



Energy/Sustainability Statement

Proposed Residential Apartments

207 - 209 Bury Old Road, Prestwich, Bury, M25 1JF

30th June 2025

ENVIRONMENTAL AND
SUSTAINABILITY CONSULTANTS

Document Control

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1. Executive Summary

This Energy/Sustainability Statement highlights that the proposed dwellings have been designed with a commitment to providing an environmentally sustainable development by delivering a dwelling with thermally efficient building fabric, energy efficient design measures and the incorporation of energy efficient and low or zero carbon technologies.

The design of the dwelling ensures that an average predicted reduction in CO₂ emissions of **60.75%** is achieved over and above the current 2021 Part L1 Building Regulations.

2. Introduction

Encon Associates Limited have been commissioned by Mr Hassen Lakhel to undertake sample SAP calculations in support of a planning application for 5 New Build Apartments at 207 - 209 Bury Old Road, Prestwich. Sample SAP calculations have been undertaken to ascertain the dwellings performance based on a fabric first approach and the utilisation of low or zero carbon technologies.

The SAP calculations that have been completed indicate the approximate CO₂ emissions and the predicted energy consumed for the actual designed dwelling, these are compared against figures for a notional dwelling that represents a 'Good practice' dwelling with the same measurements, basic structure, and geographical location of the actual dwelling. In order for the dwellings to be compliant the dwelling CO₂ emission rate (DER) must be lower than the target CO₂ emission rate (TER), and the fabric energy efficiency of the notional building (TFEE) must be higher than the design fabric energy efficiency (DFEE).

3. Sustainability Design Target

The dwellings have been designed to be energy efficient by incorporating thermally efficient building fabric, and an air source heat pump providing the space heating and hot water. Standard energy efficient features will be incorporated into the design such as LED lighting throughout.

4. Construction Materials

In order to keep heat losses through the thermal envelope to a minimum, this dwelling is designed to achieve low U-values that improve on the minimum figures required by Building Regulations. The same commitment to restricting heat loss has been applied to all elements of the building envelope, including providing new energy efficient windows throughout.

Responsible sourcing of materials is a key aspect of a material's environmental credentials, therefore all materials will be procured responsibly where possible offering auditable environmental management chains or chain of custody, however if formal certification is not possible alternative materials are sought but only from recognised suppliers with internal materials procedures meeting minimum environmental standards. The materials specified in most cases are A or A+ rated on the Green Guide which means the energy required to manufacture and supply these materials is kept to a minimum.

5. SAP Results and Predicted Building Emissions

The SAP calculations undertaken highlight the following predicted regulated carbon savings based on the project's predicted design. A summary of the specification used is provided in Appendix A and all supporting SAP calculations are provided within appendix B.

Dwelling Emissions

At this stage of the design sample SAP calculations have been completed to determine predicted dwelling emissions. Based on the sample SAP calculations undertaken, the dwellings average net predicted CO₂ emissions are 4.81kgCO₂ year/m². When compared to the Building Regulations 2021 notional dwelling a saving of 7.69kgCO₂ year/m² is predicted.

6. SAP Results and Predicted Carbon Savings

The sample SAP calculations undertaken highlight the following predicted carbon savings based on the projects predicted design.

Predicted Building Carbon Savings

At this stage of the design sample SAP calculations have been completed to determine predicted carbon savings. Based on the calculated CO₂ over the sample SAP calculations it is predicted that an average CO₂ saving of 60.75% can be achieved over Part L1 Building Regulations 2021.

7. Conclusion

The project specification developed by Plans to Build It Ltd in association with Encon Associates results in an average overall predicted reduction of regulated CO₂ emissions of **60.75%** over Part L1 Building Regulations 2021. A 60.75% reduction of CO₂ emissions is a significant improvement equivalent to approximately **478.58 kgCO₂/Year** over the notional Building Regulations 2021 compliant dwelling.

8. Appendix A

SAP Design Stage Summary Sheet

Tel: 01159 875599

Email: enquiries@enconassociates.com

Project/site name	Bury Old Road, Prestwich
Reference Number	A7284
Client name	Mr Hassen Lakhel
Dwelling type	Flats
Number of dwellings	5
Under Building Regulations	2021

External Elements	U value (W/m2K)	Construction
Ground floor	0.15 (0.12 req.)	150mm 1% reinforced concrete, over 100mm Celotex GA4000
Exposed Floor	0.30 (0.12 req.)	Timber Exposed floor over VOID, 18mm Ply, 75mm Air Gap, 100mm Rockwool RW4, 12.5mm High density Plasterboard, Fireboard (Thermaline Basic 22mm finish)
External Walls	0.18	Spec TBC based on U Value Target
Sheltered Walls	0.18	100mm Facing brickwork, 150mm Full Fill Rockwool RW4 slab, 100mm Thermalite Turbo block
Party Walls	0.00	Blockwork cavity, fully edge sealed
Roof @ Joists (Flat Ceiling)	0.14	300mm Rockwool
Roof @ Bay windows and Balconies over	0.11 req.	No details provided
Flat Roof	0.15	Spec TBC based on U Value Target
External Doors	-	-
Windows	1.0 req.	Double glazed low-e soft 0.05
Roof Lights	-	-
Roof Windows	-	Please note Velux windows noted on plans have not been included in the calculations as the section shows insulation at First Floor level to be at ceiling and no vaulted ceilings.

Air Tightness Test	
Design Stage Air Permeability Rate (m3/hm2)	5.0 assumed

Heating	
Heating Fuel	Electricity
Main heating system	ASHP
Make & model of main heating system	TBC
Design flow temperature	35
Heating Emitter	Underfloor
Heating controls	Time and Temp by arrangement (Programmer)
Secondary heating system	N/A

Water Heating	
Hot water system	From Main heating
Cylinder volume	125ltr/200ltr
Make and model of cylinder	TBC (Telford Tempest or equivalent)
Declared loss factor (kWh/day)	0.013/0.009
Pipework insulation	Fully insulated primary pipework
Shower type	0/1
Bath Count	1
Water Waste Heat Recovery System	No

Ventilation

Ventilation system type	N/A local extract only
Make and model of ventilation system	N/A

Lighting

Power (W)	8W LED throughout
Efficacy (lm/W)	95

Renewables

System Type	None
System Details	None
Battery Capacity (kWh)	None
Diverter Present	None

Thermal Bridging

Thermal Bridging details adopted	Knauf – Standard Block
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Knauf details have been adopted within the calculations. The changing of said details may have severe implications on the calculations. Encon Associates will not be held accountable for any liability of the results of the calculations, if the thermal bridging details are to change.

Post Construction Confirmations

Tel: 01159 875599

Email: enquiries@enconassociates.com

Project/site name	Bury Old Road, Prestwich
Reference Number	A7284

Upon completion of the project Encon Associates, can upgrade the previous design stage calculation to a post construction calculation in order to generate the Energy performance Certificate (EPC).

In order to produce the Energy performance Certificate, we require a signature from a trusted stake holder that can confirm, that all the build specification listed on the above SAP Design Stage Summary Sheet is correct.

You will find the signature note at the bottom of this page.

Along with the above we also require the following;

Requirement	Please tick if provided
Air Tightness Test	
Photographic Evidence (Thermal Bridge and Build Details)	
Signed Thermal Bridging Check List	

Client confirmation for post construction.		
I confirm that the above details are correct to the best of my knowledge.		
Name:	Position:	Date:
Signed:		

Post Construction Deviations

Tel: 01159 875599

Email: enquiries@enconassociates.com

Project/site name	Bury Old Road, Prestwich
Reference Number	A7284

During the build of the project, please make it known in the below box if there have been any deviations from the design stage build specification.

Post Construction Deviations (please write below)

Thermal Bridging Checklist

Tel: 01159 875599

Email: enquiries@enconassociates.com

Project/site name	Bury Old Road, Prestwich
Reference Number	A7284

Thermal Junction	Source	Psi Value (W/mK)
E1 - Lintels	Knauf	0.305
E3 - Sill	Knauf	0.024
E4 - Jamb	Knauf	0.024
E5 – Ground floor	Knauf	0.041
E7 – Party floor between dwellings (in blocks of flats)	Knauf	0.033
E8 – Balcony within dwelling insulation continuous	K1 default	0.1
E10 – Eaves (insulation @ ceiling level)	Knauf	0.082
E12 – Gable (insulation @ ceiling level)	Knauf	0.046
E16 - Corner	Knauf	0.04
E17 – Corner (inverted)	Knauf	-0.086
E18 – Party wall between dwellings	Knauf	0.03
P1 – Ground floor	K1 default	0.32
P3 - Intermediate floor between blocks of flats	K1 default	0
P7 – Exposed Floor	K1 default	0.48
P4 – Roof (insulation @ ceiling level)	Knauf	0.035

Client confirmation for thermal bridging checklist.

I confirm that the above details are correct to the best of my knowledge.

Name:	Position:	Date:

Signed:

9. Appendix B

Building Regulations England Part L (BREL) Compliance Report

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

Date: Mon 30 Jun 2025 11:01:33

Project Information			
Assessed By	Nathaniel Kempson	Building Type	Flat, Semi-detached
OCDEA Registration	EES/020528	Assessment Date	2025-06-30

Dwelling Details			
Assessment Type	As designed	Total Floor Area	44 m ²
Site Reference	Flat 1	Plot Reference	As Designed
Address	Flat 1 Bury Old Road, Prestwich, M25 3DE		

Client Details	
Name	Glenn Miles
Company	Encon Associates Ltd
Address	10 Chapel Lane, Nottingham, NG5 7DR

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	13.64 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	4.97 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	71.8 kWh _{PE} /m ²		
Dwelling primary energy	52.33 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	32.8 kWh/m ²		
Dwelling fabric energy efficiency	32.6 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	0.18	Walls (1) (0.18)	OK
Party walls	0.2	0	Party Wall (1) (0)	N/A
Curtain walls	1.6	0	N/A	N/A
Floors	0.18	0.12	Heatloss Floor 1 (0.12)	OK
Roofs	0.16	0.11	Roof (1) (0.11)	OK
Windows, doors, and roof windows	1.6	1	East Windows (1)	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)	27.2075	0.18	
Party wall: Party Wall (1)	15.28	0 (!)	
Party wall: Party Wall (2)	17.98	0 (!)	
Ground floor: Heatloss Floor 1, Heatloss Floor 1	44.26	0.12	
Exposed roof: Roof (1)	0.72	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]
East Windows, Windows	2.625	East	0.7	1 (!)
East Windows, Windows	2.625	East	0.7	1 (!)
North East Windows, Windows	0.83125	North East	0.7	1 (!)
South East Windows, Windows	0.83125	South East	0.7	1 (!)

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	E1: Steel lintel with perforated steel base plate	Not government-approved scheme	0.305	Knauf

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E3: Sill	Not government-approved scheme	0.024 (!)	Knauf
External wall	E4: Jamb	Not government-approved scheme	0.024 (!)	Knauf
External wall	E5: Ground floor (normal)	Not government-approved scheme	0.041	Knauf
External wall	E16: Corner (normal)	Not government-approved scheme	0.04	Knauf
External wall	E7: Party floor between dwellings (in blocks of flats)	Not government-approved scheme	0.033 (!)	Knauf
External wall	E18: Party wall between dwellings	Not government-approved scheme	0.03 (!)	Knauf
Party wall	P1: Ground floor	SAP table default	0.32	
Party wall	P3: Intermediate floor between dwellings (in blocks of flats)	SAP table default	0 (!)	
External wall	E10: Eaves (insulation at ceiling level)	SAP table default	0.12	

3 Air permeability (better than typically expected values are flagged with a subsequent (!))

Maximum permitted air permeability at 50Pa	8 m ³ /hm ²	
Dwelling air permeability at 50Pa	5 m ³ /hm ² , Design value	OK
Air permeability test certificate reference		

4 Space heating

Main heating system 1: Heat pump with radiators or underfloor heating - Electricity

Efficiency	249.9%
Emitter type	Underfloor
Flow temperature	35°C
System type	Air source heat pump
Manufacturer	TBC
Model	TBC
Commissioning	

Secondary heating system: N/A

Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water

Cylinder/store - type: Cylinder

Capacity	125 litres
Declared heat loss	0.013 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

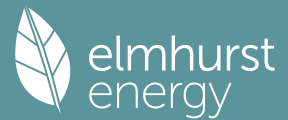
Manufacturer	
Model	

7 Lighting

Minimum permitted light source efficacy	75 lm/W	
Lowest light source efficacy	95 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: N/A		
Maximum permitted specific fan power	N/A	
Specific fan power	N/A	N/A
Minimum permitted heat recovery efficiency	N/A	
Heat recovery efficiency	N/A	N/A
Manufacturer/Model		
Commissioning		
9 Local generation		
N/A		
10 Heat networks		
N/A		
11 Supporting documentary evidence		
N/A		
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 information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.		
Signed: Name:	Assessor ID: Date:	
b. Client Declaration		
N/A		

