect.

Feature	Description	Rating
Walls	Average thermal transmittance 0.15 W/m ² K	Very good
Roof	Average thermal transmittance 0.11 W/m ² K	Very good
Floor	Average thermal transmittance 0.13 W/m ² K	Very good
Windows	High performance glazing	Good
Main heating	Air source heat pump, radiators and underfloor, electric	Good
Main heating control	Time and temperature zone control	Very good
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 2.2 m ³ /h.m ² (as tested)	Very good
Secondary heating	None	N/A

Low and zero carbon energy sources

Low and zero carbon energy sources release very little or no CO₂. Installing these sources may help reduce energy bills as well as cutting carbon emissions. The following low or zero carbon energy sources are installed in this property:

- Air source heat pump

Primary energy use

The primary energy use for this property per year is 29 kilowatt hours per square metre (kWh/m²).

Smart meters

This property had a **smart meter for gas** when it was assessed.

Smart meters help you understand your energy use and how you could save money. They may help you access better energy deals.

[Find out about using your smart meter \(https://www.smartenergygb.org/using-your-smart-meter\)](https://www.smartenergygb.org/using-your-smart-meter)

How this affects your energy bills

An average household would need to spend **£530 per year on heating, hot water and lighting** in this property. These costs usually make up the majority of your energy bills.

You could **save £52 per year** if you complete the suggested steps for improving this property's energy rating.

This is **based on average costs in 2026** when this EPC was created. People living at the property may use different amounts of energy for heating, hot water and lighting.

Impact on the environment

This property's environmental impact rating is A. It has the potential to be A.

Properties get a rating from A (best) to G (worst) on how much carbon dioxide (CO2) they produce each year.

Carbon emissions

An average household produces 6 tonnes of CO2

This property produces	0.3 tonnes of CO2
This property's potential production	0.1 tonnes of CO2

You could improve this property's CO2 emissions by making the suggested changes. This will help to protect the environment.

These ratings are based on assumptions about average occupancy and energy use. People living at the property may use different amounts of energy.

Steps you could take to save energy

Step	Typical installation cost	Typical yearly saving
1. Solar water heating	£4,000 - £7,000	£52
2. Solar photovoltaic panels	£8,000 - £10,000	£295

Advice on making energy saving improvements

[Get detailed recommendations and cost estimates \(www.gov.uk/improve-energy-efficiency\)](http://www.gov.uk/improve-energy-efficiency)

Who to contact about this certificate

Contacting the assessor

If you're unhappy about your property's energy assessment or certificate, you can complain to the assessor who created it.

Assessor's name	Daniel Watt
Telephone	0161 228 6757
Email	dan.watt@team-civic.com

Contacting the accreditation scheme

If you're still unhappy after contacting the assessor, you should contact the assessor's accreditation scheme.

Accreditation scheme	Elmhurst Energy Systems Ltd
Assessor's ID	EES/027301
Telephone	01455 883 250
Email	enquiries@elmhurstenergy.co.uk

About this assessment

Assessor's declaration	No related party
Date of assessment	2 October 2026
Date of certificate	2 October 2026
Type of assessment	SAP

Energy Report



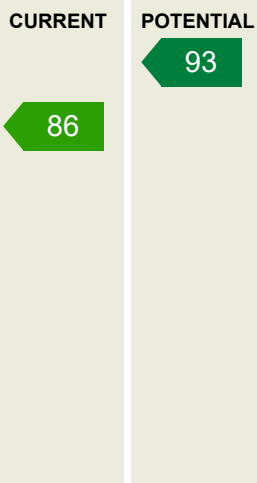
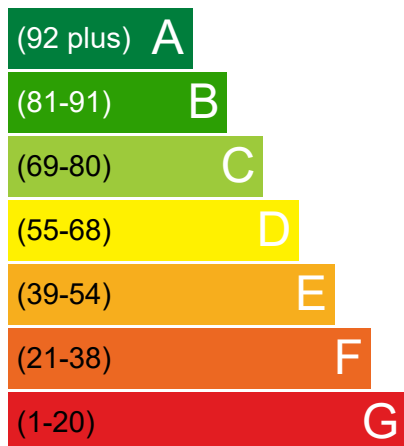
Dwelling Address	3 Malthouse Cottages, Malthouse Lane, Hurstpierpoint, HASSECKS, BN6 9PE
Reference	Plot 3-Plot 3
SAP Version	10.2
Assessment Date	11/02/2026
Submission Date	02/10/2026
Property Type	House, Semi-Detached
Total Floor Area	106

This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

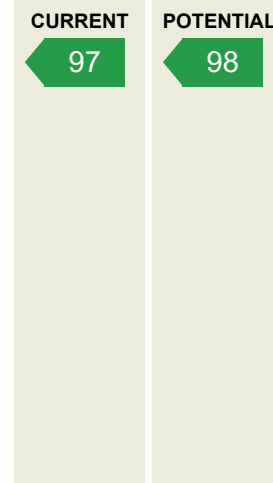
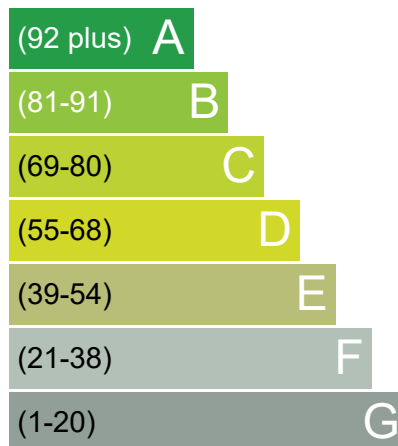
Energy Efficiency Rating

Most energy efficient - lower running costs



Carbon Dioxide (CO2) Emissions Rating

Very environmentally friendly - lower CO2 emissions



Additional ratings for your home

	Primary Energy	Energy	Carbon	Cost	HTC
CURRENT	29.46 kWh	2038 kWh	295 kg	529.93 £	76 W/K
POTENTIAL	13.55 kWh	903 kWh	145 kg	234.81 £	76 W/K

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good
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Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.15 W/m²K	Very Good
Roof	Average thermal transmittance 0.11 W/m²K	Very Good
Floor	Average thermal transmittance 0.13 W/m²K	Very Good
Windows	High performance glazing	Good
Main heating	Air source heat pump, radiators and underfloor, electric	Good
Main heating controls	Time and temperature zone control	Very Good
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 2.2 m³/h.m² (as tested)	Very Good

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling. To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed. Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating
Solar water heating	£52	B 87	£4,000 - £7,000	£52	A 97
Photovoltaic	£295	A 93	£8,000 - £10,000	£243	A 98

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

	Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting 	£61	£61	
Heating 	£209	£230	
Hot Water 	£260	£187	
New Technologies e.g. Impact of PV	£0	-(£243)	
TOTAL	£530	£235	

Estimated energy use and potential savings



Space Heating

447
kWh per year



Water Heating

1000
kWh per year

About this document

Created by:	Mr. Daniel Watt
Company/Trading name:	CIVIC MEP Ltd
Phone number:	0161 228 6757
Email address:	dan.watt@team-civic.com

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g. heating system) is working correctly.

This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.

This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.

The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO ₂)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Fri 02 Oct 2026 12:53:25

Project Information			
Assessed By	Daniel Watt	Building Type	House, Semi-detached
OCDEA Registration	EES/027301	Assessment Date	2026-10-02

Dwelling Details			
Assessment Type	As built	Total Floor Area	106 m ²
Site Reference	Plot 3	Plot Reference	Plot 3
Address	3 Malthouse Cottages, Malthouse Lane, Hurstpierpoint, HASSOCKS, BN6 9PE		

Client Details	
Name	.
Company	.
Address	., ., .

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate			
Fuel for main heating system	Electricity		
Target carbon dioxide emission rate	9.67 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	3.04 kgCO ₂ /m ²		OK

1b Target primary energy rate and dwelling primary energy			
Target primary energy	50.3 kWh _{PE} /m ²		
Dwelling primary energy	32.15 kWh _{PE} /m ²		OK

1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	34.9 kWh/m ²		
Dwelling fabric energy efficiency	31.3 kWh/m ²		OK

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m ² K]	Dwelling average U-Value [W/m ² K]	Element with highest individual U-Value	
External walls	0.26	0.15	Walls (1) (0.15)	OK
Party walls	0.2	0	Party Wall (1) (0)	N/A
Curtain walls	1.6	0	N/A	N/A
Floors	0.18	0.13	Ground Floor (0.13)	OK
Roofs	0.16	0.11	Roof (1) (0.11)	OK
Windows, doors, and roof windows	1.6	1.3	North Windows (1.3)	OK
Rooflights	2.2	N/A	N/A	N/A

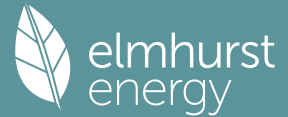
2b Envelope elements (better than typically expected values are flagged with a subsequent (!))			
Name	Net area [m ²]	U-Value [W/m ² K]	
Exposed wall: Walls (1)	93.373372	0.15	
Party wall: Party Wall (1)	34.95	0 (!)	
Ground floor: Ground Floor, Ground Floor	53.74	0.13	
Exposed roof: Roof (1)	53.74	0.11	

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
North Windows, Windows	3.0756	North	0.75	1.3
North Windows, Windows	2.1032	North	0.75	1.3
North Windows, Windows	0.64512	North	0.75	1.3
North Windows, Windows	0.64512	North	0.75	1.3
East Windows, Windows	1.06652	East	0.75	1.3
East Windows, Windows	1.06652	East	0.75	1.3
East Windows, Windows	0.5166	East	0.75	1.3
South Windows, Windows	4.090128	South	0.75	1.3
South Windows, Windows	1.5456	South	0.75	1.3
South Windows, Windows	1.7976	South	0.75	1.3
South Windows, Windows	1.7976	South	0.75	1.3
West Windows, Windows	0.51702	West	0.75	1.3

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))				
Building part 1: Thermal bridging calculated from linear thermal transmittances for each junction				
Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.093	
External wall	E3: Sill	Calculated by person with suitable expertise	-0.059	
External wall	E4: Jamb	Calculated by person with suitable expertise	-0.065	
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.03 (!)	
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.018 (!)	
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.039 (!)	
Party wall	P4: Roof (insulation at ceiling level)	Calculated by person with suitable expertise	0.101	
External wall	E10: Eaves (insulation at ceiling level)	Calculated by person with suitable expertise	0.043	
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.117	
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	0.04	
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.054	
3 Air permeability (better than typically expected values are flagged with a subsequent (!))				
Maximum permitted air permeability at 50Pa		8 m³/hm²		
Dwelling air permeability at 50Pa		2.23 m³/hm², Measured value (!)		OK
Air permeability test certificate reference				
4 Space heating				
Main heating system 1: Heat pump with radiators or underfloor heating - Electricity				
Efficiency		260.8%		
Emitter type		Both radiators and underfloor		
Flow temperature		35°C		
System type		Heat Pump		
Manufacturer		Vaillant Group UK Ltd		
Model		aroTHERM 12kW		
Commissioning				
Secondary heating system: N/A				
Fuel		N/A		
Efficiency		N/A		
Commissioning				
5 Hot water				
Cylinder/store - type: Cylinder				
Capacity		200 litres		
Declared heat loss		1.69 kWh/day		
Primary pipework insulated		Yes		
Manufacturer				
Model				
Commissioning				
Waste water heat recovery system 1 - type: N/A				
Efficiency				
Manufacturer				
Model				
6 Controls				
Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services				
Function				
Ecodesign class				
Manufacturer				
Model				

Water heating - type: Cylinder thermostat and HW separately timed		
Manufacturer		
Model		
7 Lighting		
Minimum permitted light source efficacy	75 lm/W	
Lowest light source efficacy	75 lm/W	OK
External lights control	N/A	
8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	1.5 W/(l/s)	
Specific fan power	0.89 W/(l/s)	OK
Minimum permitted heat recovery efficiency	73%	
Heat recovery efficiency	91%	OK
Manufacturer/Model	Komfort EC LB400, S25	
Commissioning		
9 Local generation		
N/A		
10 Heat networks		
N/A		
11 Supporting documentary evidence		
Documentary evidence identified in 11.1 and 11.2 is needed to confirm the data values used for any calculations undertaken, manufacturer declarations made, and tests performed as reflected in this "As built" BREL Compliance Report are correct. 11.1 SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required. 11.2 Indicative photographic evidence of key stages during construction (guidance within Approved Document L, Volume 1 – Appendix B) that confirms the products identified in this BREL Compliance Report are used in this dwelling, and workmanship is of sufficient quality to support the calculated values claimed in 2a to 2d.		
12 Declarations		
a. Assessor Declaration		
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design and construction information submitted for this dwelling for the purpose of carrying out the assessment, and that the supporting documentary evidence (identified in 11.1 and 11.2) pursuant to Part L of the Building Regulations 2010 (as amended) has been reviewed in the course of preparing this BREL Compliance Report.		
Signed:	Assessor ID:	
Name:	Date:	
b. Client Declaration		
This declaration by the client is confirmation that the dwelling has been constructed and completed according to the specifications set out in this BREL Compliance Report, and that photographic evidence of key stages, as described in 11.2, has been provided to the Assessor for this dwelling.		
Signed:	Organisation:	
Name:	Date:	

Full SAP Calculation Printout



Plot Reference	Plot 3			Issued on Date	02/10/2026
Assessment Reference	Plot 3	Plot Type Ref			
Plot Address	3 Malthouse Cottages, Malthouse Lane, Hurstpierpoint, HASSOCKS, BN6 9PE			SAP Version	10.2
SAP Rating	86 B	DER	3.04	TER	9.67
Environmental	97 A	% DER < TER			68.56
CO ₂ Emissions (t/year)	0.29	DFEE	31.28	TFEE	34.87
Compliance Check	See BREL	% DFEE < TFEE			10.31
% DPER < TPER	36.09	DPER	32.15	TPER	50.30
Assessor Details	Mr. Daniel Watt			Assessor ID	AV75-0001
Client	..				

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	53.7400 (1b)	x 2.3600 (2b)	= 126.8264 (1b) - (3b)
First floor	52.4300 (1c)	x 2.6100 (2c)	= 136.8423 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	106.1700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 263.6687 (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	2.2300 (17)
Infiltration rate	0.1115 (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) = 0.1031 (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	0.1315	0.1289	0.1263	0.1135	0.1109	0.0980	0.0980	0.0954	0.1031	0.1109	0.1160	0.1212 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.8000 (23c)
Effective ac	0.2675	0.2649	0.2623	0.2495	0.2469	0.2340	0.2340	0.2314	0.2391	0.2469	0.2520	0.2572 (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
Main dwelling							
Windows			18.8700	1.2357	23.3184		(27)
Ground Floor			53.7400	0.1300	6.9862	110.0000	5911.4000 (28a)
External Walls	112.2400	18.8700	93.3700	0.1500	14.0055	18.0000	1680.6600 (29a)
External Roof	53.7400		53.7400	0.1100	5.9114	9.0000	483.6600 (30)
Total net area of external elements Aum(A, m ²)			219.7200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.2215		(33)
Main dwelling							
Party Walls			34.9500	0.0000	0.0000	70.0000	2446.5001 (32)
Internal Walls			80.6100			9.0000	725.4900 (32c)
Internal Floor			52.4300			18.0000	943.7400 (32d)
Internal Ceiling			52.4300			9.0000	471.8700 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	12663.3200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							119.2740 (35)

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List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	15.0200	0.0930	1.3969
E3 Sill	15.0200	-0.0590	-0.8862
E4 Jamb	29.0000	-0.0650	-1.8850
E5 Ground floor (normal)	23.2400	0.0300	0.6972
E6 Intermediate floor within a dwelling	21.9900	0.0180	0.3958
E12 Gable (insulation at ceiling level)	7.0300	0.0390	0.2742
P4 Party wall - Roof (insulation at ceiling level)	7.0300	0.1010	0.7100
E10 Eaves (insulation at ceiling level)	16.2100	0.0430	0.6970
E16 Corner (normal)	14.6600	0.1170	1.7152
E17 Corner (inverted - internal area greater than external area)	4.7200	0.0400	0.1888
E18 Party wall between dwellings	9.9400	0.0540	0.5368
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			3.8407 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	54.0623 (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	23.2754	23.0510	22.8267	21.7049	21.4806	20.3588	20.3588	20.1345	20.8075	21.4806	21.9293	22.3780	(38)
Heat transfer coeff	77.3376	77.1133	76.8889	75.7672	75.5428	74.4211	74.4211	74.1967	74.8698	75.5428	75.9915	76.4402	(39)
Average = Sum(39)m / 12 =												75.7111	
HLP	0.7284	0.7263	0.7242	0.7136	0.7115	0.7010	0.7010	0.6988	0.7052	0.7115	0.7158	0.7200	(40)
HLP (average)												0.7131	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7898 (42)
Hot water usage for mixer showers	70.9951	69.9282	68.3735	65.3989	63.2036	60.7555	59.3641	60.9070	62.5983	65.2269	68.2654	70.7231	(42a)
Hot water usage for baths	30.6535	30.1982	29.5571	28.3751	27.4900	26.5086	25.9784	26.6150	27.3082	28.3583	29.5647	30.5498	(42b)
Hot water usage for other uses	43.2001	41.6292	40.0583	38.4873	36.9164	35.3455	35.3455	36.9164	38.4873	40.0583	41.6292	43.2001	(42c)
Average daily hot water use (litres/day)												133.1485	(43)
Daily hot water use	144.8487	141.7556	137.9889	132.2613	127.6101	122.6096	120.6880	124.4385	128.3939	133.6435	139.4593	144.4730	(44)
Energy conte	229.4049	201.8581	212.0838	181.0591	171.7877	150.7628	145.9617	154.0808	158.3225	181.3529	198.6853	226.2099	(45)
Energy content (annual)										Total = Sum(45)m =		2211.5695	
Distribution loss (46)m = 0.15 x (45)m	34.4107	30.2787	31.8126	27.1589	25.7682	22.6144	21.8943	23.1121	23.7484	27.2029	29.8028	33.9315	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6900	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9126	(55)
Total storage loss	28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906	(56)
If cylinder contains dedicated solar storage	28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906	(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	280.9579	248.4221	263.6368	230.9491	223.3407	200.6528	197.5147	205.6338	208.2125	232.9059	248.5753	277.7629	(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	280.9579	248.4221	263.6368	230.9491	223.3407	200.6528	197.5147	205.6338	208.2125	232.9059	248.5753	277.7629	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2818.5645	(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	117.5195	104.3690	111.7603	100.1142	98.3618	90.0406	89.7747	92.4743	92.5542	101.5422	105.9749	116.4572	(65)

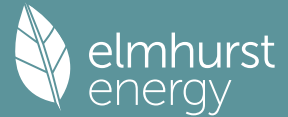
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	135.8693	150.4267	135.8693	140.3983	135.8693	140.3983	135.8693	135.8693	140.3983	135.8693	140.3983	135.8693	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	265.9341	268.6936	261.7396	246.9354	228.2476	210.6838	198.9501	196.1905	203.1445	217.9488	236.6365	254.2004	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	(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)	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	(71)
Water heating gains (Table 5)	157.9564	155.3110	150.2154	139.0474	132.2067	125.0564	120.6649	124.2934	128.5475	136.4815	147.1873	156.5285	(72)
Total internal gains	624.6064	639.2780	612.6710	591.2277	561.1703	540.9852	520.3309	521.1998	536.9370	555.1463	589.0688	611.4448	(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	6.4700	10.6334	0.4000	0.7500	0.7700	14.3031 (74)
East	2.6500	19.6403	0.4000	0.7500	0.7700	10.8205 (76)

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South	9.2300	46.7521	0.4000	0.7500	0.7700	89.7133 (78)
West	0.5200	19.6403	0.4000	0.7500	0.7700	2.1233 (80)

Solar gains	116.9602	199.5821	275.3062	346.9532	395.4621	396.0192	380.3529	343.3724	299.8530	221.0577	140.1250	100.0887 (83)
Total gains	741.5666	838.8601	887.9772	938.1809	956.6324	937.0043	900.6838	864.5722	836.7900	776.2039	729.1938	711.5335 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	45.4835	45.6159	45.7490	46.4263	46.5642	47.2660	47.2660	47.4090	46.9828	46.5642	46.2892	46.0175
alpha	4.0322	4.0411	4.0499	4.0951	4.1043	4.1511	4.1511	4.1606	4.1322	4.1043	4.0859	4.0678
util living area	0.9516	0.9228	0.8815	0.7944	0.6651	0.4928	0.3601	0.3897	0.5822	0.8089	0.9197	0.9575 (86)
Living	20.0532	20.2288	20.4296	20.6684	20.8257	20.9037	20.9209	20.9192	20.8812	20.6890	20.3490	20.0259
Non living	19.1926	19.4129	19.6626	19.9575	20.1380	20.2270	20.2417	20.2425	20.2029	19.9879	19.5733	19.1644
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	20.5157	20.2288	20.4296	20.6684	20.8257	20.9037	20.9209	20.9192	20.8812	20.6890	20.3490	20.1621 (87)
Th 2	20.3158	20.3176	20.3195	20.3288	20.3307	20.3400	20.3400	20.3419	20.3363	20.3307	20.3269	20.3232 (88)
util rest of house	0.9451	0.9131	0.8667	0.7703	0.6291	0.4462	0.3074	0.3358	0.5347	0.7816	0.9080	0.9518 (89)
MIT 2	19.8680	19.4129	19.6626	19.9575	20.1380	20.2270	20.2417	20.2425	20.2029	19.9879	19.5733	19.3732 (90)
Living area fraction									FLA = Living area / (4) =			0.1642 (91)
MIT	19.9743	19.5468	19.7885	20.0742	20.2509	20.3381	20.3532	20.3536	20.3142	20.1030	19.7006	19.5027 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9743	19.5468	19.7885	20.0742	20.2509	20.3381	20.3532	20.3536	20.3142	20.1030	19.7006	19.5027 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9416	0.9004	0.8539	0.7605	0.6247	0.4461	0.3085	0.3368	0.5330	0.7715	0.8955	0.9436 (94)
Useful gains	698.2228	755.3385	758.2506	713.4401	597.5773	417.9741	277.8174	291.1735	446.0449	598.8292	653.0033	671.4100 (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	1212.2171	1129.4645	1021.7371	846.6389	645.9583	427.0367	279.3142	293.3408	465.2572	717.8836	957.5402	1169.7431 (97)
Space heating kWh	382.4118	251.4126	196.0340	95.9032	35.9954	0.0000	0.0000	0.0000	0.0000	88.5764	219.2665	370.7599 (98a)
Space heating requirement - total per year (kWh/year)												1640.3598
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	382.4118	251.4126	196.0340	95.9032	35.9954	0.0000	0.0000	0.0000	0.0000	88.5764	219.2665	370.7599 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1640.3598
Space heating per m2										(98c) / (4) =		15.4503 (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 %)												260.8427 (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	382.4118	251.4126	196.0340	95.9032	35.9954	0.0000	0.0000	0.0000	0.0000	88.5764	219.2665	370.7599 (98)
Space heating efficiency (main heating system 1)	260.8427	260.8427	260.8427	260.8427	260.8427	0.0000	0.0000	0.0000	0.0000	260.8427	260.8427	260.8427 (210)
Space heating fuel (main heating system)	146.6063	96.3848	75.1541	36.7667	13.7997	0.0000	0.0000	0.0000	0.0000	33.9578	84.0608	142.1393 (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	280.9579	248.4221	263.6368	230.9491	223.3407	200.6528	197.5147	205.6338	208.2125	232.9059	248.5753	277.7629 (64)
Efficiency of water heater	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650 (216)
Fuel for water heating, kWh/month	99.6782	88.1351	93.5330	81.9361	79.2368	71.1876	70.0742	72.9547	73.8696	82.6303	88.1895	98.5446 (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	30.3940	27.4526	30.3940	29.4135	30.3940	29.4135	30.3940	30.3940	29.4135	30.3940	29.4135	30.3940 (231)
Lighting	28.8849	23.1726	20.8643	15.2861	11.8074	9.6468	10.7711	14.0007	18.1855	23.8604	26.9503	29.6877 (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												628.8694 (211)

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Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	281.8650	
Water heating fuel used	999.9697	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.1125)		
mechanical ventilation fans (SFP = 1.1125)	357.8643	(230a)
Total electricity for the above, kWh/year	357.8643	(231)
Electricity for lighting (calculated in Appendix L)	233.1179	(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	2219.8213	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	628.8694	0.1564	98.3763 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	999.9697	0.1410	140.9567 (264)
Space and water heating			239.3330 (265)
Pumps, fans and electric keep-hot	357.8643	0.1387	49.6402 (267)
Energy for lighting	233.1179	0.1443	33.6461 (268)
Total CO2, kg/year			322.6193 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.0400 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	628.8694	1.5791	993.0497 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	999.9697	1.5212	1521.1795 (278)
Space and water heating			2514.2292 (279)
Pumps, fans and electric keep-hot	357.8643	1.5128	541.3772 (281)
Energy for lighting	233.1179	1.5338	357.5640 (282)
Total Primary energy kWh/year			3413.1703 (286)
Dwelling Primary energy Rate (DPER)			32.1500 (287)

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

1. Overall dwelling characteristics

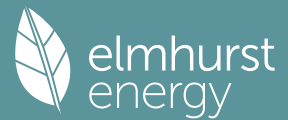
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	53.7400 (1b)	x 2.3600 (2b)	= 126.8264 (1b) - (3b)
First floor	52.4300 (1c)	x 2.6100 (2c)	= 136.8423 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	106.1700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 263.6687 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 40.0000 / (5) = 0.1517 (8)
Pressure Test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4017 (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) = 0.3716 (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												