Full SAP Calculation Printout



Property Reference	Flat 1				Issued on Date	30/06/2025	
Assessment Reference	As Designed			Prop Type Ref			
Property	Flat 1, Bury Old Road, Prestwich, Manchester, M25 3DE						
SAP Rating	85 B	DER	4.97	TER	13.64		
Environmental	97 A	% DER < TER				63.56	
CO ₂ Emissions (t/year)	0.21	DFEE	32.62	TFEE	32.84		
Compliance Check	See BREL	% DFEE < TFEE				0.66	
% DPER < TPER	27.12	DPER	52.33	TPER	71.80		
Assessor Details	Mr. Nathaniel Kempson				Assessor ID	R421-0001	
Client	Encon Associates, Glenn Miles						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	44.2600 (1b)	2.5000 (2b)	110.6500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	44.2600		110.6500 (4)
Dwelling volume			110.6500 (5)

2. Ventilation rate

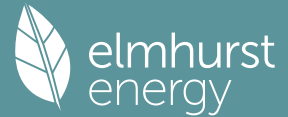
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1808 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4308 (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) = 0.3984 (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	0.5080	0.4981	0.4881	0.4383	0.4283	0.3785	0.3785	0.3686	0.3984	0.4283	0.4482	0.4682 (22b)
Effective ac	0.6290	0.6240	0.6191	0.5960	0.5917	0.5716	0.5716	0.5679	0.5794	0.5917	0.6005	0.6096 (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			6.9100	0.9615	6.6442		(27)
Heatloss Floor 1			44.2600	0.1200	5.3112	110.0000	4868.6000 (28a)
External Wall 1	34.1250	6.9100	27.2150	0.1800	4.8987	110.0000	2993.6500 (29a)
Bay window	0.7200		0.7200	0.1100	0.0792	9.0000	6.4800 (30)
Total net area of external elements Aum(A, m ²)			79.1050				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.9333		(33)
Main dwelling							
Party Wall Between Flats			15.2800	0.0000	0.0000	180.0000	2750.4000 (32)
Party Wall Between Corridor			17.9800	0.0000	0.0000	180.0000	3236.4000 (32)
Party Ceiling 1			43.8700			20.0000	877.4000 (32b)
Internal Wall 1			77.5000			9.0000	697.5000 (32c)
Heat capacity Cm = Sum (A x k)						(28)...(30) + (32) + (32a)...(32e) =	15430.4300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							348.6315 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate				3.9500	0.3050	1.2047	
E3 Sill				3.9500	0.0240	0.0948	
E4 Jamb				14.0000	0.0240	0.3360	
E5 Ground floor (normal)				13.6500	0.0410	0.5597	

Full SAP Calculation Printout



E16 Corner (normal)	2.5000	0.0400	0.1000
E7 Party floor between dwellings (in blocks of flats)	13.6500	0.0330	0.4505
E18 Party wall between dwellings	2.5000	0.0300	0.0750
P1 Party wall - Ground floor	13.3000	0.3200	4.2560
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.3000	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	2.3200	0.1200	0.2784
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			7.3551 (36)
Point Thermal bridges			0.0000
Total fabric heat loss	(33) + (36) + (36a) =		24.2884 (37)

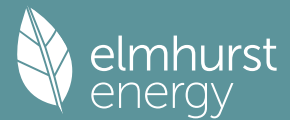
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	22.9691	22.7861	22.6068	21.7644	21.6068	20.8731	20.8731	20.7373	21.1557	21.6068	21.9256	22.2590 (38)
Average = Sum(39)m / 12 =	47.2575	47.0745	46.8952	46.0528	45.8952	45.1615	45.1615	45.0256	45.4441	45.8952	46.2140	46.5473 (39)
												46.0520
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0677	1.0636	1.0595	1.0405	1.0369	1.0204	1.0204	1.0173	1.0268	1.0369	1.0441	1.0517 (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												1.5236 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
Hot water usage for other uses	57.3089	56.4578	55.2592	53.0493	51.3946	49.5597	48.5686	49.7588	51.0546	53.0180	55.2734	57.1152 (42c)
Average daily hot water use (litres/day)	30.2331	29.1338	28.0344	26.9350	25.8356	24.7362	24.7362	25.8356	26.9350	28.0344	29.1338	30.2331 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	87.5420	85.5915	83.2936	79.9843	77.2301	74.2959	73.3048	75.5944	77.9896	81.0524	84.4072	87.3483 (44)
Energy content (annual)	138.6452	121.8812	128.0192	109.4945	103.9666	91.3555	88.6558	93.6016	96.1690	109.9873	120.2535	136.7663 (45)
Distribution loss	(46)m = 0.15 x (45)m											1338.7956
Water storage loss:	20.7968	18.2822	19.2029	16.4242	15.5950	13.7033	13.2984	14.0402	14.4253	16.4981	18.0380	20.5149 (46)
Store volume												125.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.0130 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.0070 (55)
Total storage loss	0.2176	0.1966	0.2176	0.2106	0.2176	0.2106	0.2176	0.2176	0.2106	0.2176	0.2106	0.2176 (56)
If cylinder contains dedicated solar storage	0.2176	0.1966	0.2176	0.2106	0.2176	0.2106	0.2176	0.2176	0.2106	0.2176	0.2106	0.2176 (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	162.1252	143.0890	151.4992	132.2171	127.4466	114.0781	112.1358	117.0816	118.8916	133.4673	142.9761	160.2463 (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	162.1252	143.0890	151.4992	132.2171	127.4466	114.0781	112.1358	117.0816	118.8916	133.4673	142.9761	160.2463 (64)
12Total per year (kWh/year)												1615.2539 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	64.8835	57.4917	61.3504	54.5850	53.3529	48.5538	48.2621	49.9065	50.1543	55.3548	58.1624	64.2588 (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	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	70.0009	77.5010	70.0009	72.3343	70.0009	72.3343	70.0009	70.0009	72.3343	70.0009	72.3343	70.0009 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	132.3762	133.7499	130.2883	122.9191	113.6167	104.8738	99.0331	97.6594	101.1210	108.4902	117.7926	126.5354 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180 (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)	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438 (71)
Water heating gains (Table 5)	87.2091	85.5531	82.4602	75.8125	71.7109	67.4358	64.8684	67.0787	69.6587	74.4016	80.7811	86.3694 (72)
Total internal gains	335.4402	342.6580	328.6034	316.9198	301.1825	290.4979	279.7563	280.5930	288.9679	298.7467	316.7618	328.7597 (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
Northeast				0.8300	11.2829		0.6300		0.7000		0.7700	2.8620 (75)
East				5.2500	19.6403		0.6300		0.7000		0.7700	31.5122 (76)
Southeast				0.8300	36.7938		0.6300		0.7000		0.7700	9.3331 (77)
Solar gains	43.7073	83.3679	133.7677	192.2497	234.8125	240.4224	228.8444	196.8064	154.4140	97.8362	54.0720	36.2385 (83)
Total gains	379.1474	426.0259	462.3711	509.1696	535.9950	530.9202	508.6007	477.3994	443.3819	396.5829	370.8339	364.9982 (84)

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7. Mean internal temperature (heating season)												
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	90.6995	91.0521	91.4003	93.0721	93.3917	94.9089	94.9089	95.1953	94.3187	93.3917	92.7474	92.0833
alpha	7.0466	7.0701	7.0934	7.2048	7.2261	7.3273	7.3273	7.3464	7.2879	7.2261	7.1832	7.1389
util living area	0.9970	0.9925	0.9783	0.9139	0.7594	0.5415	0.3905	0.4333	0.6896	0.9433	0.9917	0.9977 (86)
MIT	20.3800	20.4864	20.6369	20.8276	20.9291	20.9554	20.9574	20.9573	20.9463	20.8118	20.5708	20.3699 (87)
Th 2	20.0273	20.0307	20.0340	20.0497	20.0527	20.0664	20.0664	20.0689	20.0611	20.0527	20.0467	20.0405 (88)
util rest of house	0.9957	0.9892	0.9689	0.8818	0.6959	0.4641	0.3078	0.3459	0.6043	0.9140	0.9875	0.9967 (89)
MIT 2	19.3134	19.4512	19.6418	19.8780	19.9788	20.0110	20.0119	20.0145	20.0010	19.8687	19.5726	19.3117 (90)
Living area fraction	fLA = Living area / (4) =											0.5099 (91)
MIT	19.8573	19.9791	20.1493	20.3622	20.4634	20.4926	20.4940	20.4953	20.4831	20.3496	20.0816	19.8513 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.8573	19.9791	20.1493	20.3622	20.4634	20.4926	20.4940	20.4953	20.4831	20.3496	20.0816	19.8513 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9954	0.9890	0.9702	0.8934	0.7244	0.4997	0.3457	0.3860	0.6436	0.9245	0.9877	0.9964 (94)
Useful gains	377.4119	421.3400	448.5999	454.8679	388.2831	265.2743	175.8122	184.2884	285.3797	366.6387	366.2742	363.6824 (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	735.1972	709.8416	640.0854	527.8671	402.1966	266.1186	175.8602	184.3929	290.0726	447.4594	599.9328	728.5263 (97)
Space heating kWh	266.1923	193.8731	142.4652	52.5594	10.3516	0.0000	0.0000	0.0000	0.0000	60.1306	168.2341	271.4439 (98a)
Space heating requirement - total per year (kWh/year)												1165.2502
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	266.1923	193.8731	142.4652	52.5594	10.3516	0.0000	0.0000	0.0000	0.0000	60.1306	168.2341	271.4439 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1165.2502
Space heating per m2	(98c) / (4) =											26.3274 (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 %)												249.9000 (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	266.1923	193.8731	142.4652	52.5594	10.3516	0.0000	0.0000	0.0000	0.0000	60.1306	168.2341	271.4439 (98)
Space heating efficiency (main heating system 1)	249.9000	249.9000	249.9000	249.9000	249.9000	0.0000	0.0000	0.0000	0.0000	249.9000	249.9000	249.9000 (210)
Space heating fuel (main heating system)	106.5195	77.5803	57.0089	21.0322	4.1423	0.0000	0.0000	0.0000	0.0000	24.0619	67.3206	108.6210 (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	162.1252	143.0890	151.4992	132.2171	127.4466	114.0781	112.1358	117.0816	118.8916	133.4673	142.9761	160.2463 (64)
Efficiency of water heater												175.1000 (216)
(217)m	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000 (217)
Fuel for water heating, kWh/month	92.5901	81.7184	86.5215	75.5095	72.7851	65.1502	64.0410	66.8656	67.8993	76.2235	81.6540	91.5170 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	14.1479	11.3500	10.2194	7.4872	5.7833	4.7250	5.2757	6.8576	8.9073	11.6869	13.2003	14.5411 (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												466.2866 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												175.1000
Water heating fuel used												922.4751 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												114.1815 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)

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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	1502.9432 (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	466.2866	0.1570	73.1953 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	922.4751	0.1411	130.1231 (264)
Space and water heating			203.3184 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	114.1815	0.1443	16.4799 (268)
Total CO2, kg/year			219.7983 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.9700 (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	466.2866	1.5811	737.2610 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	922.4751	1.5216	1403.6301 (278)
Space and water heating			2140.8911 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	114.1815	1.5338	175.1354 (282)
Total Primary energy kWh/year			2316.0265 (286)
Dwelling Primary energy Rate (DPER)			52.3300 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	44.2600 (1b)	x 2.5000 (2b)	= 110.6500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	44.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 110.6500 (5)

2. Ventilation rate

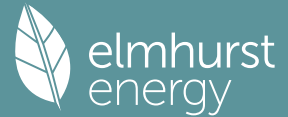
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1808 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4308 (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) = 0.3984 (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	0.5080	0.4981	0.4881	0.4383	0.4283	0.3785	0.3785	0.3686	0.3984	0.4283	0.4482	0.4682 (22b)
Effective ac	0.6290	0.6240	0.6191	0.5960	0.5917	0.5716	0.5716	0.5679	0.5794	0.5917	0.6005	0.6096 (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			6.9100	1.1450	7.9122		(27)
Heatloss Floor 1			44.2600	0.1300	5.7538		(28a)
External Wall 1	34.1250	6.9100	27.2150	0.1800	4.8987		(29a)
Bay window	0.7200		0.7200	0.1100	0.0792		(30)
Total net area of external elements Aum(A, m2)			79.1050				(31)

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Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	18.6439	(33)
Main dwelling			
Party Wall Between Flats	15.2800	0.0000	0.0000 (32)
Party Wall Between Corridor	17.9800	0.0000	0.0000 (32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 358.5434 (35)

List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	3.9500	0.0500	0.1975
E3 Sill	3.9500	0.0500	0.1975
E4 Jamb	14.0000	0.0500	0.7000
E5 Ground floor (normal)	13.6500	0.1600	2.1840
E16 Corner (normal)	2.5000	0.0900	0.2250
E7 Party floor between dwellings (in blocks of flats)	13.6500	0.0700	0.9555
E18 Party wall between dwellings	2.5000	0.0600	0.1500
P1 Party wall - Ground floor	13.3000	0.0800	1.0640
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.3000	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	2.3200	0.0600	0.1392

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.8127 (36)

Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	24.4566 (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	22.9691	22.7861	22.6068	21.7644	21.6068	20.8731	20.8731	20.7373	21.1557	21.6068	21.9256	22.2590
Average = Sum(39)m / 12 =	47.4257	47.2427	47.0634	46.2210	46.0634	45.3297	45.3297	45.1939	45.6123	46.0634	46.3822	46.7156

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0715	1.0674	1.0633	1.0443	1.0407	1.0242	1.0242	1.0211	1.0306	1.0407	1.0479	1.0555
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.5236 (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	57.3089	56.4578	55.2592	53.0493	51.3946	49.5597	48.5686	49.7588	51.0546	53.0180	55.2734	57.1152	(42b)
Hot water usage for other uses	30.2331	29.1338	28.0344	26.9350	25.8356	24.7362	24.7362	25.8356	26.9350	28.0344	29.1338	30.2331	(42c)
Average daily hot water use (litres/day)													80.6191 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	87.5420	85.5915	83.2936	79.9843	77.2301	74.2959	73.3048	75.5944	77.9896	81.0524	84.4072	87.3483	(44)
Energy content (annual)	138.6452	121.8812	128.0192	109.4945	103.9666	91.3555	88.6558	93.6016	96.1690	109.9873	120.2535	136.7663	(45)
Distribution loss (46)m = 0.15 x (45)m	20.7968	18.2822	19.2029	16.4242	15.5950	13.7033	13.2984	14.0402	14.4253	16.4981	18.0380	20.5149	(46)
Water storage loss:													
Store volume													125.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.2537 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.6770 (55)
Total storage loss	20.9878	18.9567	20.9878	20.3107	20.9878	20.3107	20.9878	20.9878	20.3107	20.9878	20.3107	20.9878	(56)
If cylinder contains dedicated solar storage	20.9878	18.9567	20.9878	20.3107	20.9878	20.3107	20.9878	20.9878	20.3107	20.9878	20.3107	20.9878	(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	182.8954	161.8491	172.2693	152.3172	148.2168	134.1782	132.9060	137.8518	138.9917	154.2375	163.0762	181.0165	(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	182.8954	161.8491	172.2693	152.3172	148.2168	134.1782	132.9060	137.8518	138.9917	154.2375	163.0762	181.0165	(64)
12Total per year (kWh/year)													1859.8058 (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	1860 (64)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)
Heat gains from water heating, kWh/month	81.4997	72.4998	77.9665	70.6651	69.9690	64.6339	64.8782	66.5227	66.2344	71.9709	74.2425	80.8749	(65)

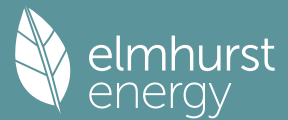
5. Internal gains (see Table 5 and 5a)

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	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	70.0009	77.5010	70.0009	72.3343	70.0009	72.3343	70.0009	70.0009	72.3343	70.0009	72.3343	70.0009	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	132.3762	133.7499	130.2883	122.9191	113.6167	104.8738	99.0331	97.6594	101.1210	108.4902	117.7926	126.5354	(68)
Pumps, fans	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	(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	3.0000	3.0000	3.0000	(70)
Water heating gains (Table 5)	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	(71)
Total internal gains	109.5426	107.8866	104.7937	98.1460	94.0444	89.7693	87.2019	89.4122	91.9922	96.7351	103.1146	108.7029	(72)
	360.7737	367.9915	353.9369	342.2533	326.5160	312.8314	302.0898	302.9265	311.3014	324.0802	342.0953	354.0932	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
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	m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W
Northeast	0.8300	11.2829	0.6300	0.7000	0.7700	2.8620 (75)
East	5.2500	19.6403	0.6300	0.7000	0.7700	31.5122 (76)
Southeast	0.8300	36.7938	0.6300	0.7000	0.7700	9.3331 (77)

Solar gains	43.7073	83.3679	133.7677	192.2497	234.8125	240.4224	228.8444	196.8064	154.4140	97.8362	54.0720	36.2385	(83)
Total gains	404.4809	451.3594	487.7046	534.5031	561.3285	553.2537	530.9342	499.7329	465.7154	421.9164	396.1674	390.3317	(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	92.9473	93.3073	93.6629	95.3699	95.6962	97.2450	97.2450	97.5374	96.6425	95.6962	95.0383	94.3602	
alpha	7.1965	7.2205	7.2442	7.3580	7.3797	7.4830	7.4830	7.5025	7.4428	7.3797	7.3359	7.2907	
util living area	0.9961	0.9905	0.9733	0.8993	0.7357	0.5224	0.3755	0.4157	0.6635	0.9287	0.9890	0.9969	(86)
MIT	20.2909	20.4282	20.6210	20.8562	20.9718	20.9980	20.9998	20.9997	20.9895	20.8403	20.5376	20.2773	(87)
Th 2	20.0242	20.0276	20.0309	20.0466	20.0495	20.0632	20.0632	20.0658	20.0579	20.0495	20.0436	20.0374	(88)
util rest of house	0.9944	0.9863	0.9619	0.8636	0.6713	0.4470	0.2957	0.3315	0.5791	0.8939	0.9834	0.9955	(89)
MIT 2	19.2208	19.3970	19.6383	19.9207	20.0313	20.0625	20.0632	20.0657	20.0531	19.9130	19.5490	19.2141	(90)
Living area fraction	19.7665	19.9229	20.1394	20.3978	20.5109	20.5395	20.5408	20.5420	20.5306	20.3859	20.0531	19.7562	(91)
MIT	19.7665	19.9229	20.1394	20.3978	20.5109	20.5395	20.5408	20.5420	20.5306	20.3859	20.0531	19.7562	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7665	19.9229	20.1394	20.3978	20.5109	20.5395	20.5408	20.5420	20.5306	20.3859	20.0531	19.7562	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9938	0.9858	0.9634	0.8778	0.7035	0.4855	0.3364	0.3744	0.6222	0.9077	0.9834	0.9950	(94)
Useful gains	401.9592	444.9471	469.8391	469.1907	394.8673	268.6043	178.6032	187.1186	289.7647	382.9658	389.6037	388.3754	(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	733.5073	709.7217	641.9157	531.4381	405.8599	269.2366	178.6373	187.1926	293.3143	450.7724	600.7957	726.7180	(97)
Space heating kWh	246.6718	177.9285	128.0250	44.8181	8.1785	0.0000	0.0000	0.0000	0.0000	50.4481	152.0583	251.7269	(98a)
Space heating requirement - total per year (kWh/year)												1059.8552	
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	246.6718	177.9285	128.0250	44.8181	8.1785	0.0000	0.0000	0.0000	0.0000	50.4481	152.0583	251.7269	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1059.8552	
Space heating per m2										(98c) / (4) =		23.9461	(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	246.6718	177.9285	128.0250	44.8181	8.1785	0.0000	0.0000	0.0000	0.0000	50.4481	152.0583	251.7269	(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)	267.2501	192.7719	138.7053	48.5570	8.8608	0.0000	0.0000	0.0000	0.0000	54.6567	164.7435	272.7269	(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	182.8954	161.8491	172.2693	152.3172	148.2168	134.1782	132.9060	137.8518	138.9917	154.2375	163.0762	181.0165	(64)
Efficiency of water heater (217)m	84.7313	84.2727	83.4038	81.6821	80.2252	79.8000	79.8000	79.8000	79.8000	81.8444	83.9032	79.8000	(216)
Fuel for water heating, kWh/month	215.8534	192.0541	206.5485	186.4756	184.7509	168.1431	166.5488	172.7466	174.1751	188.4520	194.3624	213.4642	(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	14.5448	11.6684	10.5061	7.6972	5.9455	4.8576	5.4237	7.0500	9.1572	12.0148	13.5706	14.9491	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.2332	-30.2102	-43.8422	-49.8246	-54.2345	-50.8723	-50.3098	-47.2812	-41.9587	-34.8513	-23.4662	-18.3306	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-11.1694	-23.5888	-47.0322	-70.8288	-93.8007	-94.2414	-93.0680	-78.6779	-57.5507	-33.7224	-14.9151	-8.8203	(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												1148.2722	(211)
Space heating fuel - main system 2												0.0000	(213)

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Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2263.5747 (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)	117.3850 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1093.8307 (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	2521.4012 (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	1148.2722	0.2100	241.1372 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2263.5747	0.2100	475.3507 (264)
Space and water heating			716.4879 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	117.3850	0.1443	16.9423 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-466.4150	0.1343	-62.6610
PV Unit electricity exported	-627.4157	0.1258	-78.9502
Total			-141.6112 (269)
Total CO2, kg/year			603.7482 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.6400 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1148.2722	1.1300	1297.5476 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2263.5747	1.1300	2557.8395 (278)
Space and water heating			3855.3870 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	117.3850	1.5338	180.0490 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-466.4150	1.4965	-697.9929
PV Unit electricity exported	-627.4157	0.4619	-289.8008
Total			-987.7937 (283)
Total Primary energy kWh/year			3177.7431 (286)
Target Primary Energy Rate (TPER)			71.8000 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	44.2600 (1b)	2.5000 (2b)	110.6500 (1b) - (3b)
Ground floor			0.0000 (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	44.2600		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	110.6500 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1808 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4308 (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) = 0.3984 (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	0.5080	0.4981	0.4881	0.4383	0.4283	0.3785	0.3785	0.3686	0.3984	0.4283	0.4482	0.4682 (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	0.6290	0.6240	0.6191	0.5960	0.5917	0.5716	0.5716	0.5679	0.5794	0.5917	0.6005	0.6096 (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			6.9100	0.9615	6.6442		(27)
Heatloss Floor 1			44.2600	0.1200	5.3112	110.0000	4868.6000 (28a)
External Wall 1	34.1250	6.9100	27.2150	0.1800	4.8987	110.0000	2993.6500 (29a)
Bay window	0.7200		0.7200	0.1100	0.0792	9.0000	6.4800 (30)
Total net area of external elements Aum(A, m2)			79.1050				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	16.9333	(33)
Main dwelling							
Party Wall Between Flats			15.2800	0.0000	0.0000	180.0000	2750.4000 (32)
Party Wall Between Corridor			17.9800	0.0000	0.0000	180.0000	3236.4000 (32)
Party Ceiling 1			43.8700			30.0000	1316.1000 (32b)
Internal Wall 1			77.5000			9.0000	697.5000 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15869.1300 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 358.5434 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	3.9500	0.3050	1.2047
E3 Sill	3.9500	0.0240	0.0948
E4 Jamb	14.0000	0.0240	0.3360
E5 Ground floor (normal)	13.6500	0.0410	0.5597
E16 Corner (normal)	2.5000	0.0400	0.1000
E7 Party floor between dwellings (in blocks of flats)	13.6500	0.0330	0.4505
E18 Party wall between dwellings	2.5000	0.0300	0.0750
P1 Party wall - Ground floor	13.3000	0.3200	4.2560
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.3000	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	2.3200	0.1200	0.2784
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			7.3551 (36)
Point Thermal Bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 24.2884 (37)

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

(38)m	Jan 22.9691	Feb 22.7861	Mar 22.6068	Apr 21.7644	May 21.6068	Jun 20.8731	Jul 20.8731	Aug 20.7373	Sep 21.1557	Oct 21.6068	Nov 21.9256	Dec 22.2590 (38)
Heat transfer coeff	47.2575	47.0745	46.8952	46.0528	45.8952	45.1615	45.1615	45.0256	45.4441	45.8952	46.2140	46.5473 (39)
Average = Sum(39)m / 12 =												46.0520

HLP	Jan 1.0677	Feb 1.0636	Mar 1.0595	Apr 1.0405	May 1.0369	Jun 1.0204	Jul 1.0204	Aug 1.0173	Sep 1.0268	Oct 1.0369	Nov 1.0441	Dec 1.0517 (40)
HLP (average)												1.0405
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

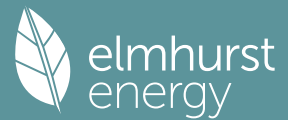
4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.5236 (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	21.5239	21.2042	20.7541	19.9241	19.3026	18.6134	18.2412	18.6882	19.1749	19.9123	20.7594	21.4511 (42b)
Hot water usage for other uses	30.2331	29.1338	28.0344	26.9350	25.8356	24.7362	24.7362	25.8356	26.9350	28.0344	29.1338	30.2331 (42c)
Average daily hot water use (litres/day)												47.4407 (43)
Daily hot water use	Jan 51.7570	Feb 50.3380	Mar 48.7884	Apr 46.8590	May 45.1382	Jun 43.3497	Jul 42.9774	Aug 44.5238	Sep 46.1099	Oct 47.9467	Nov 49.8931	Dec 51.6842 (44)
Energy conte	81.9704	71.6806	74.9860	64.1477	60.7647	53.3035	51.9775	55.1298	56.8581	65.0632	71.0819	80.9250 (45)
Energy content (annual)										Total = Sum(45)m =		787.8883
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
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	69.6749	60.9285	63.7381	54.5255	51.6500	45.3079	44.1808	46.8603	48.3294	55.3037	60.4196	68.7863 (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	69.6749	60.9285	63.7381	54.5255	51.6500	45.3079	44.1808	46.8603	48.3294	55.3037	60.4196	68.7863 (64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				669.7051 (64)
Electric shower(s)	39.8536	35.5099	38.7754	37.0029	37.6972	35.9595	37.1582	37.6972	37.0029	38.7754	38.0463	39.8536 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												453.3321 (64a)
Heat gains from water heating, kWh/month	27.3821	24.1096	25.6284	22.8821	22.3368	20.3169	20.3348	21.1394	21.3331	23.5198	24.6165	27.1600 (65)