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Effective ac	0.4738	0.4645	0.4552	0.4087	0.3994	0.3530	0.3530	0.3437	0.3716	0.3994	0.4180	0.4366 (22b)
	0.6122	0.6079	0.6036	0.5835	0.5798	0.5623	0.5623	0.5591	0.5690	0.5798	0.5874	0.5953 (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
Main dwelling							
TER Opening Type			18.8700	1.1450	21.6069		(27)
Ground Floor			53.7400	0.1300	6.9862		(28a)
External Walls	112.2400	18.8700	93.3700	0.1800	16.8066		(29a)
External Roof	53.7400		53.7400	0.1100	5.9114		(30)
Total net area of external elements Aum(A, m2)			219.7200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	51.3111		(33)
Main dwelling							
Party Walls			34.9500	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 119.2740 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	15.0200	0.0500	0.7510
E3 Sill	15.0200	0.0500	0.7510
E4 Jamb	29.0000	0.0500	1.4500
E5 Ground floor (normal)	23.2400	0.1600	3.7184
E6 Intermediate floor within a dwelling	21.9900	0.0000	0.0000
E12 Gable (insulation at ceiling level)	7.0300	0.0600	0.4218
P4 Party wall - Roof (insulation at ceiling level)	7.0300	0.1200	0.8436
E10 Eaves (insulation at ceiling level)	16.2100	0.0600	0.9726
E16 Corner (normal)	14.6600	0.0900	1.3194
E17 Corner (inverted - internal area greater than external area)	4.7200	-0.0900	-0.4248
E18 Party wall between dwellings	9.9400	0.0600	0.5964

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.3994 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 61.7105 (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	53.2701	52.8909	52.5193	50.7735	50.4469	48.9265	48.9265	48.6449	49.5121	50.4469	51.1077	51.7984 (38)
Heat transfer coeff	114.9806	114.6014	114.2297	112.4840	112.1574	110.6369	110.6369	110.3554	111.2226	112.1574	112.8181	113.5089 (39)
Average = Sum(39)m / 12 =												112.4824

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0830	1.0794	1.0759	1.0595	1.0564	1.0421	1.0421	1.0394	1.0476	1.0564	1.0626	1.0691 (40)
HLP (average)												1.0595
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7898 (42)
Hot water usage for mixer showers												
70.9951	69.9282	68.3735	65.3989	63.2036	60.7555	59.3641	60.9070	62.5983	65.2269	68.2654	70.7231	(42a)
Hot water usage for baths												
30.6535	30.1982	29.5571	28.3751	27.4900	26.5086	25.9784	26.6150	27.3082	28.3583	29.5647	30.5498	(42b)
Hot water usage for other uses												
43.2001	41.6292	40.0583	38.4873	36.9164	35.3455	35.3455	36.9164	38.4873	40.0583	41.6292	43.2001	(42c)
Average daily hot water use (litres/day)												133.1485 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	144.8487	141.7556	137.9889	132.2613	127.6101	122.6096	120.6880	124.4385	128.3939	133.6435	139.4593	144.4730 (44)
Energy conte	229.4049	201.8581	212.0838	181.0591	171.7877	150.7628	145.9617	154.0808	158.3225	181.3529	198.6853	226.2099 (45)
Energy content (annual)										Total = Sum(45)m =		2211.5695

Distribution loss (46)m = 0.15 x (45)m 33.9315 (46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.6525 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.8924 (55)

Total storage loss

27.6637 24.9865 27.6637 26.7713 27.6637 26.7713 27.6637 27.6637 26.7713 27.6637 26.7713 27.6637 27.6637 (56)

If cylinder contains dedicated solar storage

27.6637 24.9865 27.6637 26.7713 27.6637 26.7713 27.6637 27.6637 26.7713 27.6637 26.7713 27.6637 27.6637 (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

280.3310 247.8558 263.0099 230.3424 222.7137 200.0461 196.8878 205.0069 207.6058 232.2790 247.9686 277.1359 (62)

WWHRS -32.4560 -28.7044 -30.0576 -24.8888 -23.1955 -19.8486 -18.6049 -19.7844 -20.5361 -24.2098 -27.4267 -31.8556 (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

247.8750 219.1515 232.9523 205.4535 199.5182 180.1976 178.2829 185.2225 187.0697 208.0692 220.5419 245.2810 (64)

Total per year (kWh/year) = Sum(64)m = 2509.6152 (64)

Electric shower(s) 2510 (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)

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

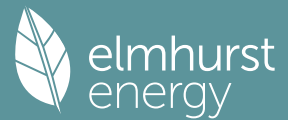
Heat gains from water heating, kWh/month

117.0180 103.9160 111.2587 99.6288 97.8603 89.5553 89.2731 91.9727 92.0689 101.0407 105.4895 115.9556 (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	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
137.2797	151.9882	137.2797	141.8557	137.2797	141.8557	137.2797	137.2797	137.2797	141.8557	137.2797	141.8557	137.2797 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
265.9341	268.6936	261.7396	246.9354	228.2476	210.6838	198.9501	196.1905	203.1445	217.9488	236.6365	254.2004	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												

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Pumps, fans	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	(69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Water heating gains (Table 5)	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	(71)
Total internal gains	157.2822	154.6369	149.5413	138.3733	131.5326	124.3823	119.9907	123.6193	127.8734	135.8074	146.5132	155.8544	(72)
	628.3426	643.1654	616.4072	595.0110	564.9065	541.7684	521.0671	521.9361	537.7202	558.8825	592.8520	615.1810	(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					6.4700	10.6334	0.6300	0.7000			0.7700			21.0256 (74)
East					2.6500	19.6403	0.6300	0.7000			0.7700			15.9061 (76)
South					9.2300	46.7521	0.6300	0.7000			0.7700			131.8786 (78)
West					0.5200	19.6403	0.6300	0.7000			0.7700			3.1212 (80)
Solar gains	171.9315	293.3857	404.7001	510.0212	581.3293	582.1482	559.1188	504.7574	440.7839	324.9548	205.9837	147.1304	(83)	
Total gains	800.2741	936.5510	1021.1073	1105.0322	1146.2358	1123.9166	1080.1859	1026.6935	978.5042	883.8373	798.8358	762.3114	(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	30.5929	30.6941	30.7940	31.2719	31.3630	31.7940	31.7940	31.8751	31.6266	31.3630	31.1793	30.9895	
alpha	3.0395	3.0463	3.0529	3.0848	3.0909	3.1196	3.1196	3.1250	3.1084	3.0909	3.0786	3.0660	
util living area	0.9580	0.9333	0.8981	0.8274	0.7188	0.5652	0.4293	0.4652	0.6584	0.8485	0.9343	0.9630	(86)
MIT	18.9724	19.2913	19.6976	20.2089	20.6116	20.8703	20.9588	20.9464	20.7810	20.2617	19.5461	18.9294	(87)
Th 2	20.0148	20.0177	20.0206	20.0341	20.0366	20.0484	20.0484	20.0506	20.0439	20.0366	20.0315	20.0261	(88)
util rest of house	0.9513	0.9231	0.8822	0.8002	0.6741	0.4978	0.3442	0.3793	0.5947	0.8189	0.9225	0.9571	(89)
MIT 2	17.6565	18.0577	18.5655	19.1975	19.6672	19.9493	20.0262	20.0199	19.8632	19.2754	18.3925	17.6094	(90)
Living area fraction	17.8725	18.2602	18.7514	19.3636	19.8223	20.1005	20.1793	20.1720	20.0139	19.4373	18.5819	17.8261	(92)
MIT	17.8725	18.2602	18.7514	19.3636	19.8223	20.1005	20.1793	20.1720	20.0139	19.4373	18.5819	17.8261	(93)
Temperature adjustment												0.0000	
adjusted MIT	17.8725	18.2602	18.7514	19.3636	19.8223	20.1005	20.1793	20.1720	20.0139	19.4373	18.5819	17.8261	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9314	0.8994	0.8568	0.7785	0.6631	0.5017	0.3563	0.3907	0.5925	0.7970	0.8995	0.9386	(94)
Ext temp.	745.3680	842.2898	874.8908	860.2263	760.1052	563.8242	384.8623	401.1607	579.7782	704.4059	718.5167	715.5000	(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	1560.5738	1531.0995	1399.4697	1176.9828	910.9712	608.5625	396.0016	416.2590	657.7584	991.1705	1295.3644	1546.6811	(97)
Space heating requirement - total per year (kWh/year)	606.5131	462.8801	390.2867	228.0647	112.2443	0.0000	0.0000	0.0000	0.0000	213.3529	415.3303	618.3988	(98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98c)
Space heating kWh	606.5131	462.8801	390.2867	228.0647	112.2443	0.0000	0.0000	0.0000	0.0000	213.3529	415.3303	618.3988	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3047.0710	
Space heating per m ²										(98c) / (4) =		28.6999	(99)

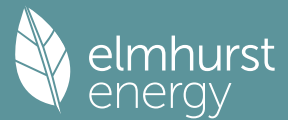
9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.3000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating efficiency (main heating system 1)	606.5131	462.8801	390.2867	228.0647	112.2443	0.0000	0.0000	0.0000	0.0000	213.3529	415.3303	618.3988	(98)
Space heating fuel (main heating system)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating efficiency (main heating system 2)	657.1106	501.4952	422.8458	247.0907	121.6082	0.0000	0.0000	0.0000	0.0000	231.1516	449.9787	669.9879	(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	247.8750	219.1515	232.9523	205.4535	199.5182	180.1976	178.2829	185.2225	187.0697	208.0692	220.5419	245.2810	(64)
Efficiency of water heater (217)m	85.9865	85.6945	85.2080	84.2945	82.8222	79.8000	79.8000	79.8000	79.8000	84.1161	85.4572	86.0440	(216)
Fuel for water heating, kWh/month	288.2720	255.7358	273.3924	243.7331	240.8996	225.8115	223.4121	232.1084	234.4232	247.3596	258.0729	285.0644	(219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	28.5240	22.8830	20.6036	15.0951	11.6599	9.5262	10.6365	13.8258	17.9583	23.5623	26.6135	29.3168	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-48.7156	-67.8926	-96.4707	-107.1594	-114.4217	-106.3451	-104.9667	-99.6027	-90.0286	-76.9523	-53.2510	-42.2051	(233a)

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	3301.2686	1.1300	3730.4336 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	3008.2849	1.1300	3399.3619 (278)
Space and water heating			7129.7955 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	230.2050	1.5338	353.0962 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1008.0114	1.4984	-1510.3948
PV Unit electricity exported	-1648.2228	0.4625	-762.3486
Total			-2272.7434 (283)
Total Primary energy kWh/year			5340.2491 (286)
Target Primary Energy Rate (TPER)			50.3000 (287)

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Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000	Air changes per hour	0.1517 (8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50				2.2300 (17)
Infiltration rate				0.2632 (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) =			0.2435 (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)
	0.3104	0.3043	0.2982	0.2678	0.2617	0.2313	0.2313	0.2252	0.2435	0.2617	0.2739	0.2861	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5482	0.5463	0.5445	0.5359	0.5342	0.5267	0.5267	0.5254	0.5296	0.5342	0.5375	0.5409	(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	
Main dwelling								
Windows			18.8700	1.2357	23.3184			(27)
Ground Floor			53.7400	0.1300	6.9862	110.0000	5911.4000	(28a)
External Walls	112.2400	18.8700	93.3700	0.1500	14.0055	18.0000	1680.6600	(29a)
External Roof	53.7400		53.7400	0.1100	5.9114	9.0000	483.6600	(30)
Total net area of external elements Aum(A, m2)			219.7200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.2215			(33)
Main dwelling								
Party Walls			34.9500	0.0000	0.0000	70.0000	2446.5001	(32)
Internal Walls			80.6100			9.0000	725.4900	(32c)
Internal Floor			52.4300			18.0000	943.7400	(32d)
Internal Ceiling			52.4300			9.0000	471.8700	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12663.3200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		119.2740 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	15.0200	0.0930	1.3969
E2 Other lintels (including other steel lintels)	15.0200	-0.0590	-0.8862
E3 Sill	29.0000	-0.0650	-1.8850
E4 Jamb	23.2400	0.0300	0.6972
E5 Ground floor (normal)	21.9900	0.0180	0.3958
E6 Intermediate floor within a dwelling	7.0300	0.0390	0.2742
E12 Gable (insulation at ceiling level)	7.0300	0.1010	0.7100
P4 Party wall - Roof (insulation at ceiling level)	16.2100	0.0430	0.6970
E10 Eaves (insulation at ceiling level)	14.6600	0.1170	1.7152
E16 Corner (normal)	4.7200	0.0400	0.1888
E17 Corner (inverted - internal area greater than external area)	9.9400	0.0540	0.5368
E18 Party wall between dwellings			

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		3.8407 (36)
Point Thermal Bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	54.0623 (37)

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

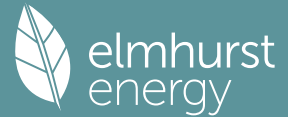
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	47.6975	47.5347	47.3751	46.6257	46.4854	45.8327	45.8327	45.7118	46.0841	46.4854	46.7691	47.0657	(38)
Average = Sum(39)m / 12 =	101.7597	101.5969	101.4374	100.6879	100.5477	99.8949	99.8949	99.7741	100.1464	100.5477	100.8314	101.1279	(39)
												100.6872	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9585	0.9569	0.9554	0.9484	0.9470	0.9409	0.9409	0.9398	0.9433	0.9470	0.9497	0.9525	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	
												0.9484	
												31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7898 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	30.6535	30.1982	29.5571	28.3751	27.4900	26.5086	25.9784	26.6150	27.3082	28.3583	29.5647	30.5498	(42b)
Hot water usage for other uses	43.2001	41.6292	40.0583	38.4873	36.9164	35.3455	35.3455	36.9164	38.4873	40.0583	41.6292	43.2001	(42c)
Average daily hot water use (litres/day)													67.6934 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	73.8535	71.8274	69.6154	66.8624	64.4064	61.8541	61.3240	63.5315	65.7955	68.4166	71.1939	73.7499	(44)
Energy content (annual)	116.9660	102.2812	106.9963	91.5313	86.7034	76.0568	74.1660	78.6652	81.1324	92.8407	101.4287	115.4745	(45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	99.4211	86.9390	90.9468	77.8016	73.6979	64.6483	63.0411	66.8654	68.9626	78.9146	86.2144	98.1534	(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	99.4211	86.9390	90.9468	77.8016	73.6979	64.6483	63.0411	66.8654	68.9626	78.9146	86.2144	98.1534 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =										955.6062 (64)	956 (64)
Electric shower(s)	56.8553	50.6585	55.3172	52.7885	53.7791	51.3000	53.0100	53.7791	52.7885	55.3172	54.2770	56.8553 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =										646.7255 (64a)	
Heat gains from water heating, kWh/month	39.0691	34.3994	36.5660	32.6475	31.8692	28.9871	29.0128	30.1611	30.4378	33.5579	35.1229	38.7522 (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	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	135.8693	150.4267	135.8693	140.3983	135.8693	140.3983	135.8693	135.8693	140.3983	135.8693	140.3983	135.8693	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	265.9341	268.6936	261.7396	246.9354	228.2476	210.6838	198.9501	196.1905	203.1445	217.9488	236.6365	254.2004	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	(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)	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	(71)
Water heating gains (Table 5)	52.5122	51.1896	49.1478	45.3438	42.8350	40.2598	38.9957	40.5391	42.2747	45.1048	48.7817	52.0862	(72)
Total internal gains	519.1622	535.1566	511.6034	497.5241	471.7986	456.1885	438.6617	437.4456	450.6641	463.7695	490.6632	507.0025	(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				6.4700	10.6334	0.4000	0.7500	0.7700	14.3031 (74)			
East				2.6500	19.6403	0.4000	0.7500	0.7700	10.8205 (76)			
South				9.2300	46.7521	0.4000	0.7500	0.7700	89.7133 (78)			
West				0.5200	19.6403	0.4000	0.7500	0.7700	2.1233 (80)			
Solar gains	116.9602	199.5821	275.3062	346.9532	395.4621	396.0192	380.3529	343.3724	299.8530	221.0577	140.1250	100.0887 (83)
Total gains	636.1225	734.7387	786.9096	844.4773	867.2607	852.2077	819.0146	780.8180	750.5171	684.8272	630.7882	607.0912 (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	34.5676	34.6230	34.6774	34.9356	34.9843	35.2129	35.2129	35.2555	35.1245	34.9843	34.8859	34.7836
alpha	3.3045	3.3082	3.3118	3.3290	3.3323	3.3475	3.3475	3.3504	3.3416	3.3323	3.3257	3.3189
util living area	0.9753	0.9597	0.9372	0.8861	0.7972	0.6498	0.5035	0.5425	0.7369	0.8998	0.9601	0.9786 (86)
MIT	19.0255	19.2962	19.6566	20.1370	20.5524	20.8426	20.9500	20.9348	20.7463	20.2110	19.5392	18.9742 (87)
Th 2	20.1181	20.1194	20.1206	20.1266	20.1277	20.1329	20.1329	20.1338	20.1309	20.1277	20.1254	20.1231 (88)
util rest of house	0.9713	0.9533	0.9268	0.8664	0.7602	0.5855	0.4159	0.4553	0.6802	0.8784	0.9527	0.9752 (89)
MIT 2	18.3032	18.5708	18.9257	19.3944	19.7822	20.0339	20.1102	20.1025	19.9590	19.4730	18.8179	18.2560 (90)
Living area fraction									fLA = Living area / (4) =			0.1642 (91)
MIT	18.4218	18.6899	19.0457	19.5163	19.9086	20.1667	20.2481	20.2392	20.0882	19.5942	18.9363	18.3739 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4218	18.6899	19.0457	19.5163	19.9086	20.1667	20.2481	20.2392	20.0882	19.5942	18.9363	18.3739 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9611	0.9401	0.9111	0.8502	0.7498	0.5881	0.4280	0.4665	0.6771	0.8627	0.9396	0.9659	(94)
Ext temp.	611.3869	690.7012	716.9897	717.9644	650.2505	501.2253	350.5669	364.2498	508.2100	590.8274	592.6999	586.3672	(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	1437.0275	1401.0117	1272.6023	1068.9375	825.3562	556.0811	364.4252	383.0489	599.7014	904.3420	1193.4735	1433.3810	(97)
Space heating requirement - total per year (kWh/year)	614.2766	477.3286	413.3758	252.7007	130.2786	0.0000	0.0000	0.0000	0.0000	233.2549	432.5570	630.1783	(98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98c)
Space heating kWh	614.2766	477.3286	413.3758	252.7007	130.2786	0.0000	0.0000	0.0000	0.0000	233.2549	432.5570	630.1783	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)	614.2766	477.3286	413.3758	252.7007	130.2786	0.0000	0.0000	0.0000	0.0000	233.2549	432.5570	630.1783	(98c)
Space heating per m ²	(98c) / (4) =											29.9892 (99)	

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	939.0125	739.2226	758.2829	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7703	0.8405	0.8167	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	723.3295	621.3165	619.2945	0.0000	0.0000	0.0000	0.0000	(102)

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Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	939.8047	903.6738	861.7261	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	155.8622	210.0738	180.3691	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	155.8622	210.0738	180.3691	0.0000	0.0000	0.0000	1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	38.9656	52.5185	45.0923	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												136.5763 (107)
Energy for space heating												29.9892 (99)
Energy for space cooling												1.2864 (108)
Total												31.2756 (109)
Fabric Energy Efficiency (DFEE)												31.3 (109)

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

1. Overall dwelling characteristics

Main dwelling	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	53.7400 (1b)	x 2.3600 (2b)	= 126.8264 (1b) - (3b)
First floor	52.4300 (1c)	x 2.6100 (2c)	= 136.8423 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	106.1700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 263.6687 (5)

2. Ventilation rate

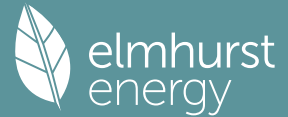
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	40.0000 / (5) = 0.1517 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4017 (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) = 0.3716 (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	0.4738	0.4645	0.4552	0.4087	0.3994	0.3530	0.3530	0.3437	0.3716	0.3994	0.4180	0.4366 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.6122	0.6079	0.6036	0.5835	0.5798	0.5623	0.5623	0.5591	0.5690	0.5798	0.5874	0.5953 (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
Main dwelling							
TER Opening Type			18.8700	1.1450	21.6069		(27)
Ground Floor			53.7400	0.1300	6.9862		(28a)
External Walls	112.2400	18.8700	93.3700	0.1800	16.8066		(29a)
External Roof	53.7400		53.7400	0.1100	5.9114		(30)
Total net area of external elements Aum(A, m2)			219.7200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	51.3111		(33)
Main dwelling							
Party Walls			34.9500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							119.2740 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				15.0200	0.0500	0.7510	
E3 Sill				15.0200	0.0500	0.7510	
E4 Jamb				29.0000	0.0500	1.4500	
E5 Ground floor (normal)				23.2400	0.1600	3.7184	
E6 Intermediate floor within a dwelling				21.9900	0.0000	0.0000	
E12 Gable (insulation at ceiling level)				7.0300	0.0600	0.4218	
P4 Party wall - Roof (insulation at ceiling level)				7.0300	0.1200	0.8436	
E10 Eaves (insulation at ceiling level)				16.2100	0.0600	0.9726	
E16 Corner (normal)				14.6600	0.0900	1.3194	
E17 Corner (inverted - internal area greater than external area)				4.7200	-0.0900	-0.4248	
E18 Party wall between dwellings				9.9400	0.0600	0.5964	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.3994 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	61.7105 (37)

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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	53.2701	52.8909	52.5193	50.7735	50.4469	48.9265	48.9265	48.6449	49.5121	50.4469	51.1077	51.7984 (38)
Average = Sum(39)m / 12 =	114.9806	114.6014	114.2297	112.4840	112.1574	110.6369	110.6369	110.3554	111.2226	112.1574	112.8181	113.5089 (39)
												112.4824
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0830	1.0794	1.0759	1.0595	1.0564	1.0421	1.0421	1.0394	1.0476	1.0564	1.0626	1.0691 (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												2.7898 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths	30.6535	30.1982	29.5571	28.3751	27.4900	26.5086	25.9784	26.6150	27.3082	28.3583	29.5647	30.5498 (42b)
Hot water usage for other uses	43.2001	41.6292	40.0583	38.4873	36.9164	35.3455	35.3455	36.9164	38.4873	40.0583	41.6292	43.2001 (42c)
Average daily hot water use (litres/day)												67.6934 (43)
Daily hot water use	73.8535	71.8274	69.6154	66.8624	64.4064	61.8541	61.3240	63.5315	65.7955	68.4166	71.1939	73.7499 (44)
Energy content (annual)	116.9660	102.2812	106.9963	91.5313	86.7034	76.0568	74.1660	78.6652	81.1324	92.8407	101.4287	115.4745 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss (or HIU loss):												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	99.4211	86.9390	90.9468	77.8016	73.6979	64.6483	63.0411	66.8654	68.9626	78.9146	86.2144	98.1534 (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	99.4211	86.9390	90.9468	77.8016	73.6979	64.6483	63.0411	66.8654	68.9626	78.9146	86.2144	98.1534 (64)
12Total per year (kWh/year)												955.6062 (64)
Electric shower(s)	56.8553	50.6585	55.3172	52.7885	53.7791	51.3000	53.0100	53.7791	52.7885	55.3172	54.2770	56.8553 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												646.7255 (64a)
Heat gains from water heating, kWh/month	39.0691	34.3994	36.5660	32.6475	31.8692	28.9871	29.0128	30.1611	30.4378	33.5579	35.1229	38.7522 (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	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	137.2797	151.9882	137.2797	141.8557	137.2797	141.8557	137.2797	137.2797	141.8557	137.2797	141.8557	137.2797 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	265.9341	268.6936	261.7396	246.9354	228.2476	210.6838	198.9501	196.1905	203.1445	217.9488	236.6365	254.2004 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489 (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)	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910 (71)
Water heating gains (Table 5)	52.5122	51.1896	49.1478	45.3438	42.8350	40.2598	38.9957	40.5391	42.2747	45.1048	48.7817	52.0862 (72)
Total internal gains	520.5726	536.7180	513.0138	498.9814	473.2089	457.6459	440.0720	438.8560	452.1215	465.1798	492.1206	508.4129 (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			6.4700	10.6334	0.6300		0.7000	0.7700		21.0256 (74)				
East			2.6500	19.6403	0.6300		0.7000	0.7700		15.9061 (76)				
South			9.2300	46.7521	0.6300		0.7000	0.7700		131.8786 (78)				
West			0.5200	19.6403	0.6300		0.7000	0.7700		3.1212 (80)				
Solar gains			171.9315	293.3857	404.7001	510.0212	581.3293	582.1482	559.1188	504.7574	440.7839	324.9548	205.9837	147.1304 (83)
Total gains			692.5041	830.1037	917.7138	1009.0027	1054.5382	1039.7941	999.1908	943.6133	892.9054	790.1346	698.1043	655.5433 (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	30.5929	30.6941	30.7940	31.2719	31.3630	31.7940	31.7940	31.8751	31.6266	31.3630	31.1793	30.9895
alpha	3.0395	3.0463	3.0529	3.0848	3.0909	3.1196	3.1196	3.1250	3.1084	3.0909	3.0786	3.0660
util living area	0.9707	0.9497	0.9191	0.8544	0.7514	0.5985	0.4592	0.4991	0.6966	0.8785	0.9523	0.9748 (86)
MIT	18.8064	19.1405	19.5680	20.1163	20.5556	20.8473	20.9503	20.9347	20.7415	20.1628	19.4018	18.7615 (87)

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Th 2	20.0148	20.0177	20.0206	20.0341	20.0366	20.0484	20.0484	20.0506	20.0439	20.0366	20.0315	20.0261 (88)
util rest of house	0.9659	0.9417	0.9057	0.8298	0.7084	0.5300	0.3699	0.4093	0.6339	0.8528	0.9433	0.9706 (89)
MIT 2	18.0144	18.3445	18.7641	19.2989	19.7033	19.9563	20.0272	20.0209	19.8748	19.3549	18.6154	17.9780 (90)
Living area fraction									fLA = Living area / (4) =			0.1642 (91)
MIT	18.1444	18.4752	18.8960	19.4331	19.8433	20.1026	20.1787	20.1709	20.0171	19.4875	18.7445	18.1066 (92)
Temperature adjustment												0.0000
adjusted MIT	18.1444	18.4752	18.8960	19.4331	19.8433	20.1026	20.1787	20.1709	20.0171	19.4875	18.7445	18.1066 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9534	0.9253	0.8869	0.8121	0.6988	0.5341	0.3826	0.4212	0.6320	0.8352	0.9276	0.9593	(94)
Useful gains	660.2159	768.0887	813.8939	819.4034	736.9455	555.3980	382.3234	397.4962	564.2961	659.9107	647.5610	628.8881	(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	1591.8408	1555.7313	1415.9967	1184.8075	913.3274	608.7902	395.9387	416.1445	658.1184	996.7997	1313.7151	1578.5225	(97)
Space heating kWh	693.1289	529.2958	447.9645	263.0910	131.2281	0.0000	0.0000	0.0000	0.0000	250.6454	479.6310	706.5280	(98a)
Space heating requirement - total per year (kWh/year)												3501.5127	
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	693.1289	529.2958	447.9645	263.0910	131.2281	0.0000	0.0000	0.0000	0.0000	250.6454	479.6310	706.5280	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3501.5127	
Space heating per m2											(98c) / (4) =	32.9802	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	1039.9871	818.7132	838.7007	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7961	0.8586	0.8351	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	827.9761	702.9510	700.4144	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1157.4815	1112.7542	1050.5312	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	237.2439	304.8936	260.4869	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	59.3110	76.2234	65.1217	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												200.6561	(107)
Energy for space heating												32.9802	(99)
Energy for space cooling												1.8900	(108)
Total												34.8702	(109)
Fabric Energy Efficiency (TFEE)												34.9	(109)