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

Metabolic gains (Table 5), Watts

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	70.0009	77.5010	70.0009	72.3343	70.0009	72.3343	70.0009	70.0009	72.3343	70.0009	72.3343	70.0009	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	132.3762	133.7499	130.2883	122.9191	113.6167	104.8738	99.0331	97.6594	101.1210	108.4902	117.7926	126.5354	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	(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)	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	(71)
Water heating gains (Table 5)	36.8039	35.8774	34.4467	31.7807	30.0226	28.2179	27.3317	28.4132	29.6293	31.6126	34.1896	36.5053	(72)
Total internal gains	285.0350	292.9822	280.5899	272.8880	259.4942	251.2799	242.2196	241.9274	248.9385	255.9577	270.1703	278.8956	(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			
Northeast			0.8300	11.2829	0.6300	0.7000	0.7700			2.8620 (75)			
East			5.2500	19.6403	0.6300	0.7000	0.7700			31.5122 (76)			
Southeast			0.8300	36.7938	0.6300	0.7000	0.7700			9.3331 (77)			
Solar gains	43.7073	83.3679	133.7677	192.2497	234.8125	240.4224	228.8444	196.8064	154.4140	97.8362	54.0720	36.2385	(83)
Total gains	328.7423	376.3501	414.3577	465.1378	494.3067	491.7023	471.0640	438.7338	403.3525	353.7939	324.2424	315.1342	(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	93.2782	93.6408	93.9989	95.7182	96.0469	97.6073	97.6073	97.9018	97.0003	96.0469	95.3843	94.7013	
alpha	7.2185	7.2427	7.2666	7.3812	7.4031	7.5072	7.5072	7.5268	7.4667	7.4031	7.3590	7.3134	
util living area	0.9990	0.9968	0.9891	0.9442	0.8074	0.5833	0.4215	0.4712	0.7474	0.9693	0.9968	0.9992	(86)
MIT	20.1598	20.3017	20.5069	20.7839	20.9492	20.9959	20.9997	20.9993	20.9778	20.7540	20.4161	20.1464	(87)
Th 2	20.0273	20.0307	20.0340	20.0497	20.0527	20.0664	20.0664	20.0689	20.0611	20.0527	20.0467	20.0405	(88)
util rest of house	0.9985	0.9953	0.9839	0.9195	0.7455	0.5007	0.3323	0.3764	0.6599	0.9503	0.9949	0.9989	(89)
MIT 2	19.2706	19.4146	19.6196	19.8927	20.0254	20.0651	20.0663	20.0688	20.0525	19.8739	19.5423	19.2683	(90)
Living area fraction									fLA = Living area / (4) =			0.5099	(91)
MIT	19.7240	19.8670	20.0721	20.3471	20.4965	20.5398	20.5423	20.5433	20.5243	20.3227	19.9879	19.7161	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7240	19.8670	20.0721	20.3471	20.4965	20.5398	20.5423	20.5433	20.5243	20.3227	19.9879	19.7161	(93)

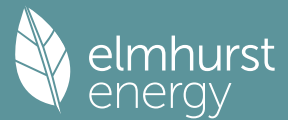
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9982	0.9950	0.9841	0.9281	0.7758	0.5429	0.3778	0.4248	0.7047	0.9567	0.9948	0.9987	(94)
Ext temp.	328.1658	374.4712	407.7756	431.7066	383.4975	266.9516	177.9652	186.3832	284.2317	338.4696	322.5489	314.7213	(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	728.8987	704.5622	636.4644	527.1726	403.7176	268.2486	178.0397	186.5550	291.9487	446.2235	595.6011	722.2312	(97)
Space heating requirement - total per year (kWh/year)	298.1453	221.8212	170.1445	68.7356	15.0437	0.0000	0.0000	0.0000	0.0000	80.1689	196.5975	303.1874	(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)	298.1453	221.8212	170.1445	68.7356	15.0437	0.0000	0.0000	0.0000	0.0000	80.1689	196.5975	303.1874	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1353.8440	(99)
Space heating per m ²										(98c) / (4) =		30.5884	(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	
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	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	424.5181	334.1951	342.1949	0.0000	0.0000	0.0000	0.0000	(100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.9626	0.9875	0.9785	0.0000	0.0000	0.0000	0.0000	(101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	408.6420	330.0323	334.8454	0.0000	0.0000	0.0000	0.0000	(102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	548.0210	525.3778	488.9464	0.0000	0.0000	0.0000	0.0000	(103)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	100.3529	145.3371	114.6512	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	25.0882	36.3343	28.6628	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling requirement												90.0853	(107)
Energy for space heating												30.5884	(108)
Energy for space cooling												2.0354	(109)
Total												32.6238	(110)
Fabric Energy Efficiency (DFEE)												32.6	(111)

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SAP 10 WORKSHEET FOR New Build (As Designed) (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	44.2600 (1b)	x 2.5000 (2b)	= 110.6500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	44.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 110.6500 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1808 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4308 (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) = 0.3984 (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 infiltr rate	0.5080	0.4981	0.4881	0.4383	0.4283	0.3785	0.3785	0.3686	0.3984	0.4283	0.4482	0.4682 (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	0.6290	0.6240	0.6191	0.5960	0.5917	0.5716	0.5716	0.5679	0.5794	0.5917	0.6005	0.6096 (25)

3. Heat losses and heat loss parameter

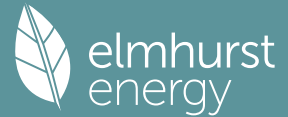
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
TER Opening Type			6.9100	1.1450	7.9122		(27)
Heatloss Floor 1			44.2600	0.1300	5.7538		(28a)
External Wall 1	34.1250	6.9100	27.2150	0.1800	4.8987		(29a)
Bay window	0.7200		0.7200	0.1100	0.0792		(30)
Total net area of external elements Aum(A, m ²)			79.1050				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		18.6439		(33)
Main dwelling							
Party Wall Between Flats			15.2800	0.0000	0.0000		(32)
Party Wall Between Corridor			17.9800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							358.5434 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate				3.9500	0.0500	0.1975	
E3 Sill				3.9500	0.0500	0.1975	
E4 Jamb				14.0000	0.0500	0.7000	
E5 Ground floor (normal)				13.6500	0.1600	2.1840	
E6 Corner (normal)				2.5000	0.0900	0.2250	
E7 Party floor between dwellings (in blocks of flats)				13.6500	0.0700	0.9555	
E18 Party wall between dwellings				2.5000	0.0600	0.1500	
P1 Party wall - Ground floor				13.3000	0.0800	1.0640	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				13.3000	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)				2.3200	0.0600	0.1392	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.8127 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	24.4566 (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	22.9691	22.7861	22.6068	21.7644	21.6068	20.8731	20.8731	20.7373	21.1557	21.6068	21.9256	22.2590 (38)
Heat transfer coeff	47.4257	47.2427	47.0634	46.2210	46.0634	45.3297	45.3297	45.1939	45.6123	46.0634	46.3822	46.7156 (39)
Average = Sum(39)m / 12 =												46.2203
HLP	1.0715	1.0674	1.0633	1.0443	1.0407	1.0242	1.0242	1.0211	1.0306	1.0407	1.0479	Dec 1.0555 (40)
HLP (average)												1.0443
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.5236 (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)

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Hot water usage for baths	21.5239	21.2042	20.7541	19.9241	19.3026	18.6134	18.2412	18.6882	19.1749	19.9123	20.7594	21.4511 (42b)
Hot water usage for other uses	30.2331	29.1338	28.0344	26.9350	25.8356	24.7362	24.7362	25.8356	26.9350	28.0344	29.1338	30.2331 (42c)
Average daily hot water use (litres/day)												47.4407 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	51.7570	50.3380	48.7884	46.8590	45.1382	43.3497	42.9774	44.5238	46.1099	47.9467	49.8931	51.6842 (44)
Distribution loss (46)m = 0.15 x (45)m	81.9704	71.6806	74.9860	64.1477	60.7647	53.3035	51.9775	55.1298	56.8581	65.0632	71.0819	80.9250 (45)
Total = Sum(45)m =	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	787.8883
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Total heat required for water heating calculated for each month												
WWHRS	69.6749	60.9285	63.7381	54.5255	51.6500	45.3079	44.1808	46.8603	48.3294	55.3037	60.4196	68.7863 (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)	69.6749	60.9285	63.7381	54.5255	51.6500	45.3079	44.1808	46.8603	48.3294	55.3037	60.4196	68.7863 (64)
Electric shower(s)	39.8536	35.5099	38.7754	37.0029	37.6972	35.9595	37.1582	37.6972	37.0029	38.7754	38.0463	39.8536 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												453.3321 (64a)
Heat gains from water heating, kWh/month	27.3821	24.1096	25.6284	22.8821	22.3368	20.3169	20.3348	21.1394	21.3331	23.5198	24.6165	27.1600 (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	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	70.0009	77.5010	70.0009	72.3343	70.0009	72.3343	70.0009	70.0009	72.3343	70.0009	72.3343	70.0009 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	132.3762	133.7499	130.2883	122.9191	113.6167	104.8738	99.0331	97.6594	101.1210	108.4902	117.7926	126.5354 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180 (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)	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438 (71)
Water heating gains (Table 5)	36.8039	35.8774	34.4467	31.7807	30.0226	28.2179	27.3317	28.4132	29.6293	31.6126	34.1896	36.5053 (72)
Total internal gains	285.0350	292.9822	280.5899	272.8880	259.4942	251.2799	242.2196	241.9274	248.9385	255.9577	270.1703	278.8956 (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	
Northeast				0.8300	11.2829	0.6300	0.7000	0.7700			2.8620 (75)	
East				5.2500	19.6403	0.6300	0.7000	0.7700			31.5122 (76)	
Southeast				0.8300	36.7938	0.6300	0.7000	0.7700			9.3331 (77)	
Solar gains	43.7073	83.3679	133.7677	192.2497	234.8125	240.4224	228.8444	196.8064	154.4140	97.8362	54.0720	36.2385 (83)
Total gains	328.7423	376.3501	414.3577	465.1378	494.3067	491.7023	471.0640	438.7338	403.3525	353.7939	324.2424	315.1342 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	92.9473	93.3073	93.6629	95.3699	95.6962	97.2450	97.2450	97.5374	96.6425	95.6962	95.0383	94.3602
util living area	7.1965	7.2205	7.2442	7.3580	7.3797	7.4830	7.4830	7.5025	7.4428	7.3797	7.3359	7.2907
MIT	0.9990	0.9968	0.9892	0.9448	0.8091	0.5853	0.4230	0.4729	0.7494	0.9697	0.9968	0.9992 (86)
MIT 2	20.1551	20.2971	20.5028	20.7808	20.9480	20.9957	20.9997	20.9993	20.9772	20.7511	20.4121	20.1417 (87)
Th 2	20.0242	20.0276	20.0309	20.0466	20.0495	20.0632	20.0632	20.0658	20.0579	20.0495	20.0436	20.0374 (88)
util rest of house	0.9985	0.9954	0.9840	0.9203	0.7472	0.5022	0.3332	0.3775	0.6617	0.9508	0.9950	0.9989 (89)
MIT 2	19.2633	19.4074	19.6129	19.8871	20.0216	20.0619	20.0632	20.0657	20.0490	19.8685	19.5357	19.2609 (90)
Living area fraction	19.7180	19.8611	20.0667	20.3429	20.4940	20.5381	20.5407	20.5417	20.5223	20.3186	19.9827	19.7101 (91)
MIT	19.7180	19.8611	20.0667	20.3429	20.4940	20.5381	20.5407	20.5417	20.5223	20.3186	19.9827	19.7101 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7180	19.8611	20.0667	20.3429	20.4940	20.5381	20.5407	20.5417	20.5223	20.3186	19.9827	19.7101 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9983	0.9950	0.9842	0.9288	0.7775	0.5447	0.3790	0.4262	0.7065	0.9571	0.9948	0.9987 (94)
Ext temp.	328.1673	374.4814	407.8282	432.0360	384.3419	267.8231	178.5541	187.0012	284.9867	338.6180	322.5589	314.7222 (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	731.2112	706.8046	638.4946	528.9011	405.0807	269.1729	178.6325	187.1813	292.9381	447.6712	597.5263	724.5614 (97)

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299.8647	223.3212	171.6158	69.7429	15.4297	0.0000	0.0000	0.0000	0.0000	81.1356	197.9765	304.9204 (98a)
Space heating requirement - total per year (kWh/year)											1364.0068
Solar heating kWh											
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)	
Solar heating contribution - total per year (kWh/year)											0.0000
Space heating kWh											
299.8647	223.3212	171.6158	69.7429	15.4297	0.0000	0.0000	0.0000	0.0000	81.1356	197.9765	304.9204 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)											1364.0068
Space heating per m2											(98c) / (4) = 30.8180 (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	426.0995	335.4401	343.4734	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9616	0.9871	0.9779	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	409.7435	331.1208	335.8721	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	548.0210	525.3778	488.9464	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	99.5598	144.5272	113.8873	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)												
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	24.8899	36.1318	28.4718	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												89.4936 (107)
Energy for space heating												30.8180 (99)
Energy for space cooling												2.0220 (108)
Total												32.8400 (109)
Fabric Energy Efficiency (TFEE)												32.8 (109)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	44.2600 (1b)	x 2.5000 (2b)	= 110.6500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	44.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	110.6500 (5)

2. Ventilation rate

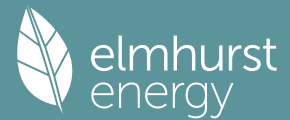
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 20.0000 / (5) = 0.1808 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4308 (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) = 0.3984 (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												
	0.5080	0.4981	0.4881	0.4383	0.4283	0.3785	0.3785	0.3686	0.3984	0.4283	0.4482	0.4682 (22b)
Effective ac	0.6290	0.6240	0.6191	0.5960	0.5917	0.5716	0.5716	0.5679	0.5794	0.5917	0.6005	0.6096 (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			6.9100	0.9615	6.6442		(27)
Heatloss Floor 1			44.2600	0.1200	5.3112	110.0000	4868.6000 (28a)
External Wall 1	34.1250	6.9100	27.2150	0.1800	4.8987	110.0000	2993.6500 (29a)
Bay window	0.7200		0.7200	0.1100	0.0792	9.0000	6.4800 (30)
Total net area of external elements Aum(A, m2)			79.1050				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	16.9333		(33)
Main dwelling							
Party Wall Between Flats			15.2800	0.0000	0.0000	180.0000	2750.4000 (32)

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Party Wall Between Corridor	17.9800	0.0000	0.0000	180.0000	3236.4000 (32)
Party Ceiling 1	43.8700			30.0000	1316.1000 (32b)
Internal Wall 1	77.5000			9.0000	697.5000 (32c)

Heat capacity $C_m = \text{Sum}(A \times k)$ (28)...(30) + (32) + (32a)...(32e) = 15869.1300 (34)
Thermal mass parameter (TMP = C_m / TFA) in kJ/m²K 358.5434 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	3.9500	0.3050	1.2047
E1 Steel lintel with perforated steel base plate	3.9500	0.0240	0.0948
E3 Sill	14.0000	0.0240	0.3360
E4 Jamb	13.6500	0.0410	0.5597
E5 Ground floor (normal)	2.5000	0.0400	0.1000
E16 Corner (normal)	13.6500	0.0330	0.4505
E7 Party floor between dwellings (in blocks of flats)	2.5000	0.0300	0.0750
E18 Party wall between dwellings	13.3000	0.3200	4.2560
P1 Party wall - Ground floor	13.3000	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	2.3200	0.1200	0.2784
E10 Eaves (insulation at ceiling level)			

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.3551 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 24.2884 (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 22.9691 22.7861 22.6068 21.7644 21.6068 20.8731 20.8731 20.7373 21.1557 21.6068 21.9256 22.2590 (38)
Average = Sum(39)m / 12 = 47.2575 46.8952 46.0528 45.8952 45.1615 45.1615 45.0256 45.4441 45.8952 46.2140 46.5473 (39)
46.0520

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0677	1.0636	1.0595	1.0405	1.0369	1.0204	1.0204	1.0173	1.0268	1.0369	1.0441	1.0517 (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													1.5236 (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	57.3089	56.4578	55.2592	53.0493	51.3946	49.5597	48.5686	49.7588	51.0546	53.0180	55.2734	57.1152	(42b)
Hot water usage for other uses	30.2331	29.1338	28.0344	26.9350	25.8356	24.7362	24.7362	25.8356	26.9350	28.0344	29.1338	30.2331	(42c)
Average daily hot water use (litres/day)													80.6191 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	87.5420	85.5915	83.2936	79.9843	77.2301	74.2959	73.3048	75.5944	77.9896	81.0524	84.4072	87.3483	(44)
Energy content (annual)	138.6452	121.8812	128.0192	109.4945	103.9666	91.3555	88.6558	93.6016	96.1690	109.9873	120.2535	136.7663	(45)
Distribution loss (46)m = 0.15 x (45)m	20.7968	18.2822	19.2029	16.4242	15.5950	13.7033	13.2984	14.0402	14.4253	16.4981	18.0380	20.5149	(46)
Water storage loss:													
Store volume													125.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													0.0130 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.0070 (55)
Total storage loss	0.2176	0.1966	0.2176	0.2106	0.2176	0.2106	0.2176	0.2176	0.2106	0.2176	0.2106	0.2176	(56)
If cylinder contains dedicated solar storage	0.2176	0.1966	0.2176	0.2106	0.2176	0.2106	0.2176	0.2176	0.2106	0.2176	0.2106	0.2176	(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	162.1252	143.0890	151.4992	132.2171	127.4466	114.0781	112.1358	117.0816	118.8916	133.4673	142.9761	160.2463	(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	162.1252	143.0890	151.4992	132.2171	127.4466	114.0781	112.1358	117.0816	118.8916	133.4673	142.9761	160.2463	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Heat gains from water heating, kWh/month	64.8835	57.4917	61.3504	54.5850	53.3529	48.5538	48.2621	49.9065	50.1543	55.3548	58.1624	64.2588	(65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)

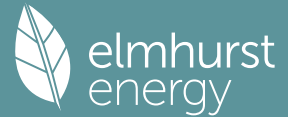
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	91.4157	91.4157	91.4157	91.4157	91.4157	91.4157	91.4157	91.4157	91.4157	91.4157	91.4157	91.4157	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.1636	14.3563	11.6754	8.8390	6.6073	5.5781	6.0274	7.8346	10.5156	13.3519	15.5837	16.6128	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.5765	199.6267	194.4602	183.4613	169.5772	156.5281	147.8105	145.7603	150.9268	161.9257	175.8098	188.8589	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	(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)	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	(71)
Water heating gains (Table 5)	87.2091	85.5531	82.4602	75.8125	71.7109	67.4358	64.8684	67.0787	69.6587	74.4016	80.7811	86.3694	(72)
Total internal gains	377.0862	375.6733	364.7328	344.2499	324.0325	305.6791	294.8433	296.8107	307.2382	325.8163	348.3116	367.9781	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W
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		W/m2	or Table 6b	or Table 6c	Table 6d	
Northeast	0.8300	11.2829	0.6300	0.7000	0.7700	2.8620 (75)
East	5.2500	19.6403	0.6300	0.7000	0.7700	31.5122 (76)
Southeast	0.8300	36.7938	0.6300	0.7000	0.7700	9.3331 (77)

Solar gains	43.7073	83.3679	133.7677	192.2497	234.8125	240.4224	228.8444	196.8064	154.4140	97.8362	54.0720	36.2385 (83)
Total gains	420.7935	459.0412	498.5006	536.4996	558.8450	546.1015	523.6877	493.6171	461.6522	423.6525	402.3836	404.2167 (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	93.2782	93.6408	93.9989	95.7182	96.0469	97.6073	97.6073	97.9018	97.0003	96.0469	95.3843	94.7013	
alpha	7.2185	7.2427	7.2666	7.3812	7.4031	7.5072	7.5072	7.5268	7.4667	7.4031	7.3590	7.3134	
util living area	0.9950	0.9894	0.9697	0.8967	0.7364	0.5272	0.3793	0.4192	0.6666	0.9265	0.9878	0.9961 (86)	
MIT	20.4502	20.5414	20.6881	20.8533	20.9370	20.9570	20.9584	20.9584	20.9503	20.8415	20.6217	20.4375 (87)	
Th 2	20.0273	20.0307	20.0340	20.0497	20.0527	20.0664	20.0664	20.0689	20.0611	20.0527	20.0467	20.0405 (88)	
util rest of house	0.9928	0.9848	0.9571	0.8605	0.6722	0.4514	0.2989	0.3346	0.5822	0.8912	0.9817	0.9944 (89)	
MIT 2	19.4008	19.5187	19.7022	19.9044	19.9851	20.0126	20.0132	20.0158	20.0039	19.8996	19.6345	19.3961 (90)	
Living area fraction	19.9359	20.0403	20.2050	20.3883	20.4705	20.4942	20.4952	20.4965	fLA = Living area / (4) =				0.5099 (91)
MIT	19.9359	20.0403	20.2050	20.3883	20.4705	20.4942	20.4952	20.4965	20.4865	20.3799	20.1379	19.9272 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.9359	20.0403	20.2050	20.3883	20.4705	20.4942	20.4952	20.4965	20.4865	20.3799	20.1379	19.9272 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9925	0.9849	0.9596	0.8745	0.7013	0.4863	0.3359	0.3735	0.6212	0.9048	0.9824	0.9941 (94)
Useful gains	417.6514	452.1055	478.3850	469.1431	391.9305	265.5687	175.8812	184.3778	286.7940	383.3353	395.2910	401.8480 (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	738.9153	712.7197	642.6959	529.0667	402.5244	266.1897	175.9136	184.4478	290.2299	448.8510	602.5353	732.0570 (97)
Space heating kWh	239.0204	175.1327	122.2473	43.1450	7.8818	0.0000	0.0000	0.0000	0.0000	48.7437	149.2158	245.6755 (98a)
Space heating requirement - total per year (kWh/year)												1031.0622
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	239.0204	175.1327	122.2473	43.1450	7.8818	0.0000	0.0000	0.0000	0.0000	48.7437	149.2158	245.6755 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1031.0622
Space heating per m2										(98c) / (4) =		23.2956 (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 %)												249.9000 (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	239.0204	175.1327	122.2473	43.1450	7.8818	0.0000	0.0000	0.0000	0.0000	48.7437	149.2158	245.6755 (98)
Space heating efficiency (main heating system 1)	249.9000	249.9000	249.9000	249.9000	249.9000	0.0000	0.0000	0.0000	0.0000	249.9000	249.9000	249.9000 (210)
Space heating fuel (main heating system)	95.6464	70.0811	48.9185	17.2649	3.1540	0.0000	0.0000	0.0000	0.0000	19.5053	59.7102	98.3095 (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	162.1252	143.0890	151.4992	132.2171	127.4466	114.0781	112.1358	117.0816	118.8916	133.4673	142.9761	160.2463 (64)
Efficiency of water heater	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000 (216)
Fuel for water heating, kWh/month	92.5901	81.7184	86.5215	75.5095	72.7851	65.1502	64.0410	66.8656	67.8993	76.2235	81.6540	91.5170 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	14.1479	11.3500	10.2194	7.4872	5.7833	4.7250	5.2757	6.8576	8.9073	11.6869	13.2003	14.5411 (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												412.5899 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)

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Efficiency of water heater	175.1000
Water heating fuel used	922.4751 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	114.1815 (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	1449.2466 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	412.5899	14.0400	57.9276 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	922.4751	14.0400	129.5155 (247)
Energy for instantaneous electric shower(s)	0.0000	14.0400	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	114.1815	16.4900	18.8285 (250)
Additional standing charges			26.0000 (251)
Total energy cost			232.2717 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	0.9368 (257)
SAP value	84.8146
SAP rating (Section 12)	85 (258)
SAP band	B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	412.5899	0.1572	64.8665 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	922.4751	0.1411	130.1231 (264)
Space and water heating			194.9896 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	114.1815	0.1443	16.4799 (268)
Total CO2, kg/year			211.4695 (272)
CO2 emissions per m2			4.7800 (273)
EI value			96.8254
EI rating			97 (274)
EI band			A

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

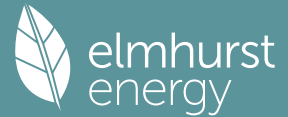
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	44.2600 (1b)	x 2.5000 (2b)	= 110.6500 (1b) - (3b)
Ground floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	44.2600		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 110.6500 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1808 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4308 (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

$$(21) = (18) \times (20) = 0.3984 \quad (21)$$

Wind speed	Jan 4.6000	Feb 4.5000	Mar 4.6000	Apr 4.1000	May 4.3000	Jun 3.7000	Jul 3.6000	Aug 3.7000	Sep 3.7000	Oct 4.2000	Nov 4.1000	Dec 4.3000	(22)
Wind factor	1.1500	1.1250	1.1500	1.0250	1.0750	0.9250	0.9000	0.9250	0.9250	1.0500	1.0250	1.0750	(22a)
Adj infilt rate	0.4582	0.4482	0.4582	0.4084	0.4283	0.3686	0.3586	0.3686	0.3686	0.4184	0.4084	0.4283	(22b)
Effective ac	0.6050	0.6005	0.6050	0.5834	0.5917	0.5679	0.5643	0.5679	0.5679	0.5875	0.5834	0.5917	(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			6.9100	0.9615	6.6442			(27)
Heatloss Floor 1			44.2600	0.1200	5.3112	110.0000	4868.6000	(28a)
External Wall 1	34.1250	6.9100	27.2150	0.1800	4.8987	110.0000	2993.6500	(29a)
Bay window	0.7200		0.7200	0.1100	0.0792	9.0000	6.4800	(30)
Total net area of external elements Aum(A, m2)			79.1050					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	16.9333			(33)
Main dwelling								
Party Wall Between Flats			15.2800	0.0000	0.0000	180.0000	2750.4000	(32)
Party Wall Between Corridor			17.9800	0.0000	0.0000	180.0000	3236.4000	(32)
Party Ceiling 1			43.8700			30.0000	1316.1000	(32b)
Internal Wall 1			77.5000			9.0000	697.5000	(32c)