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

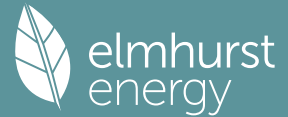
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	53.7400 (1b)	x 2.3600 (2b)	= 126.8264 (1b) - (3b)	
First floor	52.4300 (1c)	x 2.6100 (2c)	= 136.8423 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	106.1700		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	263.6687 (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		2.2300 (17)	
Infiltration rate		0.1115 (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) =	0.1031 (21)	

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1315	0.1289	0.1263	0.1135	0.1109	0.0980	0.0980	0.0954	0.1031	0.1109	0.1160	0.1212 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												72.8000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2675	0.2649	0.2623	0.2495	0.2469	0.2340	0.2340	0.2314	0.2391	0.2469	0.2520	0.2572 (25)

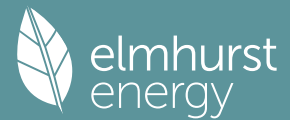
3. Heat losses and heat loss parameter

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					
Main dwelling												
Windows			18.8700	1.2357	23.3184			(27)				
Ground Floor			53.7400	0.1300	6.9862	110.0000	5911.4000	(28a)				
External Walls	112.2400	18.8700	93.3700	0.1500	14.0055	18.0000	1680.6600	(29a)				
External Roof	53.7400		53.7400	0.1100	5.9114	9.0000	483.6600	(30)				
Total net area of external elements Aum(A, m2)			219.7200					(31)				
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		50.2215			(33)				
Main dwelling												
Party Walls			34.9500	0.0000	0.0000	70.0000	2446.5001	(32)				
Internal Walls			80.6100			9.0000	725.4900	(32c)				
Internal Floor			52.4300			18.0000	943.7400	(32d)				
Internal Ceiling			52.4300			9.0000	471.8700	(32e)				
Heat capacity Cm = Sum(A x k)						(28) ... (30) + (32) + (32a) ... (32e) =	12663.3200	(34)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							119.2740	(35)				
List of Thermal Bridges												
K1 Element				Length	Psi-value		Total					
E2 Other lintels (including other steel lintels)				15.0200	0.0930		1.3969					
E3 Sill				15.0200	-0.0590		-0.8862					
E4 Jamb				29.0000	-0.0650		-1.8850					
E5 Ground floor (normal)				23.2400	0.0300		0.6972					
E6 Intermediate floor within a dwelling				21.9900	0.0180		0.3958					
E12 Gable (insulation at ceiling level)				7.0300	0.0390		0.2742					
P4 Party wall - Roof (insulation at ceiling level)				7.0300	0.1010		0.7100					
E10 Eaves (insulation at ceiling level)				16.2100	0.0430		0.6970					
E16 Corner (normal)				14.6600	0.1170		1.7152					
E17 Corner (inverted - internal area greater than external area)				4.7200	0.0400		0.1888					
E18 Party wall between dwellings				9.9400	0.0540		0.5368					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								3.8407 (36)				
Point Thermal Bridges						(36a) =	0.0000					
Total fabric heat loss						(33) + (36) + (36a) =	54.0623	(37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 23.2754	Feb 23.0510	Mar 22.8267	Apr 21.7049	May 21.4806	Jun 20.3588	Jul 20.3588	Aug 20.1345	Sep 20.8075	Oct 21.4806	Nov 21.9293	Dec 22.3780 (38)
Heat transfer coeff	77.3376	77.1133	76.8889	75.7672	75.5428	74.4211	74.4211	74.1967	74.8698	75.5428	75.9915	76.4402 (39)
Average = Sum(39)m / 12 =												75.7111
HLP	Jan 0.7284	Feb 0.7263	Mar 0.7242	Apr 0.7136	May 0.7115	Jun 0.7010	Jul 0.7010	Aug 0.6988	Sep 0.7052	Oct 0.7115	Nov 0.7158	Dec 0.7200 (40)
HLP (average)												0.7131
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7898 (42)
Hot water usage for mixer showers												70.7231 (42a)
Hot water usage for baths												30.5498 (42b)
Hot water usage for other uses												43.2001 (42c)
Average daily hot water use (litres/day)												133.1485 (43)
Daily hot water use	Jan 144.8487	Feb 141.7556	Mar 137.9889	Apr 132.2613	May 127.6101	Jun 122.6096	Jul 120.6880	Aug 124.4385	Sep 128.3939	Oct 133.6435	Nov 139.4593	Dec 144.4730 (44)
Energy conte	229.4049	201.8581	212.0838	181.0591	171.7877	150.7628	145.9617	154.0808	158.3225	181.3529	198.6853	226.2099 (45)
Energy content (annual)										Total = Sum(45)m =		2211.5695
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss (or HIU loss):												
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6900 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9126 (55)
Total storage loss												
If cylinder contains dedicated solar storage												
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Total heat required for water heating calculated for each month												
WWHRS	280.9579	248.4221	263.6368	230.9491	223.3407	200.6528	197.5147	205.6338	208.2125	232.9059	248.5753	277.7629 (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												
Electric shower(s)												
Total Energy used by instantaneous electric shower (s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
	117.5195	104.3690	111.7603	100.1142	98.3618	90.0406	89.7747	92.4743	92.5542	101.5422	105.9749	116.4572 (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	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	33.0002	29.3105	23.8369	18.0461	13.4897	11.3885	12.3057	15.9954	21.4690	27.2599	31.8163	33.9174	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	396.9165	401.0353	390.6562	368.5603	340.6681	314.4535	296.9404	292.8217	303.2008	325.2967	353.1889	379.4035	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	(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)	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	(71)
Water heating gains (Table 5)	157.9564	155.3110	150.2154	139.0474	132.2067	125.0564	120.6649	124.2934	128.5475	136.4815	147.1873	156.5285	(72)
Total internal gains	698.1971	695.9808	675.0324	635.9777	596.6884	561.2223	540.2349	543.4344	563.5413	599.3620	642.5164	680.1733	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	g Specific data or Table 6b	FF Specific data or Table 6c	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North				6.4700	10.6334	0.4000		0.7500		0.7700	14.3031 (74)	
East				2.6500	19.6403	0.4000		0.7500		0.7700	10.8205 (76)	
South				9.2300	46.7521	0.4000		0.7500		0.7700	89.7133 (78)	
West				0.5200	19.6403	0.4000		0.7500		0.7700	2.1233 (80)	
Solar gains	116.9602	199.5821	275.3062	346.9532	395.4621	396.0192	380.3529	343.3724	299.8530	221.0577	140.1250	100.0887 (83)
Total gains	815.1573	895.5629	950.3386	982.9309	992.1505	957.2415	920.5878	886.8068	863.3943	820.4197	782.6414	780.2620 (84)

7. Mean internal temperature (heating season)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, nil,m (see Table 9a)													21.0000 (85)
tau	45.4835	45.6159	45.7490	46.4263	46.5642	47.2660	47.2660	47.4090	46.9828	46.5642	46.2892	46.0175	
alpha	4.0322	4.0411	4.0499	4.0951	4.1043	4.1511	4.1511	4.1606	4.1322	4.1043	4.0859	4.0678	
util living area	0.9360	0.9078	0.8604	0.7748	0.6476	0.4834	0.3525	0.3804	0.5673	0.7863	0.9027	0.9438	(86)
Living	20.1384	20.2866	20.4816	20.6928	20.8350	20.9052	20.9212	20.9198	20.8852	20.7147	20.4026	20.1080	
Non living	19.2985	19.4837	19.7245	19.9850	20.1474	20.2282	20.2419	20.2428	20.2064	20.0164	19.6382	19.2668	
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	20.5592	20.2866	20.4816	20.6928	20.8350	20.9052	20.9212	20.9198	20.8852	20.7147	20.4026	20.2328	(87)
Th 2	20.3158	20.3176	20.3195	20.3288	20.3307	20.3400	20.3400	20.3419	20.3363	20.3307	20.3269	20.3232	(88)
util rest of house	0.9279	0.8967	0.8440	0.7498	0.6116	0.4374	0.3009	0.3276	0.5203	0.7576	0.8894	0.9366	(89)
MIT 2	19.9102	19.4837	19.7245	19.9850	20.1474	20.2282	20.2419	20.2428	20.2064	20.0164	19.6382	19.4572	(90)
Living area fraction													
MIT	20.0168	19.6155	19.8488	20.1012	20.2603	20.3394	20.3534	20.3540	20.3178	20.1311	19.7637	19.5845	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0168	19.6155	19.8488	20.1012	20.2603	20.3394	20.3534	20.3540	20.3178	20.1311	19.7637	19.5845	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9241	0.8838	0.8316	0.7407	0.6076	0.4374	0.3019	0.3286	0.5190	0.7484	0.8766	0.9275	(94)
Useful gains	753.2540	791.4771	790.2797	728.0913	602.8776	418.6985	277.9520	291.3953	448.0852	613.9947	686.0883	723.7019	(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	1215.4984	1134.7602	1026.3749	848.6806	646.6694	427.1313	279.3324	293.3705	465.5269	720.0037	962.3330	1175.9939	(97)
Space heating kWh	343.9098	230.6863	175.6548	86.8243	32.5811	0.0000	0.0000	0.0000	0.0000	78.8707	198.8962	336.5052	(98a)
Space heating requirement - total per year (kWh/year)												1483.9285	
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	343.9098	230.6863	175.6548	86.8243	32.5811	0.0000	0.0000	0.0000	0.0000	78.8707	198.8962	336.5052	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1483.9285	
Space heating per m2										(98c) / (4) =		13.9769	(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 %)												260.8427	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement	343.9098	230.6863	175.6548	86.8243	32.5811	0.0000	0.0000	0.0000	0.0000	78.8707	198.8962	336.5052	(98)
Space heating efficiency (main heating system 1)	260.8427	260.8427	260.8427	260.8427	260.8427	0.0000	0.0000	0.0000	0.0000	260.8427	260.8427	260.8427	(210)
Space heating fuel (main heating system)	131.8457	88.4388	67.3413	33.2861	12.4907	0.0000	0.0000	0.0000	0.0000	30.2369	76.2514	129.0070	(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)													

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Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	280.9579	248.4221	263.6368	230.9491	223.3407	200.6528	197.5147	205.6338	208.2125	232.9059	248.5753	277.7629	(64)
Efficiency of water heater	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	(216)
Fuel for water heating, kWh/month	99.6782	88.1351	93.5330	81.9361	79.2368	71.1876	70.0742	72.9547	73.8696	82.6303	88.1895	98.5446	(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	30.3940	27.4526	30.3940	29.4135	30.3940	29.4135	30.3940	30.3940	29.4135	30.3940	29.4135	30.3940	(231)
Lighting	28.8849	23.1726	20.8643	15.2861	11.8074	9.6468	10.7711	14.0007	18.1855	23.8604	26.9503	29.6877	(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												568.8979	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												281.8650	
Water heating fuel used												999.9697	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.1125)													
mechanical ventilation fans (SFP = 1.1125)												357.8643	(230a)
Total electricity for the above, kWh/year												357.8643	(231)
Electricity for lighting (calculated in Appendix L)												233.1179	(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												2159.8498	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	568.8979	16.4900	93.8113 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	999.9697	16.4900	164.8950 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	357.8643	16.4900	59.0118 (249)
Energy for lighting	233.1179	16.4900	38.4411 (250)
Additional standing charges			0.0000 (251)
Total energy cost			356.1592 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	0.8482 (257)
SAP value	86.2512
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	568.8979	0.1565	89.0073 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	999.9697	0.1410	140.9567 (264)
Space and water heating			229.9640 (265)
Pumps, fans and electric keep-hot	357.8643	0.1387	49.6402 (267)
Energy for lighting	233.1179	0.1443	33.6461 (268)
Total CO2, kg/year			313.2503 (272)
CO2 emissions per m2			2.9500 (273)
EI value			97.2233
EI rating			97 (274)
EI band			A

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1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	53.7400 (1b)	x 2.3600 (2b)	= 126.8264 (1b) - (3b)
First floor	52.4300 (1c)	x 2.6100 (2c)	= 136.8423 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	106.1700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 263.6687 (5)

2. Ventilation rate

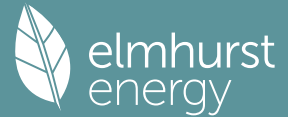
											m3 per hour		
Number of open chimneys											0 * 80 =	0.0000 (6a)	
Number of open flues											0 * 20 =	0.0000 (6b)	
Number of chimneys / flues attached to closed fire											0 * 10 =	0.0000 (6c)	
Number of flues attached to solid fuel boiler											0 * 20 =	0.0000 (6d)	
Number of flues attached 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		
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											2.2300 (17)		
Infiltration rate											0.1115 (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) =	0.1031 (21)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	4.1000	3.8000	3.7000	3.5000	3.5000	3.2000	3.3000	3.1000	3.1000	3.4000	3.3000	3.7000 (22)	
Wind factor	1.0250	0.9500	0.9250	0.8750	0.8750	0.8000	0.8250	0.7750	0.7750	0.8500	0.8250	0.9250 (22a)	
Adj infilt rate													
	0.1057	0.0980	0.0954	0.0902	0.0902	0.0825	0.0851	0.0799	0.0799	0.0877	0.0851	0.0954 (22b)	
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation													
													0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													72.8000 (23c)
Effective ac	0.2417	0.2340	0.2314	0.2262	0.2262	0.2185	0.2211	0.2159	0.2159	0.2237	0.2211	0.2314 (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						
Main dwelling													
Windows			18.8700	1.2357	23.3184			(27)					
Ground Floor			53.7400	0.1300	6.9862	110.0000	5911.4000	(28a)					
External Walls	112.2400	18.8700	93.3700	0.1500	14.0055	18.0000	1680.6600	(29a)					
External Roof	53.7400		53.7400	0.1100	5.9114	9.0000	483.6600	(30)					
Total net area of external elements Aum(A, m2)			219.7200					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		50.2215			(33)					
Main dwelling													
Party Walls			34.9500	0.0000	0.0000	70.0000	2446.5001	(32)					
Internal Walls			80.6100			9.0000	725.4900	(32c)					
Internal Floor			52.4300			18.0000	943.7400	(32d)					
Internal Ceiling			52.4300			9.0000	471.8700	(32e)					
Heat capacity Cm = Sum(A x k)								(28) ... (30) + (32) + (32a) ... (32e) = 12663.3200 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								119.2740 (35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value	Total							
E2 Other lintels (including other steel lintels)				15.0200	0.0930	1.3969							
E3 Sill				15.0200	-0.0590	-0.8862							
E4 Jamb				29.0000	-0.0650	-1.8850							
E5 Ground floor (normal)				23.2400	0.0300	0.6972							
E6 Intermediate floor within a dwelling				21.9900	0.0180	0.3958							
E12 Gable (insulation at ceiling level)				7.0300	0.0390	0.2742							
P4 Party wall - Roof (insulation at ceiling level)				7.0300	0.1010	0.7100							
E10 Eaves (insulation at ceiling level)				16.2100	0.0430	0.6970							
E16 Corner (normal)				14.6600	0.1170	1.7152							
E17 Corner (inverted - internal area greater than external area)				4.7200	0.0400	0.1888							
E18 Party wall between dwellings				9.9400	0.0540	0.5368							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								3.8407 (36)					
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	54.0623	(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	21.0319	20.3588	20.1345	19.6858	19.6858	19.0127	19.2371	18.7883	18.7883	19.4614	19.2371	20.1345	(38)
Average = Sum(39)m / 12 =	75.0941	74.4211	74.1967	73.7480	73.7480	73.0750	73.2993	72.8506	72.8506	73.5237	73.2993	74.1967	(39)
												73.6919	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.7073	0.7010	0.6988	0.6946	0.6946	0.6883	0.6904	0.6862	0.6862	0.6925	0.6904	0.6988	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

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Assumed occupancy												2.7898 (42)
Hot water usage for mixer showers	70.9951	69.9282	68.3735	65.3989	63.2036	60.7555	59.3641	60.9070	62.5983	65.2269	68.2654	70.7231 (42a)
Hot water usage for baths	30.6535	30.1982	29.5571	28.3751	27.4900	26.5086	25.9784	26.6150	27.3082	28.3583	29.5647	30.5498 (42b)
Hot water usage for other uses	43.2001	41.6292	40.0583	38.4873	36.9164	35.3455	35.3455	36.9164	38.4873	40.0583	41.6292	43.2001 (42c)
Average daily hot water use (litres/day)												133.1485 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	144.8487	141.7556	137.9889	132.2613	127.6101	122.6096	120.6880	124.4385	128.3939	133.6435	139.4593	144.4730 (44)
Distribution loss (46)m = 0.15 x (45)m	229.4049	201.8581	212.0838	181.0591	171.7877	150.7628	145.9617	154.0808	158.3225	181.3529	198.6853	226.2099 (45)
Water storage loss (or HIU loss):	34.4107	30.2787	31.8126	27.1589	25.7682	22.6144	21.8943	23.1121	23.7484	27.2029	29.8028	33.9315 (46)
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6900 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9126 (55)
Total storage loss	28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906 (56)
If cylinder contains dedicated solar storage	28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906 (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	280.9579	248.4221	263.6368	230.9491	223.3407	200.6528	197.5147	205.6338	208.2125	232.9059	248.5753	277.7629 (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	280.9579	248.4221	263.6368	230.9491	223.3407	200.6528	197.5147	205.6338	208.2125	232.9059	248.5753	277.7629 (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	117.5195	104.3690	111.7603	100.1142	98.3618	90.0406	89.7747	92.4743	92.5542	101.5422	105.9749	116.4572 (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	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	33.0002	29.3105	23.8369	18.0461	13.4897	11.3885	12.3057	15.9954	21.4690	27.2599	31.8163	33.9174 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	396.9165	401.0353	390.6562	368.5603	340.6681	314.4535	296.9404	292.8217	303.2008	325.2967	353.1889	379.4035 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284 (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)	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910 (71)
Water heating gains (Table 5)	157.9564	155.3110	150.2154	139.0474	132.2067	125.0564	120.6649	124.2934	128.5475	136.4815	147.1873	156.5285 (72)
Total internal gains	698.1971	695.9808	675.0324	635.9777	596.6884	561.2223	540.2349	543.4344	563.5413	599.3620	642.5164	680.1733 (73)

6. Solar gains												

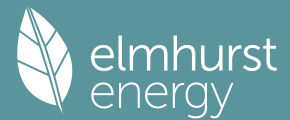
[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	Specific data	Specific data	factor	W						
		W/m2	or Table 6b	or Table 6c	Table 6d							
North	6.4700	12.6762	0.4000	0.7500	0.7700	17.0509 (74)						
East	2.6500	23.6925	0.4000	0.7500	0.7700	13.0530 (76)						
South	9.2300	53.2576	0.4000	0.7500	0.7700	102.1969 (78)						
West	0.5200	23.6925	0.4000	0.7500	0.7700	2.5613 (80)						

Solar gains	134.8622	204.7752	282.6040	373.9870	415.8302	452.5636	425.3514	383.2240	330.4936	242.8061	163.1609	116.0820 (83)
Total gains	833.0592	900.7560	957.6364	1009.9647	1012.5186	1013.7859	965.5863	926.6584	894.0349	842.1682	805.6773	796.2554 (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	46.8424	47.2660	47.4090	47.6974	47.6974	48.1367	47.9894	48.2850	48.2850	47.8430	47.9894	47.4090
alpha	4.1228	4.1511	4.1606	4.1798	4.1798	4.2091	4.1993	4.2190	4.2190	4.1895	4.1993	4.1606
util living area	0.9200	0.8928	0.8349	0.7348	0.5844	0.4051	0.3022	0.2975	0.5049	0.7204	0.8713	0.9284 (86)
Living	20.2739	20.3905	20.5778	20.7557	20.8733	20.9178	20.9244	20.9250	20.9044	20.7992	20.5376	20.2534
Non living	19.4828	19.6307	19.8600	20.0723	20.2019	20.2505	20.2538	20.2582	20.2411	20.1269	19.8218	19.4639
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	20.6286	20.3905	20.5778	20.7557	20.8733	20.9178	20.9244	20.9250	20.9044	20.7992	20.5376	20.3578 (87)
Th 2	20.3344	20.3400	20.3419	20.3456	20.3456	20.3512	20.3493	20.3531	20.3531	20.3475	20.3493	20.3419 (88)
util rest of house	0.9101	0.8803	0.8164	0.7077	0.5465	0.3608	0.2536	0.2474	0.4584	0.6862	0.8544	0.9193 (89)
MIT 2	19.9949	19.6307	19.8600	20.0723	20.2019	20.2505	20.2538	20.2582	20.2411	20.1269	19.8218	19.6221 (90)
Living area fraction	fLA = Living area / (4) =											0.1642 (91)
MIT	20.0989	19.7554	19.9779	20.1845	20.3121	20.3600	20.3639	20.3676	20.3500	20.2373	19.9393	19.7429 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0989	19.7554	19.9779	20.1845	20.3121	20.3600	20.3639	20.3676	20.3500	20.2373	19.9393	19.7429 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9062	0.8679	0.8053	0.7006	0.5445	0.3614	0.2547	0.2485	0.4582	0.6801	0.8426	0.9099	(94)
Useful gains	754.9529	781.7579	771.2040	707.6230	551.2708	366.3785	245.9741	230.2714	409.6268	572.7935	678.8243	724.5229	(95)
Ext temp.	5.0000	5.4000	7.1000	9.4000	12.5000	15.3000	17.0000	17.2000	14.6000	11.6000	7.9000	5.0000	(96)
Heat loss rate W	1133.8405	1068.3449	955.4945	795.3351	576.1298	369.7627	246.5694	230.7633	418.8917	635.0449	882.4714	1093.8743	(97)
Space heating kWh	281.8924	192.5865	137.1121	63.1527	18.4951	0.0000	0.0000	0.0000	0.0000	46.3151	146.6259	274.7974	(98a)
Space heating requirement - total per year (kWh/year)												1160.9772	
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	281.8924	192.5865	137.1121	63.1527	18.4951	0.0000	0.0000	0.0000	0.0000	46.3151	146.6259	274.7974	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1160.9772	
Space heating per m2										(98c) / (4) =		10.9351	(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 %)													259.5842	(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	281.8924	192.5865	137.1121	63.1527	18.4951	0.0000	0.0000	0.0000	0.0000	46.3151	146.6259	274.7974	(98)	
Space heating efficiency (main heating system 1)	259.5842	259.5842	259.5842	259.5842	259.5842	0.0000	0.0000	0.0000	0.0000	259.5842	259.5842	259.5842	(210)	
Space heating fuel (main heating system)	108.5938	74.1904	52.8199	24.3284	7.1249	0.0000	0.0000	0.0000	0.0000	17.8420	56.4849	105.8606	(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	280.9579	248.4221	263.6368	230.9491	223.3407	200.6528	197.5147	205.6338	208.2125	232.9059	248.5753	277.7629	(64)	
Efficiency of water heater (217)m	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	(216)	
Fuel for water heating, kWh/month	99.6782	88.1351	93.5330	81.9361	79.2368	71.1876	70.0742	72.9547	73.8696	82.6303	88.1895	98.5446	(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	30.3940	27.4526	30.3940	29.4135	30.3940	29.4135	30.3940	30.3940	29.4135	30.3940	29.4135	30.3940	(231)	
Lighting	28.8849	23.1726	20.8643	15.2861	11.8074	9.6468	10.7711	14.0007	18.1855	23.8604	26.9503	29.6877	(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													447.2449	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													281.8650	
Water heating fuel used													999.9697	(219)
Space cooling fuel													0.0000	(221)
Electricity for pumps and fans:														
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.1125)														
mechanical ventilation fans (SFP = 1.1125)														357.8643 (230a)
Total electricity for the above, kWh/year														357.8643 (231)
Electricity for lighting (calculated in Appendix L)														233.1179 (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														2038.1968 (238)

10a. Fuel costs - using BEDF prices (599)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	447.2449	26.0000	116.2837	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	999.9697	26.0000	259.9921	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0000	0.0000	(247a)
Pumps, fans and electric keep-hot	357.8643	26.0000	93.0447	(249)
Energy for lighting	233.1179	26.0000	60.6107	(250)

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Additional standing charges 0.0000 (251)
Total energy cost 529.9312 (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	447.2449	0.1571	70.2832	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	999.9697	0.1410	140.9567	(264)
Space and water heating			211.2399	(265)
Pumps, fans and electric keep-hot	357.8643	0.1387	49.6402	(267)
Energy for lighting	233.1179	0.1443	33.6461	(268)
Total CO2, kg/year			294.5262	(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	447.2449	1.5817	707.4296	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	999.9697	1.5212	1521.1795	(278)
Space and water heating			2228.6091	(279)
Pumps, fans and electric keep-hot	357.8643	1.5128	541.3772	(281)
Energy for lighting	233.1179	1.5338	357.5640	(282)
Total Primary energy kWh/year			3127.5503	(286)

SAP 10 EPC IMPROVEMENTS

Plot 3

Current energy efficiency rating: B 86
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	+ 1.0	-£ 52	-25 kg (8.4%)
U Solar photovoltaic panels	+ 5.6	-£ 243	-125 kg (46.4%)

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
Solar water heating	£52	0.23 kg/m²	B 87 A 97
Solar photovoltaic panels	£243	1.18 kg/m²	A 93 A 98
Total Savings	£295	1.41 kg/m²	
Potential energy efficiency rating:		A 93	
Potential environmental impact rating:			A 98