Heat capacity Cm = Sum(A x k)

$$(28)...(30) + (32) + (32a)...(32e) = 15869.1300 \quad (34)$$

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

$$358.5434 \quad (35)$$

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	3.9500	0.3050	1.2047
E3 Sill	3.9500	0.0240	0.0948
E4 Jamb	14.0000	0.0240	0.3360
E5 Ground floor (normal)	13.6500	0.0410	0.5597
E16 Corner (normal)	2.5000	0.0400	0.1000
E7 Party floor between dwellings (in blocks of flats)	13.6500	0.0330	0.4505
E18 Party wall between dwellings	2.5000	0.0300	0.0750
P1 Party wall - Ground floor	13.3000	0.3200	4.2560
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.3000	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	2.3200	0.1200	0.2784

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

$$7.3551 \quad (36)$$

Point Thermal Bridges

$$(36a) = 0.0000$$

Total fabric heat loss

$$(33) + (36) + (36a) = 24.2884 \quad (37)$$

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

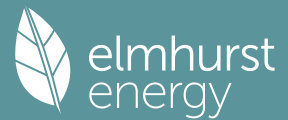
(38)m	Jan 22.0905	Feb 21.9256	Mar 22.0905	Apr 21.3025	May 21.6068	Jun 20.7373	Jul 20.6050	Aug 20.7373	Sep 20.7373	Oct 21.4528	Nov 21.3025	Dec 21.6068	(38)
Heat transfer coeff	46.3789	46.2140	46.3789	45.5908	45.8952	45.0256	44.8934	45.0256	45.0256	45.7412	45.5908	45.8952	(39)
Average = Sum(39)m / 12 =												45.6379	

HLP	Jan 1.0479	Feb 1.0441	Mar 1.0479	Apr 1.0301	May 1.0369	Jun 1.0173	Jul 1.0143	Aug 1.0173	Sep 1.0173	Oct 1.0335	Nov 1.0301	Dec 1.0369	(40)
HLP (average)												1.0311	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.5236	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	57.3089	56.4578	55.2592	53.0493	51.3946	49.5597	48.5686	49.7588	51.0546	53.0180	55.2734	57.1152	57.1152	(42b)
Hot water usage for other uses	30.2331	29.1338	28.0344	26.9350	25.8356	24.7362	24.7362	25.8356	26.9350	28.0344	29.1338	30.2331	30.2331	(42c)
Average daily hot water use (litres/day)													80.6191	(43)
Daily hot water use	Jan 87.5420	Feb 85.5915	Mar 83.2936	Apr 79.9843	May 77.2301	Jun 74.2959	Jul 73.3048	Aug 75.5944	Sep 77.9896	Oct 81.0524	Nov 84.4072	Dec 87.3483		(44)
Energy conte	138.6452	121.8812	128.0192	109.4945	103.9666	91.3555	88.6558	93.6016	96.1690	109.9873	120.2535	136.7663		(45)
Energy content (annual)										Total = Sum(45)m =		1338.7956		
Distribution loss (46)m = 0.15 x (45)m	20.7968	18.2822	19.2029	16.4242	15.5950	13.7033	13.2984	14.0402	14.4253	16.4981	18.0380	20.5149		(46)
Water storage loss:														
Store volume													125.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):													0.0130	(48)
Temperature factor from Table 2b													0.5400	(49)
Enter (49) or (54) in (55)													0.0070	(55)
Total storage loss	0.2176	0.1966	0.2176	0.2106	0.2176	0.2106	0.2176	0.2176	0.2106	0.2176	0.2106	0.2176		(56)
If cylinder contains dedicated solar storage	0.2176	0.1966	0.2176	0.2106	0.2176	0.2106	0.2176	0.2176	0.2106	0.2176	0.2106	0.2176		(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	162.1252	143.0890	151.4992	132.2171	127.4466	114.0781	112.1358	117.0816	118.8916	133.4673	142.9761	160.2463		(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	162.1252	143.0890	151.4992	132.2171	127.4466	114.0781	112.1358	117.0816	118.8916	133.4673	142.9761	160.2463		(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000		(64a)
Heat gains from water heating, kWh/month	64.8835	57.4917	61.3504	54.5850	53.3529	48.5538	48.2621	49.9065	50.1543	55.3548	58.1624	64.2588		(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	91.4157	91.4157	91.4157	91.4157	91.4157	91.4157	91.4157	91.4157	91.4157	91.4157	91.4157	91.4157 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.1636	14.3563	11.6754	8.8390	6.6073	5.5781	6.0274	7.8346	10.5156	13.3519	15.5837	16.6128 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.5765	199.6267	194.4602	183.4613	169.5772	156.5281	147.8105	145.7603	150.9268	161.9257	175.8098	188.8589 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652 (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)	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438 (71)
Water heating gains (Table 5)	87.2091	85.5531	82.4602	75.8125	71.7109	67.4358	64.8684	67.0787	69.6587	74.4016	80.7811	86.3694 (72)
Total internal gains	377.0862	375.6733	364.7328	344.2499	324.0325	305.6791	294.8433	296.8107	307.2382	325.8163	348.3116	367.9781 (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			
Northeast				0.8300	9.5471	0.6300	0.7000	0.7700	2.4217 (75)			
East				5.2500	16.6187	0.6300	0.7000	0.7700	26.6642 (76)			
Southeast				0.8300	31.1332	0.6300	0.7000	0.7700	7.8972 (77)			
Solar gains	36.9831	74.1048	125.4072	183.2781	218.9137	228.4012	213.1038	180.5103	146.3576	90.4244	47.5178	32.7872 (83)
Total gains	414.0693	449.7781	490.1401	527.5280	542.9462	534.0804	507.9471	477.3210	453.5958	416.2407	395.8294	400.7654 (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	95.0453	95.3843	95.0453	96.6881	96.0469	97.9018	98.1902	97.9018	97.9018	96.3703	96.6881	96.0469
alpha	7.3364	7.3590	7.3364	7.4459	7.4031	7.5268	7.5460	7.5268	7.5268	7.4247	7.4459	7.4031
util living area	0.9943	0.9885	0.9680	0.8864	0.7138	0.5043	0.3799	0.4241	0.6719	0.9252	0.9863	0.9956 (86)
MIT	20.4919	20.5723	20.7051	20.8678	20.9418	20.9576	20.9587	20.9584	20.9505	20.8462	20.6488	20.4722 (87)
Th 2	20.0436	20.0467	20.0436	20.0584	20.0527	20.0689	20.0714	20.0689	20.0689	20.0555	20.0584	20.0527 (88)
util rest of house	0.9917	0.9835	0.9545	0.8471	0.6452	0.4269	0.2980	0.3366	0.5877	0.8886	0.9793	0.9936 (89)
MIT 2	19.4678	19.5714	19.7316	19.9278	19.9890	20.0155	20.0185	20.0158	20.0121	19.9075	19.6786	19.4507 (90)
Living area fraction	19.9900	20.0818	20.2280	20.4071	20.4749	20.4959	20.4979	20.4965	20.4906	20.3862	20.1734	0.5099 (91)
MIT	19.9900	20.0818	20.2280	20.4071	20.4749	20.4959	20.4979	20.4965	20.4906	20.3862	20.1734	19.9716 (92)
Temperature adjustment	19.9900	20.0818	20.2280	20.4071	20.4749	20.4959	20.4979	20.4965	20.4906	20.3862	20.1734	0.0000 (93)
adjusted MIT	19.9900	20.0818	20.2280	20.4071	20.4749	20.4959	20.4979	20.4965	20.4906	20.3862	20.1734	19.9716 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9915	0.9837	0.9575	0.8628	0.6765	0.4626	0.3356	0.3768	0.6267	0.9029	0.9804	0.9934 (94)
Useful gains	410.5685	442.4627	469.2966	455.1488	367.3211	247.0503	170.4717	179.8723	284.2486	375.8354	388.0522	398.1115 (95)
Ext temp.	4.8000	5.3000	6.8000	9.3000	12.3000	15.0000	16.7000	16.5000	14.1000	10.8000	7.5000	4.6000 (96)
Heat loss rate W	704.4945	683.1266	622.7770	506.3838	375.1883	247.4568	170.5016	179.9449	287.7427	438.4824	577.7887	705.4822 (97)
Space heating kWh	218.6810	161.7261	114.1894	36.8892	5.8532	0.0000	0.0000	0.0000	0.0000	46.6093	136.6103	228.6838 (98a)
Space heating requirement - total per year (kWh/year)												949.2424
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	218.6810	161.7261	114.1894	36.8892	5.8532	0.0000	0.0000	0.0000	0.0000	46.6093	136.6103	228.6838 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												949.2424
Space heating per m ²										(98c) / (4) =		21.4470 (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 %)												249.9000 (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	218.6810	161.7261	114.1894	36.8892	5.8532	0.0000	0.0000	0.0000	0.0000	46.6093	136.6103	228.6838 (98)
Space heating efficiency (main heating system 1)	249.9000	249.9000	249.9000	249.9000	249.9000	0.0000	0.0000	0.0000	0.0000	249.9000	249.9000	249.9000 (210)
Space heating fuel (main heating system)	87.5074	64.7163	45.6940	14.7616	2.3422	0.0000	0.0000	0.0000	0.0000	18.6512	54.6660	91.5101 (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

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Efficiency of water heater	162.1252	143.0890	151.4992	132.2171	127.4466	114.0781	112.1358	117.0816	118.8916	133.4673	142.9761	160.2463 (64)
(217)m	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000 (216)
Fuel for water heating, kWh/month	92.5901	81.7184	86.5215	75.5095	72.7851	65.1502	64.0410	66.8656	67.8993	76.2235	81.6540	91.5170 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	14.1479	11.3500	10.2194	7.4872	5.7833	4.7250	5.2757	6.8576	8.9073	11.6869	13.2003	14.5411 (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												379.8489 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												175.1000
Water heating fuel used												922.4751 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												114.1815 (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												1416.5056 (238)

10a. Fuel costs - using BEDF prices (572)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	379.8489	23.6600	89.8723 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	922.4751	23.6600	218.2576 (247)
Energy for instantaneous electric shower(s)	0.0000	23.6600	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	114.1815	26.0600	29.7557 (250)
Additional standing charges			114.0000 (251)
Total energy cost			451.8856 (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	379.8489	0.1573	59.7369 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	922.4751	0.1411	130.1231 (264)
Space and water heating			189.8599 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	114.1815	0.1443	16.4799 (268)
Total CO2, kg/year			206.3398 (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	379.8489	1.5822	600.9996 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	922.4751	1.5216	1403.6301 (278)
Space and water heating			2004.6297 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	114.1815	1.5338	175.1354 (282)
Total Primary energy kWh/year			2179.7651 (286)

SAP 10 EPC IMPROVEMENTS

As Designed

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

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

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

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

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

Fuel prices for cost data on this page from database revision number 572 TEST (30 May 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, North West England):

	Current £452	Potential £452	Saving £0
Electricity			
Space heating	£204	£204	£0
Water heating	£218	£218	£0
Lighting	£30	£30	£0
Total cost of fuels	£452	£452	£0
Total cost of uses	£452	£452	£0
Delivered energy	32 kWh/m²	32 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m²	5 kg/m²	5 kg/m²	0 kg/m²
Primary energy	49 kWh/m²	49 kWh/m²	0 kWh/m²

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

1. Overall dwelling characteristics

Main dwelling	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	44.2600 (1b)	x 2.5000 (2b)	= 110.6500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	44.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 110.6500 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

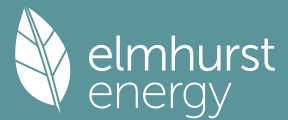
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1808 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4308 (18)
Number of sides sheltered		1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3984 (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	0.5080	0.4981	0.4881	0.4383	0.4283	0.3785	0.3785	0.3686	0.3984	0.4283	0.4482	0.4682 (22b)
Effective ac	0.6290	0.6240	0.6191	0.5960	0.5917	0.5716	0.5716	0.5679	0.5794	0.5917	0.6005	0.6096 (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			6.9100	0.9615	6.6442		(27)
Heatloss Floor 1			44.2600	0.1200	5.3112	110.0000	4868.6000 (28a)
External Wall 1	34.1250	6.9100	27.2150	0.1800	4.8987	110.0000	2993.6500 (29a)
Bay window	0.7200		0.7200	0.1100	0.0792	9.0000	6.4800 (30)
Total net area of external elements Aum(A, m2)			79.1050				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.9333		(33)
Main dwelling							
Party Wall Between Flats			15.2800	0.0000	0.0000	180.0000	2750.4000 (32)
Party Wall Between Corridor			17.9800	0.0000	0.0000	180.0000	3236.4000 (32)
Party Ceiling 1			43.8700			30.0000	1316.1000 (32b)
Internal Wall 1			77.5000			9.0000	697.5000 (32c)

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Heat capacity $C_m = \text{Sum}(A \times k)$
Thermal mass parameter (TMP = C_m / TFA) in $\text{kJ/m}^2\text{K}$ (28)...(30) + (32) + (32a)...(32e) = 15869.1300 (34)
List of Thermal Bridges 358.5434 (35)

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	3.9500	0.3050	1.2047
E3 Sill	3.9500	0.0240	0.0948
E4 Jamb	14.0000	0.0240	0.3360
E5 Ground floor (normal)	13.6500	0.0410	0.5597
E16 Corner (normal)	2.5000	0.0400	0.1000
E7 Party floor between dwellings (in blocks of flats)	13.6500	0.0330	0.4505
E8 Party wall between dwellings	2.5000	0.0300	0.0750
P1 Party wall - Ground floor	13.3000	0.3200	4.2560
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.3000	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	2.3200	0.1200	0.2784

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.3551 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 24.2884 (37)

Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)\text{m} \times (5)$
(38)m Jan 22.9691 Feb 22.7861 Mar 22.6068 Apr 21.7644 May 21.6068 Jun 20.8731 Jul 20.8731 Aug 20.7373 Sep 21.1557 Oct 21.6068 Nov 21.9256 Dec 22.2590 (38)
Heat transfer coeff 47.2575 47.0745 46.8952 46.0528 45.8952 45.1615 45.1615 45.0256 45.4441 45.8952 46.2140 46.5473 (39)
Average = $\text{Sum}(39)\text{m} / 12 =$ 46.0520

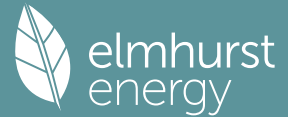
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0677	1.0636	1.0595	1.0405	1.0369	1.0204	1.0204	1.0173	1.0268	1.0369	1.0441	1.0517 (40)
HLP (average)												1.0405
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												1.5236 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths	57.3089	56.4578	55.2592	53.0493	51.3946	49.5597	48.5686	49.7588	51.0546	53.0180	55.2734	57.1152 (42b)
Hot water usage for other uses	30.2331	29.1338	28.0344	26.9350	25.8356	24.7362	24.7362	25.8356	26.9350	28.0344	29.1338	30.2331 (42c)
Average daily hot water use (litres/day)												80.6191 (43)
Daily hot water use	87.5420	85.5915	83.2936	79.9843	77.2301	74.2959	73.3048	75.5944	77.9896	81.0524	84.4072	87.3483 (44)
Energy content (annual)	138.6452	121.8812	128.0192	109.4945	103.9666	91.3555	88.6558	93.6016	96.1690	109.9873	120.2535	136.7663 (45)
Distribution loss (46)m = $0.15 \times (45)\text{m}$	20.7968	18.2822	19.2029	16.4242	15.5950	13.7033	13.2984	14.0402	14.4253	16.4981	18.0380	20.5149 (46)
Water storage loss:												125.0000 (47)
Store volume												0.0130 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.0070 (55)
Enter (49) or (54) in (55)												
Total storage loss	0.2176	0.1966	0.2176	0.2106	0.2176	0.2106	0.2176	0.2176	0.2106	0.2176	0.2106	0.2176 (56)
If cylinder contains dedicated solar storage	0.2176	0.1966	0.2176	0.2106	0.2176	0.2106	0.2176	0.2176	0.2106	0.2176	0.2106	0.2176 (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	162.1252	143.0890	151.4992	132.2171	127.4466	114.0781	112.1358	117.0816	118.8916	133.4673	142.9761	160.2463 (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	162.1252	143.0890	151.4992	132.2171	127.4466	114.0781	112.1358	117.0816	118.8916	133.4673	142.9761	160.2463 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	64.8835	57.4917	61.3504	54.5850	53.3529	48.5538	48.2621	49.9065	50.1543	55.3548	58.1624	64.2588 (65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m Jan 91.4157 Feb 91.4157 Mar 91.4157 Apr 91.4157 May 91.4157 Jun 91.4157 Jul 91.4157 Aug 91.4157 Sep 91.4157 Oct 91.4157 Nov 91.4157 Dec 91.4157 (66)												
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.1636	14.3563	11.6754	8.8390	6.6073	5.5781	6.0274	7.8346	10.5156	13.3519	15.5837	16.6128 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.5765	199.6267	194.4602	183.4613	169.5772	156.5281	147.8105	145.7603	150.9268	161.9257	175.8098	188.8589 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652 (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)	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438 (71)
Water heating gains (Table 5)	87.2091	85.5531	82.4602	75.8125	71.7109	67.4358	64.8684	67.0787	69.6587	74.4016	80.7811	86.3694 (72)
Total internal gains	377.0862	375.6733	364.7328	344.2499	324.0325	305.6791	294.8433	296.8107	307.2382	325.8163	348.3116	367.9781 (73)

6. Solar gains							
[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	0.8300	11.2829	0.6300	0.7000	0.7700	2.8620 (75)	
East	5.2500	19.6403	0.6300	0.7000	0.7700	31.5122 (76)	

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Southeast	0.8300		36.7938		0.6300		0.7000		0.7700		9.3331 (77)	
Solar gains	43.7073	83.3679	133.7677	192.2497	234.8125	240.4224	228.8444	196.8064	154.4140	97.8362	54.0720	36.2385 (83)
Total gains	420.7935	459.0412	498.5006	536.4996	558.8450	546.1015	523.6877	493.6171	461.6522	423.6525	402.3836	404.2167 (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	93.2782	93.6408	93.9989	95.7182	96.0469	97.6073	97.6073	97.9018	97.0003	96.0469	95.3843	94.7013
alpha	7.2185	7.2427	7.2666	7.3812	7.4031	7.5072	7.5072	7.5268	7.4667	7.4031	7.3590	7.3134
util living area	0.9950	0.9894	0.9697	0.8967	0.7364	0.5272	0.3793	0.4192	0.6666	0.9265	0.9878	0.9961 (86)
MIT	20.4502	20.5414	20.6881	20.8533	20.9370	20.9570	20.9584	20.9584	20.9503	20.8415	20.6217	20.4375 (87)
Th 2	20.0273	20.0307	20.0340	20.0497	20.0527	20.0664	20.0664	20.0689	20.0611	20.0527	20.0467	20.0405 (88)
util rest of house	0.9928	0.9848	0.9571	0.8605	0.6722	0.4514	0.2989	0.3346	0.5822	0.8912	0.9817	0.9944 (89)
MIT 2	19.4008	19.5187	19.7022	19.9044	19.9851	20.0126	20.0132	20.0158	20.0039	19.8996	19.6345	19.3961 (90)
Living area fraction	19.9359	20.0403	20.2050	20.3883	20.4705	20.4942	20.4952	20.4965	20.4865	20.3799	20.1379	19.9272 (92)
Temperature adjustment	19.9359	20.0403	20.2050	20.3883	20.4705	20.4942	20.4952	20.4965	20.4865	20.3799	20.1379	0.0000
adjusted MIT	19.9359	20.0403	20.2050	20.3883	20.4705	20.4942	20.4952	20.4965	20.4865	20.3799	20.1379	19.9272 (93)

8. Space heating requirement												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9925	0.9849	0.9596	0.8745	0.7013	0.4863	0.3359	0.3735	0.6212	0.9048	0.9824	0.9941 (94)
Useful gains	417.6514	452.1055	478.3850	469.1431	391.9305	265.5687	175.8812	184.3778	286.7940	383.3353	395.2910	401.8480 (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	738.9153	712.7197	642.6959	529.0667	402.5244	266.1897	175.9136	184.4478	290.2299	448.8510	602.5353	732.0570 (97)
Space heating kWh	239.0204	175.1327	122.2473	43.1450	7.8818	0.0000	0.0000	0.0000	0.0000	48.7437	149.2158	245.6755 (98a)
Space heating requirement - total per year (kWh/year)												1031.0622
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	239.0204	175.1327	122.2473	43.1450	7.8818	0.0000	0.0000	0.0000	0.0000	48.7437	149.2158	245.6755 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1031.0622
Space heating per m2										(98c) / (4) =		23.2956 (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 %)												249.9000 (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	239.0204	175.1327	122.2473	43.1450	7.8818	0.0000	0.0000	0.0000	0.0000	48.7437	149.2158	245.6755 (98)
Space heating efficiency (main heating system 1)	249.9000	249.9000	249.9000	249.9000	249.9000	0.0000	0.0000	0.0000	0.0000	249.9000	249.9000	249.9000 (210)
Space heating fuel (main heating system)	95.6464	70.0811	48.9185	17.2649	3.1540	0.0000	0.0000	0.0000	0.0000	19.5053	59.7102	98.3095 (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	162.1252	143.0890	151.4992	132.2171	127.4466	114.0781	112.1358	117.0816	118.8916	133.4673	142.9761	160.2463 (64)
Efficiency of water heater (217)m	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000 (216)
Fuel for water heating, kWh/month	92.5901	81.7184	86.5215	75.5095	72.7851	65.1502	64.0410	66.8656	67.8993	76.2235	81.6540	91.5170 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	14.1479	11.3500	10.2194	7.4872	5.7833	4.7250	5.2757	6.8576	8.9073	11.6869	13.2003	14.5411 (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												412.5899 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												175.1000
Water heating fuel used												922.4751 (219)
Space cooling fuel												0.0000 (221)

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Electricity for pumps and fans:
Total electricity for the above, kWh/year 0.0000 (231)
Electricity for lighting (calculated in Appendix L) 114.1815 (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 1449.2466 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	412.5899	14.0400	57.9276 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	922.4751	14.0400	129.5155 (247)
Energy for instantaneous electric shower(s)	0.0000	14.0400	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	114.1815	16.4900	18.8285 (250)
Additional standing charges			26.0000 (251)
Total energy cost			232.2717 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12): 0.3600 (256)
Energy cost factor (ECF) 0.9368 (257)
SAP value 84.8146
SAP rating (Section 12) 85 (258)
SAP band B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	412.5899	0.1572	64.8665 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	922.4751	0.1411	130.1231 (264)
Space and water heating			194.9896 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	114.1815	0.1443	16.4799 (268)
Total CO2, kg/year			211.4695 (272)
CO2 emissions per m2			4.7800 (273)
EI value			96.8254
EI rating			97 (274)
EI band			A

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

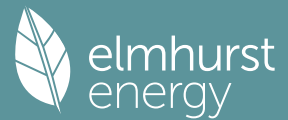
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	44.2600 (1b)	x 2.5000 (2b)	= 110.6500 (1b) - (3b)
Ground floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	44.2600		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 110.6500 (5)
Dwelling volume			

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1808 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4308 (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) = 0.3984 (21)

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Wind speed	Jan 4.6000	Feb 4.5000	Mar 4.6000	Apr 4.1000	May 4.3000	Jun 3.7000	Jul 3.6000	Aug 3.7000	Sep 3.7000	Oct 4.2000	Nov 4.1000	Dec 4.3000 (22)
Wind factor	1.1500	1.1250	1.1500	1.0250	1.0750	0.9250	0.9000	0.9250	0.9250	1.0500	1.0250	1.0750 (22a)
Adj infilt rate												
Effective ac	0.4582	0.4482	0.4582	0.4084	0.4283	0.3686	0.3586	0.3686	0.3686	0.4184	0.4084	0.4283 (22b)
	0.6050	0.6005	0.6050	0.5834	0.5917	0.5679	0.5643	0.5679	0.5679	0.5875	0.5834	0.5917 (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			6.9100	0.9615	6.6442		(27)
Heatloss Floor 1			44.2600	0.1200	5.3112	110.0000	4868.6000 (28a)
External Wall 1	34.1250	6.9100	27.2150	0.1800	4.8987	110.0000	2993.6500 (29a)
Bay window	0.7200		0.7200	0.1100	0.0792	9.0000	6.4800 (30)
Total net area of external elements Aum(A, m2)			79.1050				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	16.9333	(33)
Main dwelling							
Party Wall Between Flats			15.2800	0.0000	0.0000	180.0000	2750.4000 (32)
Party Wall Between Corridor			17.9800	0.0000	0.0000	180.0000	3236.4000 (32)
Party Ceiling 1			43.8700			30.0000	1316.1000 (32b)
Internal Wall 1			77.5000			9.0000	697.5000 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15869.1300 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 358.5434 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	3.9500	0.3050	1.2047
E3 Sill	3.9500	0.0240	0.0948
E4 Jamb	14.0000	0.0240	0.3360
E5 Ground floor (normal)	13.6500	0.0410	0.5597
E16 Corner (normal)	2.5000	0.0400	0.1000
E7 Party floor between dwellings (in blocks of flats)	13.6500	0.0330	0.4505
E18 Party wall between dwellings	2.5000	0.0300	0.0750
P1 Party wall - Ground floor	13.3000	0.3200	4.2560
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.3000	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	2.3200	0.1200	0.2784

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.3551 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 24.2884 (37)

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

(38)m	Jan 22.0905	Feb 21.9256	Mar 22.0905	Apr 21.3025	May 21.6068	Jun 20.7373	Jul 20.6050	Aug 20.7373	Sep 20.7373	Oct 21.4528	Nov 21.3025	Dec 21.6068 (38)
Heat transfer coeff	46.3789	46.2140	46.3789	45.5908	45.8952	45.0256	44.8934	45.0256	45.0256	45.7412	45.5908	45.8952 (39)
Average = Sum(39)m / 12 =												45.6379

HLP	Jan 1.0479	Feb 1.0441	Mar 1.0479	Apr 1.0301	May 1.0369	Jun 1.0173	Jul 1.0143	Aug 1.0173	Sep 1.0173	Oct 1.0335	Nov 1.0301	Dec 1.0369 (40)
HLP (average)												1.0311
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.5236 (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	57.3089	56.4578	55.2592	53.0493	51.3946	49.5597	48.5686	49.7588	51.0546	53.0180	55.2734	57.1152 (42b)
Hot water usage for other uses	30.2331	29.1338	28.0344	26.9350	25.8356	24.7362	24.7362	25.8356	26.9350	28.0344	29.1338	30.2331 (42c)
Average daily hot water use (litres/day)												80.6191 (43)