Fuel prices for cost data on this page from database revision number 599 TEST (30 Sep 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, South East England):

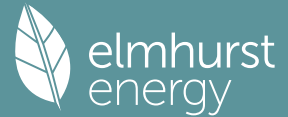
	Current	Potential	Saving
Electricity	£530	£478	£52
Space heating	£209	£230	-£21
Water heating	£260	£187	£73
Lighting	£61	£61	£0
Generated (PV)	-£0	-£243	£243
Total cost of fuels	£530	£235	£295
Total cost of uses	£530	£235	£295
Delivered energy	19 kWh/m²	9 kWh/m²	11 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.1 tonnes	0.1 tonnes
CO2 emissions per m²	3 kg/m²	1 kg/m²	1 kg/m²
Primary energy	29 kWh/m²	14 kWh/m²	16 kWh/m²

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

1. Overall dwelling characteristics

	Area (m²)	Storey height (m)	Volume (m³)
Main dwelling			
Ground floor	53.7400 (1b)	x 2.3600 (2b)	= 126.8264 (1b) - (3b)
First floor	52.4300 (1c)	x 2.6100 (2c)	= 136.8423 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	106.1700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 263.6687 (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)	
											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											2.2300 (17)		
Infiltration rate											0.1115 (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) =	0.1031 (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)	
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													
	0.1315	0.1289	0.1263	0.1135	0.1109	0.0980	0.0980	0.0954	0.1031	0.1109	0.1160	0.1212 (22b)	
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation													
													0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													72.8000 (23c)
Effective ac	0.2675	0.2649	0.2623	0.2495	0.2469	0.2340	0.2340	0.2314	0.2391	0.2469	0.2520	0.2572 (25)	

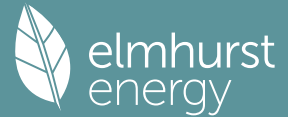
3. Heat losses and heat loss parameter

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					
Main dwelling												
Windows			18.8700	1.2357	23.3184			(27)				
Ground Floor			53.7400	0.1300	6.9862	110.0000	5911.4000	(28a)				
External Walls	112.2400	18.8700	93.3700	0.1500	14.0055	18.0000	1680.6600	(29a)				
External Roof	53.7400		53.7400	0.1100	5.9114	9.0000	483.6600	(30)				
Total net area of external elements Aum(A, m2)			219.7200					(31)				
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.2215			(33)				
Main dwelling												
Party Walls			34.9500	0.0000	0.0000	70.0000	2446.5001	(32)				
Internal Walls			80.6100			9.0000	725.4900	(32c)				
Internal Floor			52.4300			18.0000	943.7400	(32d)				
Internal Ceiling			52.4300			9.0000	471.8700	(32e)				
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) =	12663.3200 (34)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								119.2740 (35)				
List of Thermal Bridges												
K1 Element				Length	Psi-value	Total						
E2 Other lintels (including other steel lintels)				15.0200	0.0930	1.3969						
E3 Sill				15.0200	-0.0590	-0.8862						
E4 Jamb				29.0000	-0.0650	-1.8850						
E5 Ground floor (normal)				23.2400	0.0300	0.6972						
E6 Intermediate floor within a dwelling				21.9900	0.0180	0.3958						
E12 Gable (insulation at ceiling level)				7.0300	0.0390	0.2742						
P4 Party wall - Roof (insulation at ceiling level)				7.0300	0.1010	0.7100						
E10 Eaves (insulation at ceiling level)				16.2100	0.0430	0.6970						
E16 Corner (normal)				14.6600	0.1170	1.7152						
E17 Corner (inverted - internal area greater than external area)				4.7200	0.0400	0.1888						
E18 Party wall between dwellings				9.9400	0.0540	0.5368						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.8407	(36)				
Point Thermal bridges							(36a) =	0.0000				
Total fabric heat loss							(33) + (36) + (36a) =	54.0623 (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	23.2754	23.0510	22.8267	21.7049	21.4806	20.3588	20.3588	20.1345	20.8075	21.4806	21.9293	22.3780 (38)
Average = Sum(39)m / 12 =	77.3376	77.1133	76.8889	75.7672	75.5428	74.4211	74.4211	74.1967	74.8698	75.5428	75.9915	76.4402 (39)
												75.7111
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7284	0.7263	0.7242	0.7136	0.7115	0.7010	0.7010	0.6988	0.7052	0.7115	0.7158	0.7200 (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													2.7898 (42)
Hot water usage for mixer showers													
	70.9951	69.9282	68.3735	65.3989	63.2036	60.7555	59.3641	60.9070	62.5983	65.2269	68.2654	70.7231	(42a)
Hot water usage for baths													
	30.6535	30.1982	29.5571	28.3751	27.4900	26.5086	25.9784	26.6150	27.3082	28.3583	29.5647	30.5498	(42b)
Hot water usage for other uses													
	43.2001	41.6292	40.0583	38.4873	36.9164	35.3455	35.3455	36.9164	38.4873	40.0583	41.6292	43.2001	(42c)
Average daily hot water use (litres/day)													133.1485 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	144.8487	141.7556	137.9889	132.2613	127.6101	122.6096	120.6880	124.4385	128.3939	133.6435	139.4593	144.4730	(44)
Energy content (annual)	229.4049	201.8581	212.0838	181.0591	171.7877	150.7628	145.9617	154.0808	158.3225	181.3529	198.6853	226.2099	(45)
													Total = Sum(45)m = 2211.5695

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Distribution loss (46)m = 0.15 x (45)m												
34.4107	30.2787	31.8126	27.1589	25.7682	22.6144	21.8943	23.1121	23.7484	27.2029	29.8028	33.9315	(46)
Water storage loss (or HIU loss):												
Store volume											200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):											1.6900	(48)
Temperature factor from Table 2b											0.5400	(49)
Enter (49) or (54) in (55)											0.9126	(55)
Total storage loss												
28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906	(56)
If cylinder contains dedicated solar storage												
28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906	(57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	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												
280.9579	248.4221	262.2411	224.1955	210.5463	188.0461	184.4877	193.5374	202.8096	231.5102	248.5753	277.7629	(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)
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											626.6268	(H24)
Heat delivered to space heating											0.0000	(H29)
Solar input											626.6268	
Solar input	-0.0000	-16.2009	-58.5990	-80.7446	-105.6949	-97.4269	-96.7101	-84.4397	-58.1011	-28.7097	-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												
280.9579	232.2212	203.6420	143.4509	104.8515	90.6192	87.7777	109.0976	144.7084	202.8005	248.5753	277.7629	(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												
117.5195	104.3690	110.6437	94.7113	88.1263	79.9553	79.3531	82.7971	88.2319	100.4256	105.9749	116.4572	(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	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
33.0002	29.3105	23.8369	18.0461	13.4897	11.3885	12.3057	15.9954	21.4690	27.2599	31.8163	33.9174	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
396.9165	401.0353	390.6562	368.5603	340.6681	314.4535	296.9404	292.8217	303.2008	325.2967	353.1889	379.4035	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	(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)												
-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	(71)
Water heating gains (Table 5)												
157.9564	155.3110	148.7146	131.5434	118.4494	111.0490	106.6574	111.2864	122.5443	134.9807	147.1873	156.5285	(72)
Total internal gains												
698.1971	695.9808	673.5316	628.4737	582.9311	547.2149	526.2275	530.4275	557.5381	597.8612	642.5164	680.1733	(73)

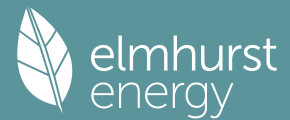
6. Solar gains

[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				6.4700	10.6334	0.4000	0.7500	0.7700			14.3031 (74)	
East				2.6500	19.6403	0.4000	0.7500	0.7700			10.8205 (76)	
South				9.2300	46.7521	0.4000	0.7500	0.7700			89.7133 (78)	
West				0.5200	19.6403	0.4000	0.7500	0.7700			2.1233 (80)	
Solar gains	116.9602	199.5821	275.3062	346.9532	395.4621	396.0192	380.3529	343.3724	299.8530	221.0577	140.1250	100.0887 (83)
Total gains	815.1573	895.5629	948.8378	975.4269	978.3932	943.2340	906.5804	873.7999	857.3911	818.9189	782.6414	780.2620 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	45.4835	45.6159	45.7490	46.4263	46.5642	47.2660	47.2660	47.4090	46.9828	46.5642	46.2892	46.0175
alpha	4.0322	4.0411	4.0499	4.0951	4.1043	4.1511	4.1511	4.1606	4.1322	4.1043	4.0859	4.0678
util living area												
	0.9360	0.9078	0.8609	0.7781	0.6543	0.4899	0.3578	0.3858	0.5706	0.7871	0.9027	0.9438 (86)
Living	20.1384	20.2866	20.4804	20.6889	20.8315	20.9042	20.9210	20.9194	20.8843	20.7139	20.4026	20.1080
Non living	19.2985	19.4837	19.7231	19.9806	20.1439	20.2274	20.2417	20.2426	20.2056	20.0155	19.6382	19.2668
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	20.5592	20.2866	20.4804	20.6889	20.8315	20.9042	20.9210	20.9194	20.8843	20.7139	20.4026	20.2328 (87)
Th 2	20.3158	20.3176	20.3195	20.3288	20.3307	20.3400	20.3400	20.3419	20.3363	20.3307	20.3269	20.3232 (88)
util rest of house												
	0.9279	0.8967	0.8446	0.7532	0.6183	0.4435	0.3054	0.3324	0.5235	0.7584	0.8894	0.9366 (89)
MIT 2	19.9102	19.4837	19.7231	19.9806	20.1439	20.2274	20.2417	20.2426	20.2056	20.0155	19.6382	19.4572 (90)
Living area fraction									fLA =	Living area / (4) =		
MIT	20.0168	19.6155	19.8474	20.0968	20.2568	20.3385	20.3532	20.3537	20.3170	20.1302	19.7637	19.5845 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0168	19.6155	19.8474	20.0968	20.2568	20.3385	20.3532	20.3537	20.3170	20.1302	19.7637	19.5845 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9241	0.8838	0.8321	0.7440	0.6142	0.4434	0.3065	0.3333	0.5221	0.7492	0.8766	0.9275	(94)
Useful gains	753.2540	791.4771	789.5463	725.7377	600.8949	418.2038	277.8586	291.2686	447.6447	613.5088	686.0883	723.7019	(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	1215.4984	1134.7602	1026.2690	848.3535	646.4038	427.0667	279.3198	293.3535	465.4687	719.9360	962.3330	1175.9939	(97)
Space heating kWh	343.9098	230.6863	176.1217	88.2834	33.8586	0.0000	0.0000	0.0000	0.0000	79.1819	198.8962	336.5052	(98a)
Space heating requirement - total per year (kWh/year)												1487.4431	
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	343.9098	230.6863	176.1217	88.2834	33.8586	0.0000	0.0000	0.0000	0.0000	79.1819	198.8962	336.5052	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1487.4431	
Space heating per m2												14.0100	(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 %)													260.8427	(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	343.9098	230.6863	176.1217	88.2834	33.8586	0.0000	0.0000	0.0000	0.0000	79.1819	198.8962	336.5052	(98)	
Space heating efficiency (main heating system 1)	260.8427	260.8427	260.8427	260.8427	260.8427	0.0000	0.0000	0.0000	0.0000	260.8427	260.8427	260.8427	(210)	
Space heating fuel (main heating system)	131.8457	88.4388	67.5203	33.8455	12.9805	0.0000	0.0000	0.0000	0.0000	30.3562	76.2514	129.0070	(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	280.9579	232.2212	203.6420	143.4509	104.8515	90.6192	87.7777	109.0976	144.7084	202.8005	248.5753	277.7629	(64)	
Efficiency of water heater	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	(216)	
Fuel for water heating, kWh/month	99.6782	82.3874	72.2481	50.8935	37.1992	32.1499	31.1417	38.7056	51.3396	71.9495	88.1895	98.5446	(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	37.1885	33.5896	37.1885	35.9888	37.1885	35.9888	37.1885	37.1885	35.9888	37.1885	35.9888	37.1885	(231)	
Lighting	28.8849	23.1726	20.8643	15.2861	11.8074	9.6468	10.7711	14.0007	18.1855	23.8604	26.9503	29.6877	(232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-37.6262	-55.6818	-83.2165	-95.9728	-104.3601	-97.2447	-96.0506	-89.7964	-78.5369	-64.2861	-42.0302	-32.1639	(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												570.2453	(211)	
Space heating fuel - main system 2												0.0000	(213)	
Space heating fuel - secondary												0.0000	(215)	
Efficiency of water heater												281.8650		
Water heating fuel used												754.4269	(219)	
Space cooling fuel												0.0000	(221)	
Electricity for pumps and fans:														
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.1125)														
mechanical ventilation fans (SFP = 1.1125)												357.8643	(230a)	
pump for solar water heating												80.0000	(230g)	
Total electricity for the above, kWh/year												437.8643	(231)	
Electricity for lighting (calculated in Appendix L)												233.1179	(232)	
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation												-876.9663	(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												1118.6881	(238)	

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	570.2453	16.4900	94.0335	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	754.4269	16.4900	124.4050	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)

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Pumps, fans and electric keep-hot	357.8643	16.4900	59.0118 (249)
Pump for solar water heating	80.0000	16.4900	13.1920 (249)
Energy for lighting	233.1179	16.4900	38.4411 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-876.9663	16.4900	-144.6117
PV Unit electricity exported	0.0000	5.5900	0.0000
Total			-144.6117 (252)
Total energy cost			184.4717 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.4393 (257)
SAP value		92.8789
SAP rating (Section 12)		93 (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	570.2453	0.1564	89.1955 (261)	
Total CO2 associated with community systems			0.0000 (373)	
Water heating (other fuel)	754.4269	0.1455	109.7493 (264)	
Space and water heating			198.9448 (265)	
Pumps, fans and electric keep-hot	437.8643	0.1387	60.7372 (267)	
Energy for lighting	233.1179	0.1443	33.6461 (268)	
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-876.9663	0.1341	-117.5758	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-117.5758 (269)	
Total CO2, kg/year			175.7523 (272)	
CO2 emissions per m2			1.6600 (273)	
EI value			98.4421	
EI rating			98 (274)	
EI band			A	

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

1. Overall dwelling characteristics

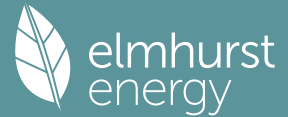
	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	53.7400 (1b)	x	2.3600 (2b)	=	126.8264 (1b) - (3b)	
First floor	52.4300 (1c)	x	2.6100 (2c)	=	136.8423 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	106.1700				(4)	
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	263.6687 (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		2.2300 (17)
Infiltration rate		0.1115 (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) =	0.1031 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.1000	3.8000	3.7000	3.5000	3.5000	3.2000	3.3000	3.1000	3.1000	3.4000	3.3000	3.7000 (22)
Wind factor	1.0250	0.9500	0.9250	0.8750	0.8750	0.8000	0.8250	0.7750	0.7750	0.8500	0.8250	0.9250 (22a)
Adj infilt rate	0.1057	0.0980	0.0954	0.0902	0.0902	0.0825	0.0851	0.0799	0.0799	0.0877	0.0851	0.0954 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.8000 (23c)
Effective ac	0.2417	0.2340	0.2314	0.2262	0.2262	0.2185	0.2211	0.2159	0.2159	0.2237	0.2211	0.2314 (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	
Main dwelling								
Windows			18.8700	1.2357	23.3184			(27)
Ground Floor			53.7400	0.1300	6.9862	110.0000	5911.4000	(28a)
External Walls	112.2400	18.8700	93.3700	0.1500	14.0055	18.0000	1680.6600	(29a)
External Roof	53.7400		53.7400	0.1100	5.9114	9.0000	483.6600	(30)
Total net area of external elements Aum(A, m2)			219.7200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	50.2215			(33)
Main dwelling								
Party Walls			34.9500	0.0000	0.0000	70.0000	2446.5001	(32)
Internal Walls			80.6100			9.0000	725.4900	(32c)
Internal Floor			52.4300			18.0000	943.7400	(32d)
Internal Ceiling			52.4300			9.0000	471.8700	(32e)

Heat capacity Cm = Sum(A x k)

(28) ... (30) + (32) + (32a) ... (32e) = 12663.3200 (34)

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

119.2740 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	15.0200	0.0930	1.3969	
E3 Sill	15.0200	-0.0590	-0.8862	
E4 Jamb	29.0000	-0.0650	-1.8850	
E5 Ground floor (normal)	23.2400	0.0300	0.6972	
E6 Intermediate floor within a dwelling	21.9900	0.0180	0.3958	
E12 Gable (insulation at ceiling level)	7.0300	0.0390	0.2742	
P4 Party wall - Roof (insulation at ceiling level)	7.0300	0.1010	0.7100	
E10 Eaves (insulation at ceiling level)	16.2100	0.0430	0.6970	
E16 Corner (normal)	14.6600	0.1170	1.7152	
E17 Corner (inverted - internal area greater than external area)	4.7200	0.0400	0.1888	
E18 Party wall between dwellings	9.9400	0.0540	0.5368	

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

3.8407 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 54.0623 (37)

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

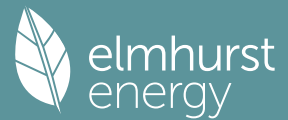
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	21.0319	20.3588	20.1345	19.6858	19.6858	19.0127	19.2371	18.7883	18.7883	19.4614	19.2371	20.1345	(38)
Heat transfer coeff	75.0941	74.4211	74.1967	73.7480	73.7480	73.0750	73.2993	72.8506	72.8506	73.5237	73.2993	74.1967	(39)
Average = Sum(39)m / 12 =												73.6919	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7073	0.7010	0.6988	0.6946	0.6946	0.6883	0.6904	0.6862	0.6862	0.6925	0.6904	0.6988	(40)
HLP (average)												0.6941	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7898 (42)
Hot water usage for mixer showers													
70.9951	69.9282	68.3735	65.3989	63.2036	60.7555	59.3641	60.9070	62.5983	65.2269	68.2654	70.7231		(42a)
Hot water usage for baths													
30.6535	30.1982	29.5571	28.3751	27.4900	26.5086	25.9784	26.6150	27.3082	28.3583	29.5647	30.5498		(42b)
Hot water usage for other uses													
43.2001	41.6292	40.0583	38.4873	36.9164	35.3455	35.3455	36.9164	38.4873	40.0583	41.6292	43.2001		(42c)
Average daily hot water use (litres/day)												133.1485	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	144.8487	141.7556	137.9889	132.2613	127.6101	122.6096	120.6880	124.4385	128.3939	133.6435	139.4593	144.4730	(44)
Energy conte	229.4049	201.8581	212.0838	181.0591	171.7877	150.7628	145.9617	154.0808	158.3225	181.3529	198.6853	226.2099	(45)
Energy content (annual)										Total = Sum(45)m =		2211.5695	
Distribution loss (46)m = 0.15 x (45)m													
34.4107	30.2787	31.8126	27.1589	25.7682	22.6144	21.8943	23.1121	23.7484	27.2029	29.8028	33.9315		(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6900	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9126	(55)
Total storage loss													
28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906		(56)
If cylinder contains dedicated solar storage													
28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906		(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													
280.9579	248.4221	262.2411	224.1955	210.5463	188.0461	184.4877	193.5374	202.8096	231.5102	248.5753	277.7629		(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)
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												729.1810	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												729.1810	
Solar input	-0.3063	-19.7566	-64.2037	-91.5695	-113.9908	-114.2541	-110.7438	-98.9729	-70.0512	-39.1981	-6.1339	-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													
280.6516	228.6655	198.0374	132.6260	96.5556	73.7920	73.7439	94.5644	132.7583	192.3120	242.4415	277.7629		(64)
Total per year (kWh/year) = Sum(64)m =												2023.9111	(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)

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Heat gains from water heating, kWh/month	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)										
117.5195 104.3690 110.6437 94.7113 88.1263 79.9553 79.3531 82.7971 88.2319 100.4256 105.9749 116.4572 (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	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	33.0002	29.3105	23.8369	18.0461	13.4897	11.3885	12.3057	15.9954	21.4690	27.2599	31.8163	33.9174	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	396.9165	401.0353	390.6562	368.5603	340.6681	314.4535	296.9404	292.8217	303.2008	325.2967	353.1889	379.4035	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	(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)	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	(71)
Water heating gains (Table 5)	157.9564	155.3110	148.7146	131.5434	118.4494	111.0490	106.6574	111.2864	122.5443	134.9807	147.1873	156.5285	(72)
Total internal gains	698.1971	695.9808	673.5316	628.4737	582.9311	547.2149	526.2275	530.4275	557.5381	597.8612	642.5164	680.1733	(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						6.4700	12.6762	0.4000	0.7500			0.7700	17.0509 (74)	
East						2.6500	23.6925	0.4000	0.7500			0.7700	13.0530 (76)	
South						9.2300	53.2576	0.4000	0.7500			0.7700	102.1969 (78)	
West						0.5200	23.6925	0.4000	0.7500			0.7700	2.5613 (80)	

Solar gains	134.8622	204.7752	282.6040	373.9870	415.8302	452.5636	425.3514	383.2240	330.4936	242.8061	163.1609	116.0820	(83)	
Total gains	833.0592	900.7560	956.1356	1002.4607	998.7612	999.7784	951.5788	913.6514	888.0317	840.6674	805.6773	796.2554	(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	46.8424	47.2660	47.4090	47.6974	47.6974	48.1367	47.9894	48.2850	48.2850	47.8430	47.9894	47.4090
alpha	4.1228	4.1511	4.1606	4.1798	4.1798	4.2091	4.1993	4.2190	4.2190	4.1895	4.1993	4.1606
util living area	0.9200	0.8928	0.8355	0.7382	0.5910	0.4105	0.3066	0.3016	0.5080	0.7212	0.8713	0.9284 (86)
Living	20.2739	20.3905	20.5767	20.7525	20.8711	20.9173	20.9242	20.9249	20.9039	20.7987	20.5376	20.2534
Non living	19.4828	19.6307	19.8588	20.0689	20.1998	20.2502	20.2537	20.2581	20.2407	20.1263	19.8218	19.4639
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	20.6286	20.3905	20.5767	20.7525	20.8711	20.9173	20.9242	20.9249	20.9039	20.7987	20.5376	20.3578 (87)
Th 2	20.3344	20.3400	20.3419	20.3456	20.3456	20.3512	20.3493	20.3531	20.3531	20.3475	20.3493	20.3419 (88)
util rest of house	0.9101	0.8803	0.8170	0.7112	0.5529	0.3657	0.2573	0.2509	0.4613	0.6871	0.8544	0.9193 (89)
MIT 2	19.9949	19.6307	19.8588	20.0689	20.1998	20.2502	20.2537	20.2581	20.2407	20.1263	19.8218	19.6221 (90)
Living area fraction	20.0989	19.7554	19.9767	20.1811	20.3100	20.3597	20.3638	20.3676	20.3496	20.2367	19.9393	0.1642 (91)
MIT	20.0989	19.7554	19.9767	20.1811	20.3100	20.3597	20.3638	20.3676	20.3496	20.2367	19.9393	19.7429 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0989	19.7554	19.9767	20.1811	20.3100	20.3597	20.3638	20.3676	20.3496	20.2367	19.9393	19.7429 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9062	0.8679	0.8059	0.7040	0.5507	0.3663	0.2584	0.2520	0.4610	0.6810	0.8426	0.9099	(94)
Useful gains	754.9529	781.7579	770.5649	705.7675	550.0487	366.1769	245.9343	230.2393	409.3814	572.4672	678.8243	724.5229	(95)
Ext temp.	5.0000	5.4000	7.1000	9.4000	12.5000	15.3000	17.0000	17.2000	14.6000	11.6000	7.9000	5.0000	(96)
Heat loss rate W	1133.8405	1068.3449	955.4055	795.0858	575.9709	369.7367	246.5640	230.7589	418.8601	635.0013	882.4714	1093.8743	(97)
Space heating kWh	281.8924	192.5865	137.5214	64.3092	19.2862	0.0000	0.0000	0.0000	0.0000	46.5254	146.6259	274.7974	(98a)
Space heating requirement - total per year (kWh/year)												1163.5443	
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	281.8924	192.5865	137.5214	64.3092	19.2862	0.0000	0.0000	0.0000	0.0000	46.5254	146.6259	274.7974	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1163.5443	
Space heating per m2										(98c) / (4) =		10.9593	(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 %)												259.5842 (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	281.8924	192.5865	137.5214	64.3092	19.2862	0.0000	0.0000	0.0000	0.0000	46.5254	146.6259	274.7974	(98)
Space heating efficiency (main heating system 1)	259.5842	259.5842	259.5842	259.5842	259.5842	0.0000	0.0000	0.0000	0.0000	259.5842	259.5842	259.5842	(210)

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Space heating fuel (main heating system)	108.5938	74.1904	52.9776	24.7739	7.4296	0.0000	0.0000	0.0000	0.0000	17.9230	56.4849	105.8606	(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	280.6516	228.6655	198.0374	132.6260	96.5556	73.7920	73.7439	94.5644	132.7583	192.3120	242.4415	277.7629	(64)
Efficiency of water heater	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	(216)
Fuel for water heating, kWh/month	99.5695	81.1259	70.2597	47.0530	34.2560	26.1799	26.1628	33.5496	47.1000	68.2284	86.0133	98.5446	(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	37.1885	33.5896	37.1885	35.9888	37.1885	35.9888	37.1885	37.1885	35.9888	37.1885	35.9888	37.1885	(231)
Lighting	28.8849	23.1726	20.8643	15.2861	11.8074	9.6468	10.7711	14.0007	18.1855	23.8604	26.9503	29.6877	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-43.1193	-57.6407	-85.4612	-100.5817	-106.9351	-103.9359	-101.7240	-95.7496	-84.2961	-69.4246	-48.1791	-37.1110	(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												448.2338	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												281.8650	
Water heating fuel used												718.0427	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.1125)													
mechanical ventilation fans (SFP = 1.1125)												357.8643	(230a)
pump for solar water heating												80.0000	(230g)
Total electricity for the above, kWh/year												437.8643	(231)
Electricity for lighting (calculated in Appendix L)												233.1179	(232)

Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-934.1584	(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												903.1004	(238)

10a. Fuel costs - using BEDF prices (599)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	448.2338	26.0000	116.5408	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	718.0427	26.0000	186.6911	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0000	0.0000	(247a)
Pumps, fans and electric keep-hot	357.8643	26.0000	93.0447	(249)
Pump for solar water heating	80.0000	26.0000	20.8000	(249)
Energy for lighting	233.1179	26.0000	60.6107	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-934.1584	26.0000	-242.8812	
PV Unit electricity exported	0.0000	5.8100	0.0000	
Total			-242.8812	(252)
Total energy cost			234.8061	(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	448.2338	0.1571	70.4222	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	718.0427	0.1464	105.0893	(264)
Space and water heating			175.5116	(265)
Pumps, fans and electric keep-hot	437.8643	0.1387	60.7372	(267)
Energy for lighting	233.1179	0.1443	33.6461	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-934.1584	0.1342	-125.3628	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-125.3628	(269)
Total CO2, kg/year			144.5321	(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	448.2338	1.5816	708.9335	(275)

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Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	718.0427	1.5414	1106.7989 (278)
Space and water heating			1815.7324 (279)
Pumps, fans and electric keep-hot	437.8643	1.5128	662.4012 (281)
Energy for lighting	233.1179	1.5338	357.5640 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-934.1584	1.4959	-1397.4499
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-1397.4499 (283)
Total Primary energy kWh/year			1438.2477 (286)

Energy Report



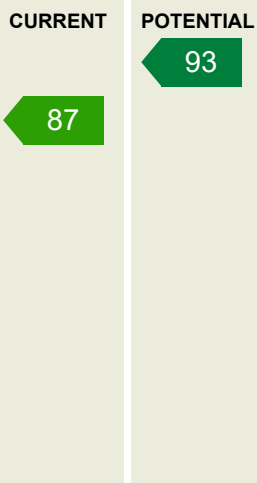
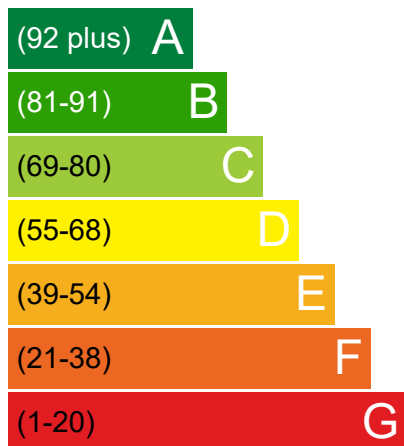
Dwelling Address	4 Malthouse Cottages, Malthouse Lane, Hurstpierpoint, HAS SOCKS, BN6 9PE
Reference	Plot 4-Plot 4
SAP Version	10.2
Assessment Date	11/02/2026
Submission Date	02/10/2026
Property Type	House, Semi-Detached
Total Floor Area	106

This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

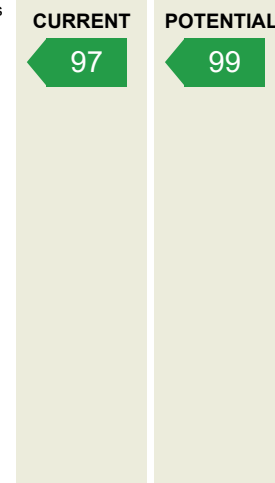
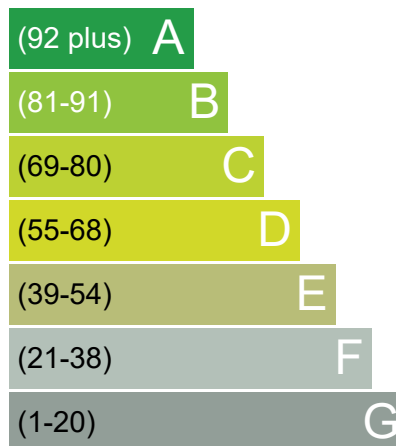
Energy Efficiency Rating

Most energy efficient - lower running costs



Carbon Dioxide (CO2) Emissions Rating

Very environmentally friendly - lower CO2 emissions



Additional ratings for your home

	Primary Energy	Energy	Carbon	Cost	HTC
CURRENT	28.24 kWh	1954 kWh	282 kg	508.08 £	74 W/K
POTENTIAL	12.40 kWh	824 kWh	133 kg	214.22 £	74 W/K

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good
-----------	------	---------	------	-----------

Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.15 W/m ² K	Very Good
Roof	Average thermal transmittance 0.11 W/m ² K	Very Good
Floor	Average thermal transmittance 0.13 W/m ² K	Very Good
Windows	High performance glazing	Good
Main heating	Air source heat pump, radiators and underfloor, electric	Good
Main heating controls	Time and temperature zone control	Very Good
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 2.7 m ³ /h.m ² (as tested)	Very Good

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling. To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed. Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating
Solar water heating	£52	B 88	£4,000 - £7,000	£52	A 98
Photovoltaic	£294	A 93	£8,000 - £10,000	£242	A 99

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

	Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting 	£61	£61	
Heating 	£187	£208	
Hot Water 	£260	£187	
New Technologies e.g. Impact of PV	£0	-(£242)	
TOTAL	£508	£214	

Estimated energy use and potential savings



Space Heating

411

kWh per year



Water Heating

1000

kWh per year

About this document

Created by:	Mr. Daniel Watt
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Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g. heating system) is working correctly.

This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.

This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.

The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO ₂)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Fri 02 Oct 2026 12:53:54

Project Information			
Assessed By	Daniel Watt	Building Type	House, Semi-detached
OCDEA Registration	EES/027301	Assessment Date	2026-10-02

Dwelling Details			
Assessment Type	As built	Total Floor Area	106 m ²
Site Reference	Plot 4	Plot Reference	Plot 4
Address	4 Malthouse Cottages, Malthouse Lane, Hurstpierpoint, HASSOCKS, BN6 9PE		

Client Details	
Name	.
Company	.
Address	., ., .

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate			
Fuel for main heating system	Electricity		
Target carbon dioxide emission rate	9.67 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	2.93 kgCO ₂ /m ²		OK

1b Target primary energy rate and dwelling primary energy			
Target primary energy	50.3 kWh _{PE} /m ²		
Dwelling primary energy	30.99 kWh _{PE} /m ²		OK

1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	34.9 kWh/m ²		
Dwelling fabric energy efficiency	31.6 kWh/m ²		OK

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m ² K]	Dwelling average U-Value [W/m ² K]	Element with highest individual U-Value	
External walls	0.26	0.15	Walls (1) (0.15)	OK
Party walls	0.2	0	Party Wall (1) (0)	N/A
Curtain walls	1.6	0	N/A	N/A
Floors	0.18	0.13	Ground Floor (0.13)	OK
Roofs	0.16	0.11	Roof (1) (0.11)	OK
Windows, doors, and roof windows	1.6	1.3	North Windows (1.3)	OK
Rooflights	2.2	N/A	N/A	N/A

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))			
Name	Net area [m ²]	U-Value [W/m ² K]	
Exposed wall: Walls (1)	93.373372	0.15	
Party wall: Party Wall (1)	34.95	0 (!)	
Ground floor: Ground Floor, Ground Floor	53.74	0.13	
Exposed roof: Roof (1)	53.74	0.11	

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
North Windows, Windows	3.0756	North	0.75	1.3
North Windows, Windows	2.1032	North	0.75	1.3
North Windows, Windows	0.64512	North	0.75	1.3
North Windows, Windows	0.64512	North	0.75	1.3
West Windows, Windows	1.06652	West	0.75	1.3
West Windows, Windows	1.06652	West	0.75	1.3
West Windows, Windows	0.5166	West	0.75	1.3
South Windows, Windows	4.090128	South	0.75	1.3
South Windows, Windows	1.5456	South	0.75	1.3
South Windows, Windows	1.7976	South	0.75	1.3
South Windows, Windows	1.7976	South	0.75	1.3
East Window, Windows	0.51702	East	0.75	1.3

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))				
Building part 1: Thermal bridging calculated from linear thermal transmittances for each junction				
Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.093	
External wall	E3: Sill	Calculated by person with suitable expertise	-0.059	
External wall	E4: Jamb	Calculated by person with suitable expertise	-0.065	
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.03 (!)	
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.018 (!)	
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.039 (!)	
Party wall	P4: Roof (insulation at ceiling level)	Calculated by person with suitable expertise	0.101	
External wall	E10: Eaves (insulation at ceiling level)	Calculated by person with suitable expertise	0.043	
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.117	
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	0.04	
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.054	

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	8 m³/hm²	
Dwelling air permeability at 50Pa	2.69 m³/hm², Measured value (!)	OK
Air permeability test certificate reference		

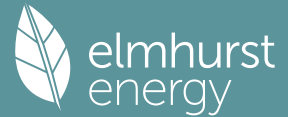
4 Space heating	
Main heating system 1: Heat pump with radiators or underfloor heating - Electricity	
Efficiency	259.6%
Emitter type	Both radiators and underfloor
Flow temperature	35°C
System type	Heat Pump
Manufacturer	Vaillant Group UK Ltd
Model	aroTHERM 12kW
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water	
Cylinder/store - type: Cylinder	
Capacity	200 litres
Declared heat loss	1.69 kWh/day
Primary pipework insulated	Yes
Manufacturer	
Model	
Commissioning	
Waste water heat recovery system 1 - type: N/A	
Efficiency	
Manufacturer	
Model	

6 Controls	
Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services	
Function	
Ecodesign class	
Manufacturer	
Model	

Water heating - type: Cylinder thermostat and HW separately timed		
Manufacturer		
Model		
7 Lighting		
Minimum permitted light source efficacy	75 lm/W	
Lowest light source efficacy	75 lm/W	OK
External lights control	N/A	
8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	1.5 W/(l/s)	
Specific fan power	0.77 W/(l/s)	OK
Minimum permitted heat recovery efficiency	73%	
Heat recovery efficiency	91%	OK
Manufacturer/Model	Komfort EC LB400, S25	
Commissioning		
9 Local generation		
N/A		
10 Heat networks		
N/A		
11 Supporting documentary evidence		
Documentary evidence identified in 11.1 and 11.2 is needed to confirm the data values used for any calculations undertaken, manufacturer declarations made, and tests performed as reflected in this "As built" BREL Compliance Report are correct. 11.1 SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required. 11.2 Indicative photographic evidence of key stages during construction (guidance within Approved Document L, Volume 1 – Appendix B) that confirms the products identified in this BREL Compliance Report are used in this dwelling, and workmanship is of sufficient quality to support the calculated values claimed in 2a to 2d.		
12 Declarations		
a. Assessor Declaration		
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design and construction information submitted for this dwelling for the purpose of carrying out the assessment, and that the supporting documentary evidence (identified in 11.1 and 11.2) pursuant to Part L of the Building Regulations 2010 (as amended) has been reviewed in the course of preparing this BREL Compliance Report.		
Signed:	Assessor ID:	
Name:	Date:	
b. Client Declaration		
This declaration by the client is confirmation that the dwelling has been constructed and completed according to the specifications set out in this BREL Compliance Report, and that photographic evidence of key stages, as described in 11.2, has been provided to the Assessor for this dwelling.		
Signed:	Organisation:	
Name:	Date:	

Full SAP Calculation Printout



Plot Reference	Plot 4			Issued on Date	02/10/2026	
Assessment Reference	Plot 4		Plot Type Ref			
Plot Address	4 Malthouse Cottages, Malthouse Lane, Hurstpierpoint, HASSOCKS, BN6 9PE			SAP Version	10.2	
SAP Rating	87 B	DER	2.93	TER	9.67	
Environmental	97 A	% DER < TER				69.70
CO ₂ Emissions (t/year)	0.28	DFEE	31.59	TFEE	34.87	
Compliance Check	See BREL	% DFEE < TFEE				9.42
% DPER < TPER	38.40	DPER	30.99	TPER	50.30	
Assessor Details	Mr. Daniel Watt			Assessor ID	AV75-0001	
Client	..					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	53.7400 (1b)	x 2.3600 (2b)	= 126.8264 (1b) - (3b)
First floor	52.4300 (1c)	x 2.6100 (2c)	= 136.8423 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	106.1700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 263.6687 (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	2.6900 (17)
Infiltration rate	0.1345 (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) = 0.1244 (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	0.1586	0.1555	0.1524	0.1369	0.1337	0.1182	0.1182	0.1151	0.1244	0.1337	0.1400	0.1462 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.9000 (23c)
Effective ac	0.2491	0.2460	0.2429	0.2274	0.2242	0.2087	0.2087	0.2056	0.2149	0.2242	0.2305	0.2367 (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
Main dwelling							
Windows			18.8700	1.2357	23.3184		(27)
Ground Floor			53.7400	0.1300	6.9862	110.0000	5911.4000 (28a)
External Walls	112.2400	18.8700	93.3700	0.1500	14.0055	18.0000	1680.6600 (29a)
External Roof	53.7400		53.7400	0.1100	5.9114	9.0000	483.6600 (30)
Total net area of external elements Aum(A, m ²)			219.7200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.2215		(33)
Main dwelling							
Party Walls			34.9500	0.0000	0.0000	70.0000	2446.5001 (32)
Internal Walls			80.6100			9.0000	725.4900 (32c)
Internal Floors			52.4300			18.0000	943.7400 (32d)
Internal Ceiling			52.4300			9.0000	471.8700 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	12663.3200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							119.2740 (35)

Full SAP Calculation Printout



List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	15.0200	0.0930	1.3969
E3 Sill	15.0200	-0.0590	-0.8862
E4 Jamb	29.0000	-0.0650	-1.8850
E5 Ground floor (normal)	23.2400	0.0300	0.6972
E6 Intermediate floor within a dwelling	21.9900	0.0180	0.3958
E12 Gable (insulation at ceiling level)	7.0300	0.0390	0.2742
P4 Party wall - Roof (insulation at ceiling level)	7.0300	0.1010	0.7100
E10 Eaves (insulation at ceiling level)	16.2100	0.0430	0.6970
E16 Corner (normal)	14.6600	0.1170	1.7152
E17 Corner (inverted - internal area greater than external area)	4.7200	0.0400	0.1888
E18 Party wall between dwellings	9.9400	0.0540	0.5368
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			3.8407 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	54.0623 (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	21.6766	21.4060	21.1354	19.7822	19.5116	18.1584	18.1584	17.8878	18.6997	19.5116	20.0528	20.5941	(38)
Heat transfer coeff	75.7389	75.4682	75.1976	73.8445	73.5738	72.2207	72.2207	71.9500	72.7619	73.5738	74.1151	74.6563	(39)
Average = Sum(39)m / 12 =												73.7768	
HLP	0.7134	0.7108	0.7083	0.6955	0.6930	0.6802	0.6802	0.6777	0.6853	0.6930	0.6981	0.7032	(40)
HLP (average)												0.6949	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7898 (42)
Hot water usage for mixer showers	70.9951	69.9282	68.3735	65.3989	63.2036	60.7555	59.3641	60.9070	62.5983	65.2269	68.2654	70.7231	(42a)
Hot water usage for baths	30.6535	30.1982	29.5571	28.3751	27.4900	26.5086	25.9784	26.6150	27.3082	28.3583	29.5647	30.5498	(42b)
Hot water usage for other uses	43.2001	41.6292	40.0583	38.4873	36.9164	35.3455	35.3455	36.9164	38.4873	40.0583	41.6292	43.2001	(42c)
Average daily hot water use (litres/day)												133.1485	(43)
Daily hot water use	144.8487	141.7556	137.9889	132.2613	127.6101	122.6096	120.6880	124.4385	128.3939	133.6435	139.4593	144.4730	(44)
Energy conte	229.4049	201.8581	212.0838	181.0591	171.7877	150.7628	145.9617	154.0808	158.3225	181.3529	198.6853	226.2099	(45)
Energy content (annual)										Total = Sum(45)m =		2211.5695	
Distribution loss (46)m = 0.15 x (45)m	34.4107	30.2787	31.8126	27.1589	25.7682	22.6144	21.8943	23.1121	23.7484	27.2029	29.8028	33.9315	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6900	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9126	(55)
Total storage loss	28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906	(56)
If cylinder contains dedicated solar storage	28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906	(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	280.9579	248.4221	263.6368	230.9491	223.3407	200.6528	197.5147	205.6338	208.2125	232.9059	248.5753	277.7629	(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	280.9579	248.4221	263.6368	230.9491	223.3407	200.6528	197.5147	205.6338	208.2125	232.9059	248.5753	277.7629	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2818.5645	(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	117.5195	104.3690	111.7603	100.1142	98.3618	90.0406	89.7747	92.4743	92.5542	101.5422	105.9749	116.4572	(65)

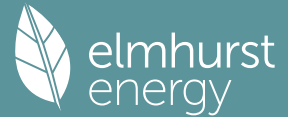
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	135.8693	150.4267	135.8693	140.3983	135.8693	140.3983	135.8693	135.8693	140.3983	135.8693	140.3983	135.8693	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	265.9341	268.6936	261.7396	246.9354	228.2476	210.6838	198.9501	196.1905	203.1445	217.9488	236.6365	254.2004	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	(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)	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	(71)
Water heating gains (Table 5)	157.9564	155.3110	150.2154	139.0474	132.2067	125.0564	120.6649	124.2934	128.5475	136.4815	147.1873	156.5285	(72)
Total internal gains	624.6064	639.2780	612.6710	591.2277	561.1703	540.9852	520.3309	521.1998	536.9370	555.1463	589.0688	611.4448	(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	6.4700	10.6334	0.4000	0.7500	0.7700	14.3031 (74)
East	0.5200	19.6403	0.4000	0.7500	0.7700	2.1233 (76)

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South			9.2300		46.7521		0.4000		0.7500		0.7700		89.7133 (78)
West			2.6500		19.6403		0.4000		0.7500		0.7700		10.8205 (80)

Solar gains	116.9602	199.5821	275.3062	346.9532	395.4621	396.0192	380.3529	343.3724	299.8530	221.0577	140.1250	100.0887 (83)
Total gains	741.5666	838.8601	887.9772	938.1809	956.6324	937.0043	900.6838	864.5722	836.7900	776.2039	729.1938	711.5335 (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	46.4436	46.6102	46.7779	47.6351	47.8103	48.7061	48.7061	48.8893	48.3438	47.8103	47.4612	47.1171
alpha	4.0962	4.1073	4.1185	4.1757	4.1874	4.2471	4.2471	4.2593	4.2229	4.1874	4.1641	4.1411
util living area	0.9503	0.9204	0.8775	0.7866	0.6545	0.4805	0.3501	0.3788	0.5702	0.8014	0.9167	0.9563 (86)
Living	20.0881	20.2627	20.4595	20.6923	20.8388	20.9092	20.9235	20.9222	20.8892	20.7109	20.3826	20.0654
Non living	19.2471	19.4662	19.7108	19.9996	20.1676	20.2505	20.2627	20.2642	20.2279	20.0278	19.6276	19.2258
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	20.5335	20.2627	20.4595	20.6923	20.8388	20.9092	20.9235	20.9222	20.8892	20.7109	20.3826	20.1961 (87)
Th 2	20.3290	20.3313	20.3335	20.3448	20.3470	20.3583	20.3583	20.3606	20.3538	20.3470	20.3425	20.3380 (88)
util rest of house	0.9438	0.9106	0.8626	0.7625	0.6191	0.4359	0.3001	0.3276	0.5240	0.7740	0.9049	0.9505 (89)
MIT 2	19.8977	19.4662	19.7108	19.9996	20.1676	20.2505	20.2627	20.2642	20.2279	20.0278	19.6276	19.4262 (90)
Living area fraction									FLA = Living area / (4) =			0.1642 (91)
MIT	20.0021	19.5970	19.8337	20.1133	20.2778	20.3586	20.3712	20.3722	20.3365	20.1399	19.7516	19.5526 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0021	19.5970	19.8337	20.1133	20.2778	20.3586	20.3712	20.3722	20.3365	20.1399	19.7516	19.5526 (93)

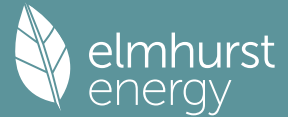
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9402	0.8982	0.8502	0.7534	0.6152	0.4359	0.3011	0.3286	0.5228	0.7646	0.8927	0.9424 (94)
Useful gains	697.2461	753.4380	754.9562	706.8129	588.5544	408.4436	271.1726	284.0815	437.4378	593.4774	650.9373	670.5337 (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	1189.2575	1109.1542	1002.6611	828.0394	631.1008	415.8933	272.3570	285.8012	453.7774	701.8890	937.6734	1146.1714 (97)
Space heating kWh	366.0565	239.0413	184.2924	87.2831	31.6545	0.0000	0.0000	0.0000	0.0000	80.6582	206.4500	353.8745 (98a)
Space heating requirement - total per year (kWh/year)												1549.3104
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	366.0565	239.0413	184.2924	87.2831	31.6545	0.0000	0.0000	0.0000	0.0000	80.6582	206.4500	353.8745 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1549.3104
Space heating per m2										(98c) / (4) =		14.5927 (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 %)												259.6382 (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	366.0565	239.0413	184.2924	87.2831	31.6545	0.0000	0.0000	0.0000	0.0000	80.6582	206.4500	353.8745 (98)
Space heating efficiency (main heating system 1)	259.6382	259.6382	259.6382	259.6382	259.6382	0.0000	0.0000	0.0000	0.0000	259.6382	259.6382	259.6382 (210)
Space heating fuel (main heating system)	140.9871	92.0670	70.9805	33.6172	12.1918	0.0000	0.0000	0.0000	0.0000	31.0656	79.5145	136.2952 (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	280.9579	248.4221	263.6368	230.9491	223.3407	200.6528	197.5147	205.6338	208.2125	232.9059	248.5753	277.7629 (64)
Efficiency of water heater (217)m	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650 (216)
Fuel for water heating, kWh/month	99.6782	88.1351	93.5330	81.9361	79.2368	71.1876	70.0742	72.9547	73.8696	82.6303	88.1895	98.5446 (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	26.2959	23.7511	26.2959	25.4476	26.2959	25.4476	26.2959	26.2959	25.4476	26.2959	25.4476	26.2959 (231)
Lighting	28.8849	23.1726	20.8643	15.2861	11.8074	9.6468	10.7711	14.0007	18.1855	23.8604	26.9503	29.6877 (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												596.7189 (211)

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Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	281.8650	
Water heating fuel used	999.9697	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.9625)		
mechanical ventilation fans (SFP = 0.9625)	309.6130	(230a)
Total electricity for the above, kWh/year	309.6130	(231)
Electricity for lighting (calculated in Appendix L)	233.1179	(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	2139.4194	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	596.7189	0.1566	93.4359 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	999.9697	0.1410	140.9567 (264)
Space and water heating			234.3926 (265)
Pumps, fans and electric keep-hot	309.6130	0.1387	42.9471 (267)
Energy for lighting	233.1179	0.1443	33.6461 (268)
Total CO2, kg/year			310.9859 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.9300 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	596.7189	1.5797	942.6087 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	999.9697	1.5212	1521.1795 (278)
Space and water heating			2463.7882 (279)
Pumps, fans and electric keep-hot	309.6130	1.5128	468.3825 (281)
Energy for lighting	233.1179	1.5338	357.5640 (282)
Total Primary energy kWh/year			3289.7347 (286)
Dwelling Primary energy Rate (DPER)			30.9900 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	53.7400 (1b)	x 2.3600 (2b)	= 126.8264 (1b) - (3b)
First floor	52.4300 (1c)	x 2.6100 (2c)	= 136.8423 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	106.1700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	263.6687 (5)

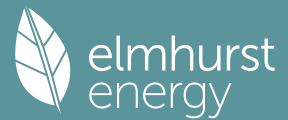
2. Ventilation rate

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

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1517 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4017	(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) =		0.3716 (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												

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Effective ac	0.4738	0.4645	0.4552	0.4087	0.3994	0.3530	0.3530	0.3437	0.3716	0.3994	0.4180	0.4366 (22b)
	0.6122	0.6079	0.6036	0.5835	0.5798	0.5623	0.5623	0.5591	0.5690	0.5798	0.5874	0.5953 (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
Main dwelling							
TER Opening Type			18.8700	1.1450	21.6069		(27)
Ground Floor			53.7400	0.1300	6.9862		(28a)
External Walls	112.2400	18.8700	93.3700	0.1800	16.8066		(29a)
External Roof	53.7400		53.7400	0.1100	5.9114		(30)
Total net area of external elements Aum(A, m2)			219.7200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26) ... (30) + (32) =	51.3111	(33)
Main dwelling							
Party Walls			34.9500	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 119.2740 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	15.0200	0.0500	0.7510
E3 Sill	15.0200	0.0500	0.7510
E4 Jamb	29.0000	0.0500	1.4500
E5 Ground floor (normal)	23.2400	0.1600	3.7184
E6 Intermediate floor within a dwelling	21.9900	0.0000	0.0000
E12 Gable (insulation at ceiling level)	7.0300	0.0600	0.4218
P4 Party wall - Roof (insulation at ceiling level)	7.0300	0.1200	0.8436
E10 Eaves (insulation at ceiling level)	16.2100	0.0600	0.9726
E16 Corner (normal)	14.6600	0.0900	1.3194
E17 Corner (inverted - internal area greater than external area)	4.7200	-0.0900	-0.4248
E18 Party wall between dwellings	9.9400	0.0600	0.5964

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.3994 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 61.7105 (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	53.2701	52.8909	52.5193	50.7735	50.4469	48.9265	48.9265	48.6449	49.5121	50.4469	51.1077	51.7984 (38)
Heat transfer coeff	114.9806	114.6014	114.2297	112.4840	112.1574	110.6369	110.6369	110.3554	111.2226	112.1574	112.8181	113.5089 (39)
Average = Sum(39)m / 12 =												112.4824

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0830	1.0794	1.0759	1.0595	1.0564	1.0421	1.0421	1.0394	1.0476	1.0564	1.0626	1.0691 (40)
HLP (average)												1.0595
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7898 (42)
Hot water usage for mixer showers												
70.9951	69.9282	68.3735	65.3989	63.2036	60.7555	59.3641	60.9070	62.5983	65.2269	68.2654	70.7231 (42a)	
Hot water usage for baths												
30.6535	30.1982	29.5571	28.3751	27.4900	26.5086	25.9784	26.6150	27.3082	28.3583	29.5647	30.5498 (42b)	
Hot water usage for other uses												
43.2001	41.6292	40.0583	38.4873	36.9164	35.3455	35.3455	36.9164	38.4873	40.0583	41.6292	43.2001 (42c)	
Average daily hot water use (litres/day)												133.1485 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	144.8487	141.7556	137.9889	132.2613	127.6101	122.6096	120.6880	124.4385	128.3939	133.6435	139.4593	144.4730 (44)
Energy conte	229.4049	201.8581	212.0838	181.0591	171.7877	150.7628	145.9617	154.0808	158.3225	181.3529	198.6853	226.2099 (45)
Energy content (annual)										Total = Sum(45)m =		2211.5695

Distribution loss (46)m = 0.15 x (45)m 33.9315 (46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.6525 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.8924 (55)

Total storage loss

27.6637 24.9865 27.6637 26.7713 27.6637 26.7713 27.6637 27.6637 26.7713 27.6637 26.7713 27.6637 (56)

If cylinder contains dedicated solar storage

27.6637 24.9865 27.6637 26.7713 27.6637 26.7713 27.6637 27.6637 26.7713 27.6637 26.7713 27.6637 (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

280.3310 247.8558 263.0099 230.3424 222.7137 200.0461 196.8878 205.0069 207.6058 232.2790 247.9686 277.1359 (62)

WWHRS -32.4560 -28.7044 -30.0576 -24.8888 -23.1955 -19.8486 -18.6049 -19.7844 -20.5361 -24.2098 -27.4267 -31.8556 (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

247.8750 219.1515 232.9523 205.4535 199.5182 180.1976 178.2829 185.2225 187.0697 208.0692 220.5419 245.2810 (64)

Total per year (kWh/year) = Sum(64)m = 2509.6152 (64)

Electric shower(s) 2510 (64)

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

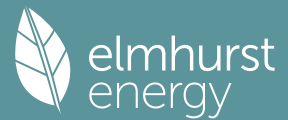
Heat gains from water heating, kWh/month

117.0180 103.9160 111.2587 99.6288 97.8603 89.5553 89.2731 91.9727 92.0689 101.0407 105.4895 115.9556 (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	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
137.2797	151.9882	137.2797	141.8557	137.2797	141.8557	137.2797	137.2797	137.2797	141.8557	137.2797	141.8557	137.2797 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
265.9341	268.6936	261.7396	246.9354	228.2476	210.6838	198.9501	196.1905	203.1445	217.9488	236.6365	254.2004	254.2004 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												

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Pumps, fans	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489 (69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Water heating gains (Table 5)	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910 (71)
Total internal gains	157.2822	154.6369	149.5413	138.3733	131.5326	124.3823	119.9907	123.6193	127.8734	135.8074	146.5132	155.8544	155.8544 (72)
	628.3426	643.1654	616.4072	595.0110	564.9065	541.7684	521.0671	521.9361	537.7202	558.8825	592.8520	615.1810	615.1810 (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					6.4700	10.6334	0.6300	0.7000			0.7700			21.0256 (74)
East					0.5200	19.6403	0.6300	0.7000			0.7700			3.1212 (76)
South					9.2300	46.7521	0.6300	0.7000			0.7700			131.8786 (78)
West					2.6500	19.6403	0.6300	0.7000			0.7700			15.9061 (80)
Solar gains	171.9315	293.3857	404.7001	510.0212	581.3293	582.1482	559.1188	504.7574	440.7839	324.9548	205.9837			147.1304 (83)
Total gains	800.2741	936.5510	1021.1073	1105.0322	1146.2358	1123.9166	1080.1859	1026.6935	978.5042	883.8373	798.8358			762.3114 (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	30.5929	30.6941	30.7940	31.2719	31.3630	31.7940	31.7940	31.8751	31.6266	31.3630	31.1793	30.9895	
alpha	3.0395	3.0463	3.0529	3.0848	3.0909	3.1196	3.1196	3.1250	3.1084	3.0909	3.0786	3.0660	
util living area	0.9580	0.9333	0.8981	0.8274	0.7188	0.5652	0.4293	0.4652	0.6584	0.8485	0.9343	0.9630	(86)
MIT	18.9724	19.2913	19.6976	20.2089	20.6116	20.8703	20.9588	20.9464	20.7810	20.2617	19.5461	18.9294	(87)
Th 2	20.0148	20.0177	20.0206	20.0341	20.0366	20.0484	20.0484	20.0506	20.0439	20.0366	20.0315	20.0261	(88)
util rest of house	0.9513	0.9231	0.8822	0.8002	0.6741	0.4978	0.3442	0.3793	0.5947	0.8189	0.9225	0.9571	(89)
MIT 2	17.6565	18.0577	18.5655	19.1975	19.6672	19.9493	20.0262	20.0199	19.8632	19.2754	18.3925	17.6094	(90)
Living area fraction	17.8725	18.2602	18.7514	19.3636	19.8223	20.1005	20.1793	20.1720	20.0139	19.4373	18.5819	17.8261	(92)
MIT	17.8725	18.2602	18.7514	19.3636	19.8223	20.1005	20.1793	20.1720	20.0139	19.4373	18.5819	17.8261	(93)
Temperature adjustment												0.0000	
adjusted MIT	17.8725	18.2602	18.7514	19.3636	19.8223	20.1005	20.1793	20.1720	20.0139	19.4373	18.5819	17.8261	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9314	0.8994	0.8568	0.7785	0.6631	0.5017	0.3563	0.3907	0.5925	0.7970	0.8995	0.9386	(94)
Ext temp.	745.3680	842.2898	874.8908	860.2263	760.1052	563.8242	384.8623	401.1607	579.7782	704.4059	718.5167	715.5000	(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	1560.5738	1531.0995	1399.4697	1176.9828	910.9712	608.5625	396.0016	416.2590	657.7584	991.1705	1295.3644	1546.6811	(97)
Space heating requirement - total per year (kWh/year)	606.5131	462.8801	390.2867	228.0647	112.2443	0.0000	0.0000	0.0000	0.0000	213.3529	415.3303	618.3988	(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)	606.5131	462.8801	390.2867	228.0647	112.2443	0.0000	0.0000	0.0000	0.0000	213.3529	415.3303	618.3988	(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	(98c) / (4) =
Space heating per m ²												28.6999	(99)

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

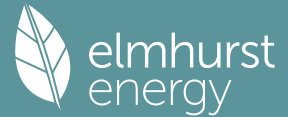
Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.3000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating efficiency (main heating system 1)	606.5131	462.8801	390.2867	228.0647	112.2443	0.0000	0.0000	0.0000	0.0000	213.3529	415.3303	618.3988	(98)
Space heating fuel (main heating system)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating efficiency (main heating system 2)	657.1106	501.4952	422.8458	247.0907	121.6082	0.0000	0.0000	0.0000	0.0000	231.1516	449.9787	669.9879	(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	247.8750	219.1515	232.9523	205.4535	199.5182	180.1976	178.2829	185.2225	187.0697	208.0692	220.5419	245.2810	(64)
Efficiency of water heater (217)m	85.9865	85.6945	85.2080	84.2945	82.8222	79.8000	79.8000	79.8000	79.8000	84.1161	85.4572	86.0440	(216)
Fuel for water heating, kWh/month	288.2720	255.7358	273.3924	243.7331	240.8996	225.8115	223.4121	232.1084	234.4232	247.3596	258.0729	285.0644	(219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	28.5240	22.8830	20.6036	15.0951	11.6599	9.5262	10.6365	13.8258	17.9583	23.5623	26.6135	29.3168	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-48.7156	-67.8926	-96.4707	-107.1594	-114.4217	-106.3451	-104.9667	-99.6027	-90.0286	-76.9523	-53.2510	-42.2051	(233a)

elmhurst
energy

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	3301.2686	1.1300	3730.4336 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	3008.2849	1.1300	3399.3619 (278)
Space and water heating			7129.7955 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	230.2050	1.5338	353.0962 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1008.0114	1.4984	-1510.3948
PV Unit electricity exported	-1648.2228	0.4625	-762.3486
Total			-2272.7434 (283)
Total Primary energy kWh/year			5340.2491 (286)
Target Primary Energy Rate (TPER)			50.3000 (287)

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Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000	Air changes per hour	0.1517 (8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50				2.6900 (17)
Infiltration rate				0.2862 (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) =			0.2647 (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)
	0.3375	0.3309	0.3243	0.2912	0.2846	0.2515	0.2515	0.2449	0.2647	0.2846	0.2978	0.3111	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5570	0.5548	0.5526	0.5424	0.5405	0.5316	0.5316	0.5300	0.5350	0.5405	0.5444	0.5484	(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	
Main dwelling								
Windows			18.8700	1.2357	23.3184			(27)
Ground Floor			53.7400	0.1300	6.9862	110.0000	5911.4000	(28a)
External Walls	112.2400	18.8700	93.3700	0.1500	14.0055	18.0000	1680.6600	(29a)
External Roof	53.7400		53.7400	0.1100	5.9114	9.0000	483.6600	(30)
Total net area of external elements Aum(A, m2)			219.7200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.2215			(33)
Main dwelling								
Party Walls			34.9500	0.0000	0.0000	70.0000	2446.5001	(32)
Internal Walls			80.6100			9.0000	725.4900	(32c)
Internal Floors			52.4300			18.0000	943.7400	(32d)
Internal Ceiling			52.4300			9.0000	471.8700	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12663.3200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		119.2740 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	15.0200	0.0930	1.3969
E2 Other lintels (including other steel lintels)	15.0200	-0.0590	-0.8862
E3 Sill	29.0000	-0.0650	-1.8850
E4 Jamb	23.2400	0.0300	0.6972
E5 Ground floor (normal)	21.9900	0.0180	0.3958
E6 Intermediate floor within a dwelling	7.0300	0.0390	0.2742
E12 Gable (insulation at ceiling level)	7.0300	0.1010	0.7100
P4 Party wall - Roof (insulation at ceiling level)	16.2100	0.0430	0.6970
E10 Eaves (insulation at ceiling level)	14.6600	0.1170	1.7152
E16 Corner (normal)	4.7200	0.0400	0.1888
E17 Corner (inverted - internal area greater than external area)	9.9400	0.0540	0.5368
E18 Party wall between dwellings			

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		3.8407 (36)
Point Thermal Bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	54.0623 (37)

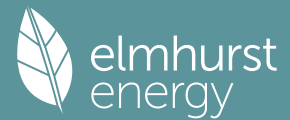
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	48.4621	48.2697	48.0810	47.1948	47.0290	46.2572	46.2572	46.1143	46.5545	47.0290	47.3644	47.7151	(38)
Average = Sum(39)m / 12 =	102.5244	102.3319	102.1433	101.2571	101.0913	100.3195	100.3195	100.1765	100.6168	101.0913	101.4267	101.7773	(39)
												101.2563	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9657	0.9638	0.9621	0.9537	0.9522	0.9449	0.9449	0.9435	0.9477	0.9522	0.9553	0.9586	(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													2.7898 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	30.6535	30.1982	29.5571	28.3751	27.4900	26.5086	25.9784	26.6150	27.3082	28.3583	29.5647	30.5498	(42b)
Hot water usage for other uses	43.2001	41.6292	40.0583	38.4873	36.9164	35.3455	35.3455	36.9164	38.4873	40.0583	41.6292	43.2001	(42c)
Average daily hot water use (litres/day)													67.6934 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	73.8535	71.8274	69.6154	66.8624	64.4064	61.8541	61.3240	63.5315	65.7955	68.4166	71.1939	73.7499	(44)
Energy content (annual)	116.9660	102.2812	106.9963	91.5313	86.7034	76.0568	74.1660	78.6652	81.1324	92.8407	101.4287	115.4745	(45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	99.4211	86.9390	90.9468	77.8016	73.6979	64.6483	63.0411	66.8654	68.9626	78.9146	86.2144	98.1534	(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	99.4211	86.9390	90.9468	77.8016	73.6979	64.6483	63.0411	66.8654	68.9626	78.9146	86.2144	98.1534 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =										955.6062 (64)	956 (64)
Electric shower(s)	56.8553	50.6585	55.3172	52.7885	53.7791	51.3000	53.0100	53.7791	52.7885	55.3172	54.2770	56.8553 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =										646.7255 (64a)	
Heat gains from water heating, kWh/month	39.0691	34.3994	36.5660	32.6475	31.8692	28.9871	29.0128	30.1611	30.4378	33.5579	35.1229	38.7522 (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	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	135.8693	150.4267	135.8693	140.3983	135.8693	140.3983	135.8693	135.8693	140.3983	135.8693	140.3983	135.8693	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	265.9341	268.6936	261.7396	246.9354	228.2476	210.6838	198.9501	196.1905	203.1445	217.9488	236.6365	254.2004	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	(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)	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	(71)
Water heating gains (Table 5)	52.5122	51.1896	49.1478	45.3438	42.8350	40.2598	38.9957	40.5391	42.2747	45.1048	48.7817	52.0862	(72)
Total internal gains	519.1622	535.1566	511.6034	497.5241	471.7986	456.1885	438.6617	437.4456	450.6641	463.7695	490.6632	507.0025	(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				6.4700	10.6334	0.4000	0.7500	0.7700	14.3031 (74)			
East				0.5200	19.6403	0.4000	0.7500	0.7700	2.1233 (76)			
South				9.2300	46.7521	0.4000	0.7500	0.7700	89.7133 (78)			
West				2.6500	19.6403	0.4000	0.7500	0.7700	10.8205 (80)			

Solar gains	116.9602	199.5821	275.3062	346.9532	395.4621	396.0192	380.3529	343.3724	299.8530	221.0577	140.1250	100.0887 (83)
Total gains	636.1225	734.7387	786.9096	844.4773	867.2607	852.2077	819.0146	780.8180	750.5171	684.8272	630.7882	607.0912 (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	34.3098	34.3743	34.4378	34.7392	34.7962	35.0639	35.0639	35.1139	34.9603	34.7962	34.6811	34.5616
alpha	3.2873	3.2916	3.2959	3.3159	3.3197	3.3376	3.3376	3.3409	3.3307	3.3197	3.3121	3.3041
util living area	0.9754	0.9599	0.9376	0.8868	0.7985	0.6513	0.5051	0.5439	0.7383	0.9003	0.9603	0.9787 (86)
MIT	19.0070	19.2787	19.6414	20.1270	20.5459	20.8401	20.9490	20.9336	20.7426	20.2027	19.5270	18.9584 (87)
Th 2	20.1120	20.1136	20.1151	20.1221	20.1234	20.1295	20.1295	20.1306	20.1271	20.1234	20.1207	20.1180 (88)
util rest of house	0.9714	0.9536	0.9272	0.8671	0.7614	0.5867	0.4170	0.4564	0.6815	0.8790	0.9529	0.9752 (89)
MIT 2	18.2806	18.5495	18.9068	19.3815	19.7728	20.0290	20.1064	20.0988	19.9527	19.4619	18.8025	18.2368 (90)
Living area fraction	18.3998	18.6692	19.0274	19.5039	19.8997	20.1621	20.2447	20.2358	20.0824	19.5835	18.9214	18.3552 (92)
MIT	18.3998	18.6692	19.0274	19.5039	19.8997	20.1621	20.2447	20.2358	20.0824	19.5835	18.9214	18.3552 (93)
Temperature adjustment												0.0000
adjusted MIT	18.3998	18.6692	19.0274	19.5039	19.8997	20.1621	20.2447	20.2358	20.0824	19.5835	18.9214	18.3552 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9612	0.9402	0.9115	0.8508	0.7508	0.5893	0.4292	0.4676	0.6783	0.8632	0.9398	0.9659	(94)
Useful gains	611.4156	690.8214	717.2563	718.4822	651.1712	502.2372	351.4925	365.1134	509.0530	591.1734	592.7842	586.3793	(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	1445.5781	1409.0290	1279.5903	1073.7184	828.9199	557.9897	365.6374	384.2608	601.9309	908.1532	1199.0091	1440.6817	(97)
Space heating kWh	620.6169	482.6355	418.3765	255.7701	132.2450	0.0000	0.0000	0.0000	0.0000	235.8330	436.4819	635.6009	(98a)
Space heating requirement - total per year (kWh/year)												3217.5599	
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	620.6169	482.6355	418.3765	255.7701	132.2450	0.0000	0.0000	0.0000	0.0000	235.8330	436.4819	635.6009	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3217.5599	
Space heating per m2												(98c) / (4) =	30.3057 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W												
	0.0000	0.0000	0.0000	0.0000	0.0000	943.0030	742.3640	761.3417	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7681	0.8386	0.8148	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	724.3664	622.5585	620.3469	0.0000	0.0000	0.0000	0.0000 (102)

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Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	939.8047	903.6738	861.7261	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	155.1156	209.1498	179.5861	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	155.1156	209.1498	179.5861	0.0000	0.0000	0.0000	1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	38.7789	52.2874	44.8965	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												135.9629 (107)
Energy for space heating												30.3057 (99)
Energy for space cooling												1.2806 (108)
Total												31.5863 (109)
Fabric Energy Efficiency (DFEE)												31.6 (109)

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

1. Overall dwelling characteristics

Main dwelling	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	53.7400 (1b)	x 2.3600 (2b)	= 126.8264 (1b) - (3b)
First floor	52.4300 (1c)	x 2.6100 (2c)	= 136.8423 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	106.1700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	263.6687 (5)

2. Ventilation rate

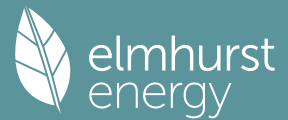
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1517 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4017 (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) = 0.3716 (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	0.4738	0.4645	0.4552	0.4087	0.3994	0.3530	0.3530	0.3437	0.3716	0.3994	0.4180	0.4366 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.6122	0.6079	0.6036	0.5835	0.5798	0.5623	0.5623	0.5591	0.5690	0.5798	0.5874	0.5953 (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
Main dwelling							
TER Opening Type			18.8700	1.1450	21.6069		(27)
Ground Floor			53.7400	0.1300	6.9862		(28a)
External Walls	112.2400	18.8700	93.3700	0.1800	16.8066		(29a)
External Roof	53.7400		53.7400	0.1100	5.9114		(30)
Total net area of external elements Aum(A, m2)			219.7200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	51.3111		(33)
Main dwelling							
Party Walls			34.9500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							119.2740 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				15.0200	0.0500	0.7510	
E3 Sill				15.0200	0.0500	0.7510	
E4 Jamb				29.0000	0.0500	1.4500	
E5 Ground floor (normal)				23.2400	0.1600	3.7184	
E6 Intermediate floor within a dwelling				21.9900	0.0000	0.0000	
E12 Gable (insulation at ceiling level)				7.0300	0.0600	0.4218	
P4 Party wall - Roof (insulation at ceiling level)				7.0300	0.1200	0.8436	
E10 Eaves (insulation at ceiling level)				16.2100	0.0600	0.9726	
E16 Corner (normal)				14.6600	0.0900	1.3194	
E17 Corner (inverted - internal area greater than external area)				4.7200	-0.0900	-0.4248	
E18 Party wall between dwellings				9.9400	0.0600	0.5964	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.3994 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	61.7105 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	53.2701	52.8909	52.5193	50.7735	50.4469	48.9265	48.9265	48.6449	49.5121	50.4469	51.1077	51.7984	(38)
Heat transfer coeff	114.9806	114.6014	114.2297	112.4840	112.1574	110.6369	110.6369	110.3554	111.2226	112.1574	112.8181	113.5089	(39)
Average = Sum(39)m / 12 =												112.4824	
HLP	1.0830	1.0794	1.0759	1.0595	1.0564	1.0421	1.0421	1.0394	1.0476	1.0564	1.0626	1.0691	(40)
HLP (average)												1.0595	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7898 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	30.6535	30.1982	29.5571	28.3751	27.4900	26.5086	25.9784	26.6150	27.3082	28.3583	29.5647	30.5498	(42b)
Hot water usage for other uses	43.2001	41.6292	40.0583	38.4873	36.9164	35.3455	35.3455	36.9164	38.4873	40.0583	41.6292	43.2001	(42c)
Average daily hot water use (litres/day)												67.6934	(43)
Daily hot water use	73.8535	71.8274	69.6154	66.8624	64.4064	61.8541	61.3240	63.5315	65.7955	68.4166	71.1939	73.7499	(44)
Energy conte	116.9660	102.2812	106.9963	91.5313	86.7034	76.0568	74.1660	78.6652	81.1324	92.8407	101.4287	115.4745	(45)
Energy content (annual)										Total = Sum(45)m =		1124.2426	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
WWHRS	99.4211	86.9390	90.9468	77.8016	73.6979	64.6483	63.0411	66.8654	68.9626	78.9146	86.2144	98.1534	(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	99.4211	86.9390	90.9468	77.8016	73.6979	64.6483	63.0411	66.8654	68.9626	78.9146	86.2144	98.1534	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		955.6062	(64)
Electric shower(s)	56.8553	50.6585	55.3172	52.7885	53.7791	51.3000	53.0100	53.7791	52.7885	55.3172	54.2770	56.8553	(64a)
Heat gains from water heating, kWh/month	39.0691	34.3994	36.5660	32.6475	31.8692	28.9871	29.0128	30.1611	30.4378	33.5579	35.1229	38.7522	(65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												646.7255	(64a)

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

Metabolic gains (Table 5), Watts													
(66)m	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	139.4887	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	137.2797	151.9882	137.2797	141.8557	137.2797	141.8557	137.2797	137.2797	141.8557	137.2797	141.8557	137.2797	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	265.9341	268.6936	261.7396	246.9354	228.2476	210.6838	198.9501	196.1905	203.1445	217.9488	236.6365	254.2004	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	36.9489	(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)	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	(71)
Water heating gains (Table 5)	52.5122	51.1896	49.1478	45.3438	42.8350	40.2598	38.9957	40.5391	42.2747	45.1048	48.7817	52.0862	(72)
Total internal gains	520.5726	536.7180	513.0138	498.9814	473.2089	457.6459	440.0720	438.8560	452.1215	465.1798	492.1206	508.4129	(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					6.4700	10.6334		0.6300		0.7000		0.7700		21.0256 (74)
East					0.5200	19.6403		0.6300		0.7000		0.7700		3.1212 (76)
South					9.2300	46.7521		0.6300		0.7000		0.7700		131.8786 (78)
West					2.6500	19.6403		0.6300		0.7000		0.7700		15.9061 (80)
Solar gains	171.9315	293.3857	404.7001	510.0212	581.3293	582.1482	559.1188	504.7574	440.7839	324.9548	205.9837	147.1304	(83)	
Total gains	692.5041	830.1037	917.7138	1009.0027	1054.5382	1039.7941	999.1908	943.6133	892.9054	790.1346	698.1043	655.5433	(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	30.5929	30.6941	30.7940	31.2719	31.3630	31.7940	31.7940	31.8751	31.6266	31.3630	31.1793	30.9895	
alpha	3.0395	3.0463	3.0529	3.0848	3.0909	3.1196	3.1196	3.1250	3.1084	3.0909	3.0786	3.0660	
util living area	0.9707	0.9497	0.9191	0.8544	0.7514	0.5985	0.4592	0.4991	0.6966	0.8785	0.9523	0.9748	(86)
MIT	18.8064	19.1405	19.5680	20.1163	20.5556	20.8473	20.9503	20.9347	20.7415	20.1628	19.4018	18.7615	(87)

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Th 2	20.0148	20.0177	20.0206	20.0341	20.0366	20.0484	20.0484	20.0506	20.0439	20.0366	20.0315	20.0261 (88)
util rest of house	0.9659	0.9417	0.9057	0.8298	0.7084	0.5300	0.3699	0.4093	0.6339	0.8528	0.9433	0.9706 (89)
MIT 2	18.0144	18.3445	18.7641	19.2989	19.7033	19.9563	20.0272	20.0209	19.8748	19.3549	18.6154	17.9780 (90)
Living area fraction									fLA = Living area / (4) =			0.1642 (91)
MIT	18.1444	18.4752	18.8960	19.4331	19.8433	20.1026	20.1787	20.1709	20.0171	19.4875	18.7445	18.1066 (92)
Temperature adjustment												0.0000
adjusted MIT	18.1444	18.4752	18.8960	19.4331	19.8433	20.1026	20.1787	20.1709	20.0171	19.4875	18.7445	18.1066 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9534	0.9253	0.8869	0.8121	0.6988	0.5341	0.3826	0.4212	0.6320	0.8352	0.9276	0.9593	(94)
Useful gains	660.2159	768.0887	813.8939	819.4034	736.9455	555.3980	382.3234	397.4962	564.2961	659.9107	647.5610	628.8881	(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	1591.8408	1555.7313	1415.9967	1184.8075	913.3274	608.7902	395.9387	416.1445	658.1184	996.7997	1313.7151	1578.5225	(97)
Space heating kWh	693.1289	529.2958	447.9645	263.0910	131.2281	0.0000	0.0000	0.0000	0.0000	250.6454	479.6310	706.5280	(98a)
Space heating requirement - total per year (kWh/year)												3501.5127	
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	693.1289	529.2958	447.9645	263.0910	131.2281	0.0000	0.0000	0.0000	0.0000	250.6454	479.6310	706.5280	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3501.5127	
Space heating per m2											(98c) / (4) =	32.9802	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	1039.9871	818.7132	838.7007	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7961	0.8586	0.8351	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	827.9761	702.9510	700.4144	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1157.4815	1112.7542	1050.5312	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	237.2439	304.8936	260.4869	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	59.3110	76.2234	65.1217	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												200.6561	(107)
Energy for space heating												32.9802	(99)
Energy for space cooling												1.8900	(108)
Total												34.8702	(109)
Fabric Energy Efficiency (TFEE)												34.9	(109)

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

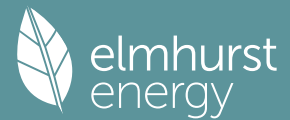
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	53.7400 (1b)	x 2.3600 (2b)	= 126.8264 (1b) - (3b)	
First floor	52.4300 (1c)	x 2.6100 (2c)	= 136.8423 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	106.1700		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	263.6687 (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		2.6900 (17)
Infiltration rate		0.1345 (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) =	0.1244 (21)

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Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.1586	0.1555	0.1524	0.1369	0.1337	0.1182	0.1182	0.1151	0.1244	0.1337	0.1400	0.1462	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation													0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													81.9000 (23c)
Effective ac	0.2491	0.2460	0.2429	0.2274	0.2242	0.2087	0.2087	0.2056	0.2149	0.2242	0.2305	0.2367	(25)

3. Heat losses and heat loss parameter

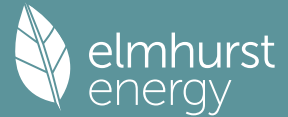
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Windows			18.8700	1.2357	23.3184			(27)
Ground Floor			53.7400	0.1300	6.9862	110.0000	5911.4000	(28a)
External Walls	112.2400	18.8700	93.3700	0.1500	14.0055	18.0000	1680.6600	(29a)
External Roof	53.7400		53.7400	0.1100	5.9114	9.0000	483.6600	(30)
Total net area of external elements Aum(A, m2)			219.7200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.2215			(33)
Main dwelling								
Party Walls			34.9500	0.0000	0.0000	70.0000	2446.5001	(32)
Internal Walls			80.6100			9.0000	725.4900	(32c)
Internal Floors			52.4300			18.0000	943.7400	(32d)
Internal Ceiling			52.4300			9.0000	471.8700	(32e)
Heat capacity Cm = Sum(A x k)								(28)...(30) + (32) + (32a)...(32e) = 12663.3200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								119.2740 (35)
List of Thermal Bridges								
K1 Element				Length	Psi-value		Total	
E2 Other lintels (including other steel lintels)				15.0200	0.0930		1.3969	
E3 Sill				15.0200	-0.0590		-0.8862	
E4 Jamb				29.0000	-0.0650		-1.8850	
E5 Ground floor (normal)				23.2400	0.0300		0.6972	
E6 Intermediate floor within a dwelling				21.9900	0.0180		0.3958	
E12 Gable (insulation at ceiling level)				7.0300	0.0390		0.2742	
P4 Party wall - Roof (insulation at ceiling level)				7.0300	0.1010		0.7100	
E10 Eaves (insulation at ceiling level)				16.2100	0.0430		0.6970	
E16 Corner (normal)				14.6600	0.1170		1.7152	
E17 Corner (inverted - internal area greater than external area)				4.7200	0.0400		0.1888	
E18 Party wall between dwellings				9.9400	0.0540		0.5368	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								3.8407 (36)
Point Thermal Bridges							(36a) =	0.0000
Total fabric heat loss							(33) + (36) + (36a) =	54.0623 (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	21.6766	21.4060	21.1354	19.7822	19.5116	18.1584	18.1584	17.8878	18.6997	19.5116	20.0528	20.5941	(38)
Average = Sum(39)m / 12 =	75.7389	75.4682	75.1976	73.8445	73.5738	72.2207	72.2207	71.9500	72.7619	73.5738	74.1151	74.6563	(39)
													73.7768
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.7134	0.7108	0.7083	0.6955	0.6930	0.6802	0.6802	0.6777	0.6853	0.6930	0.6981	0.7032	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	
													0.6949
													31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7898 (42)
Hot water usage for mixer showers													
	70.9951	69.9282	68.3735	65.3989	63.2036	60.7555	59.3641	60.9070	62.5983	65.2269	68.2654	70.7231	(42a)
Hot water usage for baths													
	30.6535	30.1982	29.5571	28.3751	27.4900	26.5086	25.9784	26.6150	27.3082	28.3583	29.5647	30.5498	(42b)
Hot water usage for other uses													
	43.2001	41.6292	40.0583	38.4873	36.9164	35.3455	35.3455	36.9164	38.4873	40.0583	41.6292	43.2001	(42c)
Average daily hot water use (litres/day)													133.1485 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	144.8487	141.7556	137.9889	132.2613	127.6101	122.6096	120.6880	124.4385	128.3939	133.6435	139.4593	144.4730	(44)
Energy conte	229.4049	201.8581	212.0838	181.0591	171.7877	150.7628	145.9617	154.0808	158.3225	181.3529	198.6853	226.2099	(45)
Energy content (annual)													Total = Sum(45)m = 2211.5695
Distribution loss (46)m = 0.15 x (45)m													
	34.4107	30.2787	31.8126	27.1589	25.7682	22.6144	21.8943	23.1121	23.7484	27.2029	29.8028	33.9315	(46)
Water storage loss (or HIU loss):													
Store volume													200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6900 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.9126 (55)
Total storage loss													
	28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906	(56)
If cylinder contains dedicated solar storage													
	28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906	(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													
	280.9579	248.4221	263.6368	230.9491	223.3407	200.6528	197.5147	205.6338	208.2125	232.9059	248.5753	277.7629	(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													
	280.9579	248.4221	263.6368	230.9491	223.3407	200.6528	197.5147	205.6338	208.2125	232.9059	248.5753	277.7629	(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													
	117.5195	104.3690	111.7603	100.1142	98.3618	90.0406	89.7747	92.4743	92.5542	101.5422	105.9749	116.4572	(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	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	33.0002	29.3105	23.8369	18.0461	13.4897	11.3885	12.3057	15.9954	21.4690	27.2599	31.8163	33.9174	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	396.9165	401.0353	390.6562	368.5603	340.6681	314.4535	296.9404	292.8217	303.2008	325.2967	353.1889	379.4035	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	(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)	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	(71)
Water heating gains (Table 5)	157.9564	155.3110	150.2154	139.0474	132.2067	125.0564	120.6649	124.2934	128.5475	136.4815	147.1873	156.5285	(72)
Total internal gains	698.1971	695.9808	675.0324	635.9777	596.6884	561.2223	540.2349	543.4344	563.5413	599.3620	642.5164	680.1733	(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					6.4700	10.6334	0.4000	0.7500	0.7700		14.3031 (74)	
East					0.5200	19.6403	0.4000	0.7500	0.7700		2.1233 (76)	
South					9.2300	46.7521	0.4000	0.7500	0.7700		89.7133 (78)	
West					2.6500	19.6403	0.4000	0.7500	0.7700		10.8205 (80)	
Solar gains	116.9602	199.5821	275.3062	346.9532	395.4621	396.0192	380.3529	343.3724	299.8530	221.0577	140.1250	100.0887 (83)
Total gains	815.1573	895.5629	950.3386	982.9309	992.1505	957.2415	920.5878	886.8068	863.3943	820.4197	782.6414	780.2620 (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	46.4436	46.6102	46.7779	47.6351	47.8103	48.7061	48.7061	48.8893	48.3438	47.8103	47.4612	47.1171	
alpha	4.0962	4.1073	4.1185	4.1757	4.1874	4.2471	4.2471	4.2593	4.2229	4.1874	4.1641	4.1411	
util living area	0.9342	0.9049	0.8557	0.7665	0.6368	0.4713	0.3427	0.3697	0.5553	0.7781	0.8991	0.9420	(86)
Living	20.1730	20.3199	20.5103	20.7155	20.8473	20.9105	20.9238	20.9227	20.8927	20.7355	20.4355	20.1472	
Non living	19.3524	19.5362	19.7713	20.0256	20.1762	20.2516	20.2629	20.2645	20.2310	20.0549	19.6916	19.3278	
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	20.5769	20.3199	20.5103	20.7155	20.8473	20.9105	20.9238	20.9227	20.8927	20.7355	20.4355	20.2665	(87)
Th 2	20.3290	20.3313	20.3335	20.3448	20.3470	20.3583	20.3583	20.3606	20.3538	20.3470	20.3425	20.3380	(88)
util rest of house	0.9260	0.8937	0.8392	0.7415	0.6015	0.4272	0.2937	0.3196	0.5098	0.7494	0.8855	0.9347	(89)
MIT 2	19.9397	19.5362	19.7713	20.0256	20.1762	20.2516	20.2629	20.2645	20.2310	20.0549	19.6916	19.5099	(90)
Living area fraction													
MIT	20.0443	19.6649	19.8926	20.1389	20.2864	20.3597	20.3714	20.3725	20.3397	20.1666	19.8137	19.6341	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0443	19.6649	19.8926	20.1389	20.2864	20.3597	20.3714	20.3725	20.3397	20.1666	19.8137	19.6341	(93)

8. Space heating requirement

Utilisation	0.9222	0.8810	0.8272	0.7332	0.5981	0.4273	0.2947	0.3205	0.5087	0.7409	0.8732	0.9257	(94)
Useful gains	751.7319	789.0091	786.1576	720.6886	593.3835	409.0581	271.2819	284.2623	439.2324	607.8595	683.3649	722.3238	(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	1192.4557	1114.2774	1007.0948	829.9293	631.7342	415.9718	272.3714	285.8249	454.0092	703.8532	942.2767	1152.2517	(97)
Space heating kWh	327.8985	218.5802	164.3773	78.6533	28.5329	0.0000	0.0000	0.0000	0.0000	71.4193	186.4165	319.8664	(98a)
Space heating requirement - total per year (kWh/year)												1395.7444	
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	327.8985	218.5802	164.3773	78.6533	28.5329	0.0000	0.0000	0.0000	0.0000	71.4193	186.4165	319.8664	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1395.7444	
Space heating per m2										(98c) / (4) =		13.1463	(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 %)												259.6382	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement	327.8985	218.5802	164.3773	78.6533	28.5329	0.0000	0.0000	0.0000	0.0000	71.4193	186.4165	319.8664	(98)
Space heating efficiency (main heating system 1)	259.6382	259.6382	259.6382	259.6382	259.6382	0.0000	0.0000	0.0000	0.0000	259.6382	259.6382	259.6382	(210)
Space heating fuel (main heating system)	126.2905	84.1865	63.3101	30.2934	10.9895	0.0000	0.0000	0.0000	0.0000	27.5072	71.7985	123.1969	(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)													

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Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	280.9579	248.4221	263.6368	230.9491	223.3407	200.6528	197.5147	205.6338	208.2125	232.9059	248.5753	277.7629	(64)
Efficiency of water heater													
(217)m	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	(216)
Fuel for water heating, kWh/month	99.6782	88.1351	93.5330	81.9361	79.2368	71.1876	70.0742	72.9547	73.8696	82.6303	88.1895	98.5446	(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	26.2959	23.7511	26.2959	25.4476	26.2959	25.4476	26.2959	26.2959	25.4476	26.2959	25.4476	26.2959	(231)
Lighting	28.8849	23.1726	20.8643	15.2861	11.8074	9.6468	10.7711	14.0007	18.1855	23.8604	26.9503	29.6877	(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												537.5727	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												281.8650	
Water heating fuel used												999.9697	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.9625)													
mechanical ventilation fans (SFP = 0.9625)												309.6130	(230a)
Total electricity for the above, kWh/year												309.6130	(231)
Electricity for lighting (calculated in Appendix L)												233.1179	(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												2080.2732	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	537.5727	16.4900	88.6457 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	999.9697	16.4900	164.8950 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	309.6130	16.4900	51.0552 (249)
Energy for lighting	233.1179	16.4900	38.4411 (250)
Additional standing charges			0.0000 (251)
Total energy cost			343.0371 (255)

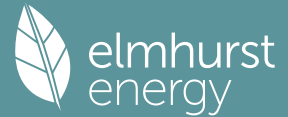
11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] = 0.8169 (257)
SAP value	86.7578
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	537.5727	0.1566	84.1879 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	999.9697	0.1410	140.9567 (264)
Space and water heating			225.1446 (265)
Pumps, fans and electric keep-hot	309.6130	0.1387	42.9471 (267)
Energy for lighting	233.1179	0.1443	33.6461 (268)
Total CO2, kg/year			301.7378 (272)
CO2 emissions per m2			2.8400 (273)
EI value			97.3253
EI rating			97 (274)
EI band			A

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1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	53.7400 (1b)	x 2.3600 (2b)	= 126.8264 (1b) - (3b)
First floor	52.4300 (1c)	x 2.6100 (2c)	= 136.8423 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	106.1700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 263.6687 (5)

2. Ventilation rate

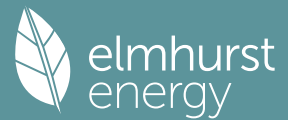
	m ³ per hour											
Number of open chimneys												0 * 80 = 0.0000 (6a)
Number of open flues												0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire												0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler												0 * 20 = 0.0000 (6d)
Number 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												2.6900 (17)
Infiltration rate												0.1345 (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) =											0.1244 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	4.1000	3.8000	3.7000	3.5000	3.5000	3.2000	3.3000	3.1000	3.1000	3.4000	3.3000	3.7000 (22)
Adj infilt rate	1.0250	0.9500	0.9250	0.8750	0.8750	0.8000	0.8250	0.7750	0.7750	0.8500	0.8250	0.9250 (22a)
Balanced mechanical ventilation with heat recovery	0.1275	0.1182	0.1151	0.1089	0.1089	0.0995	0.1026	0.0964	0.0964	0.1058	0.1026	0.1151 (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)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.9000 (23c)
Effective ac	0.2180	0.2087	0.2056	0.1994	0.1994	0.1900	0.1931	0.1869	0.1869	0.1963	0.1931	0.2056 (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						
Main dwelling													
Windows			18.8700	1.2357	23.3184			(27)					
Ground Floor			53.7400	0.1300	6.9862	110.0000	5911.4000	(28a)					
External Walls	112.2400	18.8700	93.3700	0.1500	14.0055	18.0000	1680.6600	(29a)					
External Roof	53.7400		53.7400	0.1100	5.9114	9.0000	483.6600	(30)					
Total net area of external elements Aum(A, m2)			219.7200					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		50.2215			(33)					
Main dwelling													
Party Walls			34.9500	0.0000	0.0000	70.0000	2446.5001	(32)					
Internal Walls			80.6100			9.0000	725.4900	(32c)					
Internal Floors			52.4300			18.0000	943.7400	(32d)					
Internal Ceiling			52.4300			9.0000	471.8700	(32e)					
Heat capacity Cm = Sum(A x k)					(28) ... (30) + (32) + (32a) ... (32e) =		12663.3200	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							119.2740	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value	Total							
E2 Other lintels (including other steel lintels)				15.0200	0.0930	1.3969							
E3 Sill				15.0200	-0.0590	-0.8862							
E4 Jamb				29.0000	-0.0650	-1.8850							
E5 Ground floor (normal)				23.2400	0.0300	0.6972							
E6 Intermediate floor within a dwelling				21.9900	0.0180	0.3958							
E12 Gable (insulation at ceiling level)				7.0300	0.0390	0.2742							
P4 Party wall - Roof (insulation at ceiling level)				7.0300	0.1010	0.7100							
E10 Eaves (insulation at ceiling level)				16.2100	0.0430	0.6970							
E16 Corner (normal)				14.6600	0.1170	1.7152							
E17 Corner (inverted - internal area greater than external area)				4.7200	0.0400	0.1888							
E18 Party wall between dwellings				9.9400	0.0540	0.5368							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.8407	(36)					
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss					(33) + (36) + (36a) =		54.0623	(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	18.9703	18.1584	17.8878	17.3465	17.3465	16.5346	16.8053	16.2640	16.2640	17.0759	16.8053	17.8878	(38)
Average = Sum(39)m / 12 =	73.0326	72.2207	71.9500	71.4088	71.4088	70.5969	70.8675	70.3263	70.3263	71.1381	70.8675	71.9500	(39)
												71.3411	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.6879	0.6802	0.6777	0.6726	0.6726	0.6649	0.6675	0.6624	0.6624	0.6700	0.6675	0.6777	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

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Assumed occupancy												2.7898 (42)
Hot water usage for mixer showers	70.9951	69.9282	68.3735	65.3989	63.2036	60.7555	59.3641	60.9070	62.5983	65.2269	68.2654	70.7231 (42a)
Hot water usage for baths	30.6535	30.1982	29.5571	28.3751	27.4900	26.5086	25.9784	26.6150	27.3082	28.3583	29.5647	30.5498 (42b)
Hot water usage for other uses	43.2001	41.6292	40.0583	38.4873	36.9164	35.3455	35.3455	36.9164	38.4873	40.0583	41.6292	43.2001 (42c)
Average daily hot water use (litres/day)												133.1485 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	144.8487	141.7556	137.9889	132.2613	127.6101	122.6096	120.6880	124.4385	128.3939	133.6435	139.4593	144.4730 (44)
Distribution loss (46)m = 0.15 x (45)m	229.4049	201.8581	212.0838	181.0591	171.7877	150.7628	145.9617	154.0808	158.3225	181.3529	198.6853	226.2099 (45)
Water storage loss (or HIU loss):	34.4107	30.2787	31.8126	27.1589	25.7682	22.6144	21.8943	23.1121	23.7484	27.2029	29.8028	33.9315 (46)
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6900 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9126 (55)
Total storage loss	28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906 (56)
If cylinder contains dedicated solar storage	28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906 (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	280.9579	248.4221	263.6368	230.9491	223.3407	200.6528	197.5147	205.6338	208.2125	232.9059	248.5753	277.7629 (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	280.9579	248.4221	263.6368	230.9491	223.3407	200.6528	197.5147	205.6338	208.2125	232.9059	248.5753	277.7629 (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	117.5195	104.3690	111.7603	100.1142	98.3618	90.0406	89.7747	92.4743	92.5542	101.5422	105.9749	116.4572 (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	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	33.0002	29.3105	23.8369	18.0461	13.4897	11.3885	12.3057	15.9954	21.4690	27.2599	31.8163	33.9174 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	396.9165	401.0353	390.6562	368.5603	340.6681	314.4535	296.9404	292.8217	303.2008	325.2967	353.1889	379.4035 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284 (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)	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910 (71)
Water heating gains (Table 5)	157.9564	155.3110	150.2154	139.0474	132.2067	125.0564	120.6649	124.2934	128.5475	136.4815	147.1873	156.5285 (72)
Total internal gains	698.1971	695.9808	675.0324	635.9777	596.6884	561.2223	540.2349	543.4344	563.5413	599.3620	642.5164	680.1733 (73)

6. Solar gains												

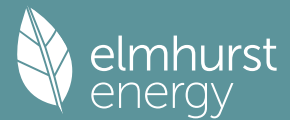
[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	Specific data	Specific data	factor	W						
		W/m2	or Table 6b	or Table 6c	Table 6d							
North	6.4700	12.6762	0.4000	0.7500	0.7700	17.0509 (74)						
East	0.5200	23.6925	0.4000	0.7500	0.7700	2.5613 (76)						
South	9.2300	53.2576	0.4000	0.7500	0.7700	102.1969 (78)						
West	2.6500	23.6925	0.4000	0.7500	0.7700	13.0530 (80)						

Solar gains	134.8622	204.7752	282.6040	373.9870	415.8302	452.5636	425.3514	383.2240	330.4936	242.8061	163.1609	116.0820 (83)
Total gains	833.0592	900.7560	957.6364	1009.9647	1012.5186	1013.7859	965.5863	926.6584	894.0349	842.1682	805.6773	796.2554 (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	48.1647	48.7061	48.8893	49.2599	49.2599	49.8264	49.6361	50.0181	50.0181	49.4473	49.6361	48.8893
alpha	4.2110	4.2471	4.2593	4.2840	4.2840	4.3218	4.3091	4.3345	4.3345	4.2965	4.3091	4.2593
util living area	0.9167	0.8878	0.8270	0.7230	0.5707	0.3925	0.2925	0.2875	0.4903	0.7079	0.8643	0.9251 (86)
Living	20.3164	20.4331	20.6126	20.7791	20.8838	20.9216	20.9267	20.9274	20.9109	20.8181	20.5760	20.3003
Non living	19.5497	19.6985	19.9181	20.1170	20.2318	20.2751	20.2767	20.2820	20.2683	20.1662	19.8856	19.5377
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	20.6503	20.4331	20.6126	20.7791	20.8838	20.9216	20.9267	20.9274	20.9109	20.8181	20.5760	20.3982 (87)
Th 2	20.3515	20.3583	20.3606	20.3651	20.3651	20.3719	20.3696	20.3742	20.3742	20.3674	20.3696	20.3606 (88)
util rest of house	0.9066	0.8751	0.8084	0.6961	0.5340	0.3506	0.2469	0.2405	0.4460	0.6742	0.8471	0.9158 (89)
MIT 2	20.0319	19.6985	19.9181	20.1170	20.2318	20.2751	20.2767	20.2820	20.2683	20.1662	19.8856	19.6860 (90)
Living area fraction	fLA = Living area / (4) =											0.1642 (91)
MIT	20.1334	19.8191	20.0321	20.2257	20.3388	20.3812	20.3834	20.3879	20.3738	20.2732	19.9990	19.8029 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1334	19.8191	20.0321	20.2257	20.3388	20.3812	20.3834	20.3879	20.3738	20.2732	19.9990	19.8029 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9029	0.8631	0.7980	0.6899	0.5324	0.3513	0.2479	0.2415	0.4460	0.6689	0.8360	0.9067	(94)
Useful gains	752.1289	777.4820	764.2197	696.7844	539.0993	356.1068	239.3306	223.8320	398.6982	563.3293	673.5507	721.9405	(95)
Ext temp.	5.0000	5.4000	7.1000	9.4000	12.5000	15.3000	17.0000	17.2000	14.6000	11.6000	7.9000	5.0000	(96)
Heat loss rate W	1105.2308	1041.3579	930.4669	773.0505	559.7597	358.7182	239.7764	224.1944	406.0492	616.9974	857.4246	1065.0683	(97)
Space heating kWh	262.7078	177.3246	123.6879	54.9116	15.3713	0.0000	0.0000	0.0000	0.0000	39.9290	132.3892	255.2871	(98a)
Space heating requirement - total per year (kWh/year)												1061.6087	
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	262.7078	177.3246	123.6879	54.9116	15.3713	0.0000	0.0000	0.0000	0.0000	39.9290	132.3892	255.2871	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1061.6087	
Space heating per m2										(98c) / (4) =		9.9991	(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 %)													258.0464	(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	262.7078	177.3246	123.6879	54.9116	15.3713	0.0000	0.0000	0.0000	0.0000	39.9290	132.3892	255.2871	(98)	
Space heating efficiency (main heating system 1)	258.0464	258.0464	258.0464	258.0464	258.0464	0.0000	0.0000	0.0000	0.0000	258.0464	258.0464	258.0464	(210)	
Space heating fuel (main heating system)	101.8064	68.7181	47.9324	21.2797	5.9568	0.0000	0.0000	0.0000	0.0000	15.4736	51.3044	98.9307	(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	280.9579	248.4221	263.6368	230.9491	223.3407	200.6528	197.5147	205.6338	208.2125	232.9059	248.5753	277.7629	(64)	
Efficiency of water heater (217)m	281.8468	281.8468	281.8468	281.8468	281.8468	281.8468	281.8468	281.8468	281.8468	281.8468	281.8468	281.8468	(216)	
Fuel for water heating, kWh/month	99.6846	88.1408	93.5391	81.9414	79.2419	71.1922	70.0787	72.9594	73.8744	82.6356	88.1952	98.5510	(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	26.2959	23.7511	26.2959	25.4476	26.2959	25.4476	26.2959	26.2959	25.4476	26.2959	25.4476	26.2959	(231)	
Lighting	28.8849	23.1726	20.8643	15.2861	11.8074	9.6468	10.7711	14.0007	18.1855	23.8604	26.9503	29.6877	(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													411.4023	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													281.8468	
Water heating fuel used													1000.0344	(219)
Space cooling fuel													0.0000	(221)
Electricity for pumps and fans:														
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.9625)														
mechanical ventilation fans (SFP = 0.9625)														309.6130 (230a)
Total electricity for the above, kWh/year														309.6130 (231)
Electricity for lighting (calculated in Appendix L)														233.1179 (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														1954.1675 (238)

10a. Fuel costs - using BEDF prices (599)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	411.4023	26.0000	106.9646	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1000.0344	26.0000	260.0089	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0000	0.0000	(247a)
Pumps, fans and electric keep-hot	309.6130	26.0000	80.4994	(249)
Energy for lighting	233.1179	26.0000	60.6107	(250)

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Additional standing charges 0.0000 (251)
Total energy cost 508.0835 (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	411.4023	0.1573	64.7294	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1000.0344	0.1410	140.9658	(264)
Space and water heating			205.6952	(265)
Pumps, fans and electric keep-hot	309.6130	0.1387	42.9471	(267)
Energy for lighting	233.1179	0.1443	33.6461	(268)
Total CO2, kg/year			282.2885	(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	411.4023	1.5825	651.0252	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1000.0344	1.5212	1521.2779	(278)
Space and water heating			2172.3031	(279)
Pumps, fans and electric keep-hot	309.6130	1.5128	468.3825	(281)
Energy for lighting	233.1179	1.5338	357.5640	(282)
Total Primary energy kWh/year			2998.2495	(286)

SAP 10 EPC IMPROVEMENTS

Plot 4

Current energy efficiency rating: B 87
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	+ 1.0	-£ 52	-25 kg (8.7%)
U Solar photovoltaic panels	+ 5.6	-£ 242	-125 kg (48.4%)

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
Solar water heating	£52	0.23 kg/m²	B 88 A 98
Solar photovoltaic panels	£242	1.17 kg/m²	A 93 A 99
Total Savings	£294	1.41 kg/m²	
Potential energy efficiency rating:		A 93	
Potential environmental impact rating:			A 99

Fuel prices for cost data on this page from database revision number 599 TEST (30 Sep 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, South East England):

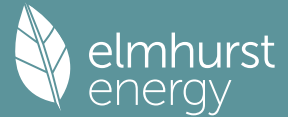
	Current	Potential	Saving
Electricity	£508	£456	£52
Space heating	£187	£208	-£21
Water heating	£260	£187	£73
Lighting	£61	£61	£0
Generated (PV)	-£0	-£242	£242
Total cost of fuels	£508	£214	£294
Total cost of uses	£508	£214	£294
Delivered energy	18 kWh/m²	8 kWh/m²	11 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.1 tonnes	0.1 tonnes
CO2 emissions per m²	3 kg/m²	1 kg/m²	1 kg/m²
Primary energy	28 kWh/m²	12 kWh/m²	16 kWh/m²

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

1. Overall dwelling characteristics

	Area (m²)	Storey height (m)	Volume (m³)
Main dwelling			
Ground floor	53.7400 (1b)	x 2.3600 (2b)	= 126.8264 (1b) - (3b)
First floor	52.4300 (1c)	x 2.6100 (2c)	= 136.8423 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	106.1700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 263.6687 (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)	
											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											2.6900 (17)		
Infiltration rate											0.1345 (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) =	0.1244 (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)
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													
	0.1586	0.1555	0.1524	0.1369	0.1337	0.1182	0.1182	0.1151	0.1244	0.1337	0.1400	0.1462	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation													0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													81.9000 (23c)
Effective ac	0.2491	0.2460	0.2429	0.2274	0.2242	0.2087	0.2087	0.2056	0.2149	0.2242	0.2305	0.2367	(25)

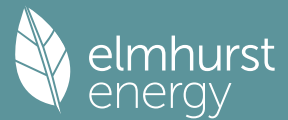
3. Heat losses and heat loss parameter

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						
Main dwelling													
Windows			18.8700	1.2357	23.3184			(27)					
Ground Floor			53.7400	0.1300	6.9862	110.0000	5911.4000	(28a)					
External Walls	112.2400	18.8700	93.3700	0.1500	14.0055	18.0000	1680.6600	(29a)					
External Roof	53.7400		53.7400	0.1100	5.9114	9.0000	483.6600	(30)					
Total net area of external elements Aum(A, m2)			219.7200					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.2215			(33)					
Main dwelling													
Party Walls			34.9500	0.0000	0.0000	70.0000	2446.5001	(32)					
Internal Walls			80.6100			9.0000	725.4900	(32c)					
Internal Floors			52.4300			18.0000	943.7400	(32d)					
Internal Ceiling			52.4300			9.0000	471.8700	(32e)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12663.3200	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							119.2740	(35)					
List of Thermal Bridges													
K1 Element					Length	Psi-value	Total						
E2 Other lintels (including other steel lintels)					15.0200	0.0930	1.3969						
E3 Sill					15.0200	-0.0590	-0.8862						
E4 Jamb					29.0000	-0.0650	-1.8850						
E5 Ground floor (normal)					23.2400	0.0300	0.6972						
E6 Intermediate floor within a dwelling					21.9900	0.0180	0.3958						
E12 Gable (insulation at ceiling level)					7.0300	0.0390	0.2742						
P4 Party wall - Roof (insulation at ceiling level)					7.0300	0.1010	0.7100						
E10 Eaves (insulation at ceiling level)					16.2100	0.0430	0.6970						
E16 Corner (normal)					14.6600	0.1170	1.7152						
E17 Corner (inverted - internal area greater than external area)					4.7200	0.0400	0.1888						
E18 Party wall between dwellings					9.9400	0.0540	0.5368						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.8407	(36)					
Point Thermal bridges							(36a) =	0.0000					
Total fabric heat loss							(33) + (36) + (36a) =	54.0623 (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	21.6766	21.4060	21.1354	19.7822	19.5116	18.1584	18.1584	17.8878	18.6997	19.5116	20.0528	20.5941	(38)
Average = Sum(39)m / 12 =	75.7389	75.4682	75.1976	73.8445	73.5738	72.2207	72.2207	71.9500	72.7619	73.5738	74.1151	74.6563	(39)
												73.7768	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.7134	0.7108	0.7083	0.6955	0.6930	0.6802	0.6802	0.6777	0.6853	0.6930	0.6981	0.7032	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

												2.7898 (42)	
Assumed occupancy													
Hot water usage for mixer showers													
	70.9951	69.9282	68.3735	65.3989	63.2036	60.7555	59.3641	60.9070	62.5983	65.2269	68.2654	70.7231 (42a)	
Hot water usage for baths													
	30.6535	30.1982	29.5571	28.3751	27.4900	26.5086	25.9784	26.6150	27.3082	28.3583	29.5647	30.5498 (42b)	
Hot water usage for other uses													
	43.2001	41.6292	40.0583	38.4873	36.9164	35.3455	35.3455	36.9164	38.4873	40.0583	41.6292	43.2001 (42c)	
Average daily hot water use (litres/day)												133.1485 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	144.8487	141.7556	137.9889	132.2613	127.6101	122.6096	120.6880	124.4385	128.3939	133.6435	139.4593	144.4730 (44)	
Energy content (annual)													
	229.4049	201.8581	212.0838	181.0591	171.7877	150.7628	145.9617	154.0808	158.3225	181.3529	198.6853	226.2099 (45)	
										Total = Sum(45)m =			2211.5695

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Distribution loss (46)m = 0.15 x (45)m												
34.4107	30.2787	31.8126	27.1589	25.7682	22.6144	21.8943	23.1121	23.7484	27.2029	29.8028	33.9315	(46)
Water storage loss (or HIU loss):												
Store volume											200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):											1.6900	(48)
Temperature factor from Table 2b											0.5400	(49)
Enter (49) or (54) in (55)											0.9126	(55)
Total storage loss												
28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906	(56)
If cylinder contains dedicated solar storage												
28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906	(57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	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												
280.9579	248.4221	262.2411	224.1955	210.5463	188.0461	184.4877	193.5374	202.8096	231.5102	248.5753	277.7629	(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)
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											626.6268	(H24)
Heat delivered to space heating											0.0000	(H29)
Solar input											626.6268	
Solar input	-0.0000	-16.2009	-58.5990	-80.7446	-105.6949	-97.4269	-96.7101	-84.4397	-58.1011	-28.7097	-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												
280.9579	232.2212	203.6420	143.4509	104.8515	90.6192	87.7777	109.0976	144.7084	202.8005	248.5753	277.7629	(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												
117.5195	104.3690	110.6437	94.7113	88.1263	79.9553	79.3531	82.7971	88.2319	100.4256	105.9749	116.4572	(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	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
33.0002	29.3105	23.8369	18.0461	13.4897	11.3885	12.3057	15.9954	21.4690	27.2599	31.8163	33.9174	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
396.9165	401.0353	390.6562	368.5603	340.6681	314.4535	296.9404	292.8217	303.2008	325.2967	353.1889	379.4035	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	(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)												
-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	(71)
Water heating gains (Table 5)												
157.9564	155.3110	148.7146	131.5434	118.4494	111.0490	106.6574	111.2864	122.5443	134.9807	147.1873	156.5285	(72)
Total internal gains												
698.1971	695.9808	673.5316	628.4737	582.9311	547.2149	526.2275	530.4275	557.5381	597.8612	642.5164	680.1733	(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			6.4700	10.6334	0.4000	0.7500	0.7700	14.3031 (74)				
East			0.5200	19.6403	0.4000	0.7500	0.7700	2.1233 (76)				
South			9.2300	46.7521	0.4000	0.7500	0.7700	89.7133 (78)				
West			2.6500	19.6403	0.4000	0.7500	0.7700	10.8205 (80)				
Solar gains	116.9602	199.5821	275.3062	346.9532	395.4621	396.0192	380.3529	343.3724	299.8530	221.0577	140.1250	100.0887 (83)
Total gains	815.1573	895.5629	948.8378	975.4269	978.3932	943.2340	906.5804	873.7999	857.3911	818.9189	782.6414	780.2620 (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	46.4436	46.6102	46.7779	47.6351	47.8103	48.7061	48.7061	48.8893	48.3438	47.8103	47.4612	47.1171
alpha	4.0962	4.1073	4.1185	4.1757	4.1874	4.2471	4.2471	4.2593	4.2229	4.1874	4.1641	4.1411
util living area												
	0.9342	0.9049	0.8562	0.7699	0.6436	0.4777	0.3479	0.3750	0.5586	0.7789	0.8991	0.9420 (86)
Living	20.1730	20.3199	20.5092	20.7117	20.8441	20.9096	20.9236	20.9224	20.8919	20.7347	20.4355	20.1472
Non living	19.3524	19.5362	19.7699	20.0215	20.1730	20.2508	20.2627	20.2643	20.2304	20.0540	19.6916	19.3278
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	20.5769	20.3199	20.5092	20.7117	20.8441	20.9096	20.9236	20.9224	20.8919	20.7347	20.4355	20.2665 (87)
Th 2	20.3290	20.3313	20.3335	20.3448	20.3470	20.3583	20.3583	20.3606	20.3538	20.3470	20.3425	20.3380 (88)
util rest of house												
	0.9260	0.8937	0.8398	0.7450	0.6082	0.4332	0.2981	0.3243	0.5129	0.7502	0.8855	0.9347 (89)
MIT 2	19.9397	19.5362	19.7699	20.0215	20.1730	20.2508	20.2627	20.2643	20.2304	20.0540	19.6916	19.5099 (90)
Living area fraction									fLA =	Living area / (4) =		
MIT	20.0443	19.6649	19.8913	20.1348	20.2832	20.3590	20.3712	20.3724	20.3390	20.1658	19.8137	19.6341 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0443	19.6649	19.8913	20.1348	20.2832	20.3590	20.3712	20.3724	20.3390	20.1658	19.8137	19.6341 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9222	0.8810	0.8278	0.7366	0.6046	0.4332	0.2992	0.3252	0.5118	0.7417	0.8732	0.9257	(94)
Useful gains	751.7319	789.0091	785.4447	718.4646	591.5798	408.6386	271.2062	284.1591	438.8456	607.4001	683.3649	722.3238	(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	1192.4557	1114.2774	1006.9939	829.6272	631.4979	415.9182	272.3614	285.8114	453.9593	703.7907	942.2767	1152.2517	(97)
Space heating kWh	327.8985	218.5802	164.8326	80.0371	29.6991	0.0000	0.0000	0.0000	0.0000	71.7146	186.4165	319.8664	(98a)
Space heating requirement - total per year (kWh/year)												1399.0449	
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	327.8985	218.5802	164.8326	80.0371	29.6991	0.0000	0.0000	0.0000	0.0000	71.7146	186.4165	319.8664	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1399.0449	
Space heating per m2											(98c) / (4) =	13.1774	(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 %)													259.6382	(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	327.8985	218.5802	164.8326	80.0371	29.6991	0.0000	0.0000	0.0000	0.0000	71.7146	186.4165	319.8664	(98)	
Space heating efficiency (main heating system 1)	259.6382	259.6382	259.6382	259.6382	259.6382	0.0000	0.0000	0.0000	0.0000	259.6382	259.6382	259.6382	(210)	
Space heating fuel (main heating system)	126.2905	84.1865	63.4855	30.8264	11.4386	0.0000	0.0000	0.0000	0.0000	27.6210	71.7985	123.1969	(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	280.9579	232.2212	203.6420	143.4509	104.8515	90.6192	87.7777	109.0976	144.7084	202.8005	248.5753	277.7629	(64)	
Efficiency of water heater (217)m	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	281.8650	(216)	
Fuel for water heating, kWh/month	99.6782	82.3874	72.2481	50.8935	37.1992	32.1499	31.1417	38.7056	51.3396	71.9495	88.1895	98.5446	(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	33.0904	29.8881	33.0904	32.0230	33.0904	32.0230	33.0904	33.0904	32.0230	33.0904	32.0230	33.0904	(231)	
Lighting	28.8849	23.1726	20.8643	15.2861	11.8074	9.6468	10.7711	14.0007	18.1855	23.8604	26.9503	29.6877	(232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-37.5384	-55.5011	-82.8465	-95.4058	-103.6941	-96.7097	-95.4989	-89.3321	-78.2136	-64.0142	-41.9035	-32.0906	(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													538.8439	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													281.8650	
Water heating fuel used													754.4269	(219)
Space cooling fuel													0.0000	(221)
Electricity for pumps and fans:														
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.9625)														
mechanical ventilation fans (SFP = 0.9625)													309.6130	(230a)
pump for solar water heating													80.0000	(230g)
Total electricity for the above, kWh/year													389.6130	(231)
Electricity for lighting (calculated in Appendix L)													233.1179	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-872.7485	(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													1043.2531	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	538.8439	16.4900	88.8554 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	754.4269	16.4900	124.4050 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)

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Pumps, fans and electric keep-hot	309.6130	16.4900	51.0552 (249)
Pump for solar water heating	80.0000	16.4900	13.1920 (249)
Energy for lighting	233.1179	16.4900	38.4411 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-872.7485	16.4900	-143.9162
PV Unit electricity exported	0.0000	5.5900	0.0000
Total			-143.9162 (252)
Total energy cost			172.0324 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.4097 (257)
SAP value		93.3590
SAP rating (Section 12)		93 (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	538.8439	0.1566	84.3657 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	754.4269	0.1455	109.7493 (264)
Space and water heating			194.1149 (265)
Pumps, fans and electric keep-hot	389.6130	0.1387	54.0441 (267)
Energy for lighting	233.1179	0.1443	33.6461 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-872.7485	0.1341	-117.0220
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-117.0220 (269)
Total CO2, kg/year			164.7831 (272)
CO2 emissions per m2			1.5500 (273)
EI value			98.5393
EI rating			99 (274)
EI band			A

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

1. Overall dwelling characteristics

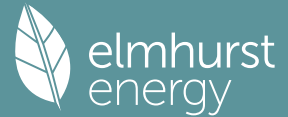
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	53.7400 (1b)	x 2.3600 (2b)	= 126.8264 (1b) - (3b)
First floor	52.4300 (1c)	x 2.6100 (2c)	= 136.8423 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	106.1700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	263.6687 (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	2.6900 (17)
Infiltration rate	0.1345 (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) = 0.1244 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.1000	3.8000	3.7000	3.5000	3.5000	3.2000	3.3000	3.1000	3.1000	3.4000	3.3000	3.7000 (22)
Wind factor	1.0250	0.9500	0.9250	0.8750	0.8750	0.8000	0.8250	0.7750	0.7750	0.8500	0.8250	0.9250 (22a)
Adj infilt rate	0.1275	0.1182	0.1151	0.1089	0.1089	0.0995	0.1026	0.0964	0.0964	0.1058	0.1026	0.1151 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.9000 (23c)
Effective ac	0.2180	0.2087	0.2056	0.1994	0.1994	0.1900	0.1931	0.1869	0.1869	0.1963	0.1931	0.2056 (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	
Main dwelling								
Windows			18.8700	1.2357	23.3184			(27)
Ground Floor			53.7400	0.1300	6.9862	110.0000	5911.4000	(28a)
External Walls	112.2400	18.8700	93.3700	0.1500	14.0055	18.0000	1680.6600	(29a)
External Roof	53.7400		53.7400	0.1100	5.9114	9.0000	483.6600	(30)
Total net area of external elements Aum(A, m2)			219.7200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	50.2215			(33)
Main dwelling								
Party Walls			34.9500	0.0000	0.0000	70.0000	2446.5001	(32)
Internal Walls			80.6100			9.0000	725.4900	(32c)
Internal Floors			52.4300			18.0000	943.7400	(32d)
Internal Ceiling			52.4300			9.0000	471.8700	(32e)

Heat capacity Cm = Sum(A x k)

(28) ... (30) + (32) + (32a) ... (32e) = 12663.3200 (34)

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

119.2740 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	15.0200	0.0930	1.3969	
E3 Sill	15.0200	-0.0590	-0.8862	
E4 Jamb	29.0000	-0.0650	-1.8850	
E5 Ground floor (normal)	23.2400	0.0300	0.6972	
E6 Intermediate floor within a dwelling	21.9900	0.0180	0.3958	
E12 Gable (insulation at ceiling level)	7.0300	0.0390	0.2742	
P4 Party wall - Roof (insulation at ceiling level)	7.0300	0.1010	0.7100	
E10 Eaves (insulation at ceiling level)	16.2100	0.0430	0.6970	
E16 Corner (normal)	14.6600	0.1170	1.7152	
E17 Corner (inverted - internal area greater than external area)	4.7200	0.0400	0.1888	
E18 Party wall between dwellings	9.9400	0.0540	0.5368	

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

3.8407 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 54.0623 (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	18.9703	18.1584	17.8878	17.3465	17.3465	16.5346	16.8053	16.2640	16.2640	17.0759	16.8053	17.8878	(38)
Heat transfer coeff	73.0326	72.2207	71.9500	71.4088	71.4088	70.5969	70.8675	70.3263	70.3263	71.1381	70.8675	71.9500	(39)
Average = Sum(39)m / 12 =												71.3411	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6879	0.6802	0.6777	0.6726	0.6726	0.6649	0.6675	0.6624	0.6624	0.6700	0.6675	0.6777	(40)
HLP (average)												0.6720	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7898 (42)
Hot water usage for mixer showers													
70.9951	69.9282	68.3735	65.3989	63.2036	60.7555	59.3641	60.9070	62.5983	65.2269	68.2654	70.7231		(42a)
Hot water usage for baths													
30.6535	30.1982	29.5571	28.3751	27.4900	26.5086	25.9784	26.6150	27.3082	28.3583	29.5647	30.5498		(42b)
Hot water usage for other uses													
43.2001	41.6292	40.0583	38.4873	36.9164	35.3455	35.3455	36.9164	38.4873	40.0583	41.6292	43.2001		(42c)
Average daily hot water use (litres/day)												133.1485	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	144.8487	141.7556	137.9889	132.2613	127.6101	122.6096	120.6880	124.4385	128.3939	133.6435	139.4593	144.4730	(44)
Energy conte	229.4049	201.8581	212.0838	181.0591	171.7877	150.7628	145.9617	154.0808	158.3225	181.3529	198.6853	226.2099	(45)
Energy content (annual)										Total = Sum(45)m =		2211.5695	
Distribution loss (46)m = 0.15 x (45)m													
34.4107	30.2787	31.8126	27.1589	25.7682	22.6144	21.8943	23.1121	23.7484	27.2029	29.8028	33.9315		(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6900	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9126	(55)
Total storage loss													
28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906	(56)
If cylinder contains dedicated solar storage													
28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906	(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													
280.9579	248.4221	262.2411	224.1955	210.5463	188.0461	184.4877	193.5374	202.8096	231.5102	248.5753	277.7629		(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												729.1810	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												729.1810	
Solar input	-0.3063	-19.7566	-64.2037	-91.5695	-113.9908	-114.2541	-110.7438	-98.9729	-70.0512	-39.1981	-6.1339	-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													
280.6516	228.6655	198.0374	132.6260	96.5556	73.7920	73.7439	94.5644	132.7583	192.3120	242.4415	277.7629		(64)
Total per year (kWh/year) = Sum(64)m =												2023.9111	(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)

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Heat gains from water heating, kWh/month
117.5195 104.3690 110.6437 94.7113 88.1263 79.9553 79.3531 82.7971 88.2319 100.4256 105.9749 116.4572 (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	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	167.3865	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	33.0002	29.3105	23.8369	18.0461	13.4897	11.3885	12.3057	15.9954	21.4690	27.2599	31.8163	33.9174	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	396.9165	401.0353	390.6562	368.5603	340.6681	314.4535	296.9404	292.8217	303.2008	325.2967	353.1889	379.4035	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	54.5284	(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)	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	-111.5910	(71)
Water heating gains (Table 5)	157.9564	155.3110	148.7146	131.5434	118.4494	111.0490	106.6574	111.2864	122.5443	134.9807	147.1873	156.5285	(72)
Total internal gains	698.1971	695.9808	673.5316	628.4737	582.9311	547.2149	526.2275	530.4275	557.5381	597.8612	642.5164	680.1733	(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				6.4700	12.6762		0.4000		0.7500		0.7700		17.0509 (74)
East				0.5200	23.6925		0.4000		0.7500		0.7700		2.5613 (76)
South				9.2300	53.2576		0.4000		0.7500		0.7700		102.1969 (78)
West				2.6500	23.6925		0.4000		0.7500		0.7700		13.0530 (80)
Solar gains	134.8622	204.7752	282.6040	373.9870	415.8302	452.5636	425.3514	383.2240	330.4936	242.8061	163.1609	116.0820	(83)
Total gains	833.0592	900.7560	956.1356	1002.4607	998.7612	999.7784	951.5788	913.6514	888.0317	840.6674	805.6773	796.2554	(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)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	21.0000 (85)
tau	48.1647	48.7061	48.8893	49.2599	49.2599	49.8264	49.6361	50.0181	50.0181	49.4473	49.6361	48.8893	
alpha	4.2110	4.2471	4.2593	4.2840	4.2840	4.3218	4.3091	4.3345	4.3345	4.2965	4.3091	4.2593	
util living area	0.9167	0.8878	0.8276	0.7265	0.5773	0.3977	0.2968	0.2915	0.4933	0.7088	0.8643	0.9251	(86)
Living	20.3164	20.4331	20.6116	20.7762	20.8818	20.9213	20.9266	20.9273	20.9104	20.8176	20.5760	20.3003	
Non living	19.5497	19.6985	19.9169	20.1139	20.2299	20.2748	20.2767	20.2819	20.2680	20.1657	19.8856	19.5377	
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	20.6503	20.4331	20.6116	20.7762	20.8818	20.9213	20.9266	20.9273	20.9104	20.8176	20.5760	20.3982	(87)
Th 2	20.3515	20.3583	20.3606	20.3651	20.3651	20.3719	20.3696	20.3742	20.3742	20.3674	20.3696	20.3606	(88)
util rest of house	0.9066	0.8751	0.8090	0.6997	0.5404	0.3554	0.2505	0.2439	0.4488	0.6751	0.8471	0.9158	(89)
MIT 2	20.0319	19.6985	19.9169	20.1139	20.2299	20.2748	20.2767	20.2819	20.2680	20.1657	19.8856	19.6860	(90)
Living area fraction	20.1334	19.8191	20.0310	20.2226	20.3369	20.3809	20.3834	20.3879	fLA = Living area / (4) =	20.2727	19.9990	19.8029	(91)
MIT	20.1334	19.8191	20.0310	20.2226	20.3369	20.3809	20.3834	20.3879	20.3734	20.2727	19.9990	19.8029	(92)
Temperature adjustment	20.1334	19.8191	20.0310	20.2226	20.3369	20.3809	20.3834	20.3879	20.3734	20.2727	19.9990	19.8029	(93)
adjusted MIT	20.1334	19.8191	20.0310	20.2226	20.3369	20.3809	20.3834	20.3879	20.3734	20.2727	19.9990	19.8029	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9029	0.8631	0.7986	0.6934	0.5387	0.3560	0.2515	0.2450	0.4487	0.6697	0.8360	0.9067	(94)
Ext temp.	752.1289	777.4820	763.6119	695.0858	538.0393	355.9458	239.2999	223.8076	398.4955	563.0334	673.5507	721.9405	(95)
Heat loss rate W	5.0000	5.4000	7.1000	9.4000	12.5000	15.3000	17.0000	17.2000	14.6000	11.6000	7.9000	5.0000	(96)
Space heating kWh	1105.2308	1041.3579	930.3845	772.8288	559.6255	358.6979	239.7724	224.1911	406.0238	616.9590	857.4246	1065.0683	(97)
Space heating requirement - total per year (kWh/year)	262.7078	177.3246	124.0788	55.9750	16.0601	0.0000	0.0000	0.0000	0.0000	40.1206	132.3892	255.2871	(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)	262.7078	177.3246	124.0788	55.9750	16.0601	0.0000	0.0000	0.0000	0.0000	40.1206	132.3892	255.2871	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)	258.0464	258.0464	258.0464	258.0464	258.0464	0.0000	0.0000	0.0000	0.0000	258.0464	258.0464	258.0464	(210)
Space heating per m ²													(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 %)													258.0464 (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	
262.7078	177.3246	124.0788	55.9750	16.0601	0.0000	0.0000	0.0000	0.0000	0.0000	40.1206	132.3892	255.2871	(98)
Space heating efficiency (main heating system 1)	258.0464	258.0464	258.0464	258.0464	258.0464	0.0000	0.0000	0.0000	0.0000	258.0464	258.0464	258.0464	(210)

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Space heating fuel (main heating system)	101.8064	68.7181	48.0839	21.6918	6.2237	0.0000	0.0000	0.0000	0.0000	15.5478	51.3044	98.9307	(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	280.6516	228.6655	198.0374	132.6260	96.5556	73.7920	73.7439	94.5644	132.7583	192.3120	242.4415	277.7629	(64)
Efficiency of water heater	281.8468	281.8468	281.8468	281.8468	281.8468	281.8468	281.8468	281.8468	281.8468	281.8468	281.8468	281.8468	(216)
Fuel for water heating, kWh/month	99.5760	81.1311	70.2642	47.0561	34.2582	26.1816	26.1645	33.5517	47.1030	68.2328	86.0189	98.5510	(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	33.0904	29.8881	33.0904	32.0230	33.0904	32.0230	33.0904	33.0904	32.0230	33.0904	32.0230	33.0904	(231)
Lighting	28.8849	23.1726	20.8643	15.2861	11.8074	9.6468	10.7711	14.0007	18.1855	23.8604	26.9503	29.6877	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-42.9880	-57.4082	-85.0077	-99.9233	-106.2505	-103.3045	-101.0883	-95.2099	-83.9207	-69.1113	-47.9940	-37.0017	(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												412.3070	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												281.8468	
Water heating fuel used												718.0892	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.9625)													
mechanical ventilation fans (SFP = 0.9625)												309.6130	(230a)
pump for solar water heating												80.0000	(230g)
Total electricity for the above, kWh/year												389.6130	(231)
Electricity for lighting (calculated in Appendix L)												233.1179	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-929.2080	(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												823.9190	(238)

10a. Fuel costs - using BEDF prices (599)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	412.3070	26.0000	107.1998	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	718.0892	26.0000	186.7032	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0000	0.0000	(247a)
Pumps, fans and electric keep-hot	309.6130	26.0000	80.4994	(249)
Pump for solar water heating	80.0000	26.0000	20.8000	(249)
Energy for lighting	233.1179	26.0000	60.6107	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-929.2080	26.0000	-241.5941	
PV Unit electricity exported	0.0000	5.8100	0.0000	
Total			-241.5941	(252)
Total energy cost			214.2189	(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	412.3070	0.1573	64.8568	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	718.0892	0.1464	105.0961	(264)
Space and water heating			169.9530	(265)
Pumps, fans and electric keep-hot	389.6130	0.1387	54.0441	(267)
Energy for lighting	233.1179	0.1443	33.6461	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-929.2080	0.1342	-124.7093	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-124.7093	(269)
Total CO2, kg/year			132.9339	(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	412.3070	1.5823	652.4017	(275)

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Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	718.0892	1.5414	1106.8705 (278)
Space and water heating			1759.2723 (279)
Pumps, fans and electric keep-hot	389.6130	1.5128	589.4065 (281)
Energy for lighting	233.1179	1.5338	357.5640 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-929.2080	1.4960	-1390.0849
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-1390.0849 (283)
Total Primary energy kWh/year			1316.1578 (286)