Daily hot water use	Jan 87.5420	Feb 85.5915	Mar 83.2936	Apr 79.9843	May 77.2301	Jun 74.2959	Jul 73.3048	Aug 75.5944	Sep 77.9896	Oct 81.0524	Nov 84.4072	Dec 87.3483 (44)
Energy conte	138.6452	121.8812	128.0192	109.4945	103.9666	91.3555	88.6558	93.6016	96.1690	109.9873	120.2535	136.7663 (45)
Energy content (annual)										Total = Sum(45)m =		1338.7956
Distribution loss (46)m = 0.15 x (45)m	20.7968	18.2822	19.2029	16.4242	15.5950	13.7033	13.2984	14.0402	14.4253	16.4981	18.0380	20.5149 (46)

Water storage loss:

Store volume 125.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 0.0130 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.0070 (55)

Total storage loss

	0.2176	0.1966	0.2176	0.2106	0.2176	0.2106	0.2176	0.2176	0.2106	0.2176	0.2106	0.2176 (56)
If cylinder contains dedicated solar storage												
	0.2176	0.1966	0.2176	0.2106	0.2176	0.2106	0.2176	0.2176	0.2106	0.2176	0.2106	0.2176 (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	162.1252	143.0890	151.4992	132.2171	127.4466	114.0781	112.1358	117.0816	118.8916	133.4673	142.9761	160.2463 (62)
WVHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
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	162.1252	143.0890	151.4992	132.2171	127.4466	114.0781	112.1358	117.0816	118.8916	133.4673	142.9761	160.2463 (64)
								Total per year (kWh/year) = Sum(64)m =				1615.2539 (64)

Electric shower(s) 0.0000

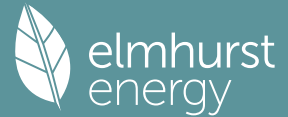
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)

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

Heat gains from water heating, kWh/month 64.8835 57.4917 61.3504 54.5850 53.3529 48.5538 48.2621 49.9065 50.1543 55.3548 58.1624 64.2588 (65)

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

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Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	91.4157	91.4157	91.4157	91.4157	91.4157	91.4157	91.4157	91.4157	91.4157	91.4157	91.4157	91.4157	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.1636	14.3563	11.6754	8.8390	6.6073	5.5781	6.0274	7.8346	10.5156	13.3519	15.5837	16.6128	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.5765	199.6267	194.4602	183.4613	169.5772	156.5281	147.8105	145.7603	150.9268	161.9257	175.8098	188.8589	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	(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)	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	(71)
Water heating gains (Table 5)	87.2091	85.5531	82.4602	75.8125	71.7109	67.4358	64.8684	67.0787	69.6587	74.4016	80.7811	86.3694	(72)
Total internal gains	377.0862	375.6733	364.7328	344.2499	324.0325	305.6791	294.8433	296.8107	307.2382	325.8163	348.3116	367.9781	(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				
Northeast					0.8300	9.5471		0.6300	0.7000	0.7700		2.4217 (75)				
East					5.2500	16.6187		0.6300	0.7000	0.7700		26.6642 (76)				
Southeast					0.8300	31.1332		0.6300	0.7000	0.7700		7.8972 (77)				
Solar gains					36.9831	74.1048	125.4072	183.2781	218.9137	228.4012	213.1038	180.5103	146.3576	90.4244	47.5178	32.7872 (83)
Total gains					414.0693	449.7781	490.1401	527.5280	542.9462	534.0804	507.9471	477.3210	453.5958	416.2407	395.8294	400.7654 (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	95.0453	95.3843	95.0453	96.6881	96.0469	97.9018	98.1902	97.9018	97.9018	96.3703	96.6881	96.0469	
alpha	7.3364	7.3590	7.3364	7.4459	7.4031	7.5268	7.5460	7.5268	7.5268	7.4247	7.4459	7.4031	
util living area	0.9943	0.9885	0.9680	0.8864	0.7138	0.5043	0.3799	0.4241	0.6719	0.9252	0.9863	0.9956	(86)
MIT	20.4919	20.5723	20.7051	20.8678	20.9418	20.9576	20.9587	20.9584	20.9505	20.8462	20.6488	20.4722	(87)
Th 2	20.0436	20.0467	20.0436	20.0584	20.0527	20.0689	20.0714	20.0689	20.0689	20.0555	20.0584	20.0527	(88)
util rest of house	0.9917	0.9835	0.9545	0.8471	0.6452	0.4269	0.2980	0.3366	0.5877	0.8886	0.9793	0.9936	(89)
MIT 2	19.4678	19.5714	19.7316	19.9278	19.9890	20.0155	20.0185	20.0158	20.0121	19.9075	19.6786	19.4507	(90)
Living area fraction	19.9900	20.0818	20.2280	20.4071	20.4749	20.4959	20.4979	20.4965	20.4906	20.3862	20.1734	19.9716	(92)
MIT	19.9900	20.0818	20.2280	20.4071	20.4749	20.4959	20.4979	20.4965	20.4906	20.3862	20.1734	19.9716	(93)
Temperature adjustment												0.0000	
adjusted MIT	19.9900	20.0818	20.2280	20.4071	20.4749	20.4959	20.4979	20.4965	20.4906	20.3862	20.1734	19.9716	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9915	0.9837	0.9575	0.8628	0.6765	0.4626	0.3356	0.3768	0.6267	0.9029	0.9804	0.9934	(94)
Useful gains	410.5685	442.4627	469.2966	455.1488	367.3211	247.0503	170.4717	179.8723	284.2486	375.8354	388.0522	398.1115	(95)
Ext temp.	4.8000	5.3000	6.8000	9.3000	12.3000	15.0000	16.7000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W	704.4945	683.1266	622.7770	506.3838	375.1883	247.4568	170.5016	179.9449	287.7427	438.4824	577.7887	705.4822	(97)
Space heating kWh	218.6810	161.7261	114.1894	36.8892	5.8532	0.0000	0.0000	0.0000	0.0000	46.6093	136.6103	228.6838	(98a)
Space heating requirement - total per year (kWh/year)												949.2424	
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	218.6810	161.7261	114.1894	36.8892	5.8532	0.0000	0.0000	0.0000	0.0000	46.6093	136.6103	228.6838	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												949.2424	
Space heating per m2										(98c) / (4) =		21.4470	(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 %)													249.9000 (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	
	218.6810	161.7261	114.1894	36.8892	5.8532	0.0000	0.0000	0.0000	0.0000	46.6093	136.6103	228.6838	(98)
Space heating efficiency (main heating system 1)	249.9000	249.9000	249.9000	249.9000	249.9000	0.0000	0.0000	0.0000	0.0000	249.9000	249.9000	249.9000	(210)
Space heating fuel (main heating system)	87.5074	64.7163	45.6940	14.7616	2.3422	0.0000	0.0000	0.0000	0.0000	18.6512	54.6660	91.5101	(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	162.1252	143.0890	151.4992	132.2171	127.4466	114.0781	112.1358	117.0816	118.8916	133.4673	142.9761	160.2463	(64)
Efficiency of water heater	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	(216)
(217)m	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	(217)
Fuel for water heating, kWh/month													

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Space cooling fuel requirement (221)m	92.5901	81.7184	86.5215	75.5095	72.7851	65.1502	64.0410	66.8656	67.8993	76.2235	81.6540	91.5170	(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	14.1479	11.3500	10.2194	7.4872	5.7833	4.7250	5.2757	6.8576	8.9073	11.6869	13.2003	14.5411	(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												379.8489	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												175.1000	
Water heating fuel used												922.4751	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												114.1815	(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												1416.5056	(238)

10a. Fuel costs - using BEDF prices (572)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	379.8489	23.6600	89.8723	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	922.4751	23.6600	218.2576	(247)
Energy for instantaneous electric shower(s)	0.0000	23.6600	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	114.1815	26.0600	29.7557	(250)
Additional standing charges			114.0000	(251)
Total energy cost			451.8856	(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	379.8489	0.1573	59.7369	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	922.4751	0.1411	130.1231	(264)
Space and water heating			189.8599	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	114.1815	0.1443	16.4799	(268)
Total CO2, kg/year			206.3398	(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	379.8489	1.5822	600.9996	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	922.4751	1.5216	1403.6301	(278)
Space and water heating			2004.6297	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	114.1815	1.5338	175.1354	(282)
Total Primary energy kWh/year			2179.7651	(286)

Thermal Bridging

Property Reference	Flat 1	Issued on Date	30/06/2025
Assessment Reference	As Designed	Prop Type Ref	Semi-Detached Flat
Property	Flat 1, Bury Old Road, Prestwich, Manchester, M25 3DE		

SAP Rating	85 B	DER	4.97	TER	13.64
Environmental	97 A	% DER < TER			63.56
CO ₂ Emissions (t/year)	0.21	DFEE	32.62	TFEE	32.84
Compliance Check	See BREL	% DFEE < TFEE			0.66
% DPER < TPER	27.12	DPER	52.33	TPER	71.80

Assessor Details	Mr. Nathaniel Kempson	Assessor ID	R421-0001
Client	Encon Associates, Glenn Miles		

	Junction details	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E1 Steel lintel with perforated steel base plate	Non Gov Approved Schemes	0.305	3.95	1.20	Knauf
External wall	E3 Sill	Non Gov Approved Schemes	0.024	3.95	0.09	Knauf
External wall	E4 Jamb	Non Gov Approved Schemes	0.024	14.00	0.34	Knauf
External wall	E5 Ground floor (normal)	Non Gov Approved Schemes	0.041	13.65	0.56	Knauf
External wall	E16 Corner (normal)	Non Gov Approved Schemes	0.040	2.50	0.10	Knauf
External wall	E7 Party floor between dwellings (in blocks of flats)	Non Gov Approved Schemes	0.033	13.65	0.45	Knauf
External wall	E18 Party wall between dwellings	Non Gov Approved Schemes	0.030	2.50	0.07	Knauf
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.320	13.30	4.26	
Party wall	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	0.000	13.30	0.00	
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Default	0.120	2.32	0.28	

Total: 83.12 W/mK:
Y-Value: 0.09 W/m²K:

Building Regulations England Part L (BREL) Compliance Report

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

Date: Mon 30 Jun 2025 11:01:52

Project Information			
Assessed By	Nathaniel Kempson	Building Type	Flat, Semi-detached
OCDEA Registration	EES/020528	Assessment Date	2025-06-30

Dwelling Details			
Assessment Type	As designed	Total Floor Area	44 m ²
Site Reference	Flat 2	Plot Reference	As Designed
Address	Flat 2 Bury Old Road, Prestwich, M25 3DE		

Client Details	
Name	Glenn Miles
Company	Encon Associates Ltd
Address	10 Chapel Lane, Nottingham, NG5 7DR

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	14.26 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	4.98 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	75.13 kWh _{PE} /m ²		
Dwelling primary energy	52.45 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	35.6 kWh/m ²		
Dwelling fabric energy efficiency	32.7 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	0.18	Walls (1) (0.18)	OK
Party walls	0.2	0	Party Wall (1) (0)	N/A
Curtain walls	1.6	0	N/A	N/A
Floors	0.18	0.12	Heatloss Floor 1 (0.12)	OK
Roofs	0.16	0.11	Roof (1) (0.11)	OK
Windows, doors, and roof windows	1.6	1	East Windows (1)	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)	21.5375	0.18	
Exposed wall: Walls (2)	15.3	0.18	
Party wall: Party Wall (1)	17.98	0 (!)	
Ground floor: Heatloss Floor 1, Heatloss Floor 1	44.26	0.12	
Exposed roof: Roof (1)	0.72	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]
East Windows, Windows	2.625	East	0.7	1 (!)
East Windows, Windows	2.625	East	0.7	1 (!)
North East Windows, Windows	0.83125	North East	0.7	1 (!)
South East Windows, Windows	0.83125	South East	0.7	1 (!)

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	E1: Steel lintel with perforated steel base plate	Not government-approved scheme	0.305	Knauf

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E3: Sill	Not government-approved scheme	0.024 (!)	Knauf
External wall	E4: Jamb	Not government-approved scheme	0.024 (!)	Knauf
External wall	E5: Ground floor (normal)	Not government-approved scheme	0.041	Knauf
External wall	E16: Corner (normal)	Not government-approved scheme	0.04	Knauf
External wall	E7: Party floor between dwellings (in blocks of flats)	Not government-approved scheme	0.033 (!)	Knauf
External wall	E18: Party wall between dwellings	Not government-approved scheme	0.03 (!)	Knauf
Party wall	P1: Ground floor	SAP table default	0.32	
Party wall	P3: Intermediate floor between dwellings (in blocks of flats)	SAP table default	0 (!)	
External wall	E10: Eaves (insulation at ceiling level)	SAP table default	0.12	

3 Air permeability (better than typically expected values are flagged with a subsequent (!))

Maximum permitted air permeability at 50Pa	8 m ³ /hm ²	
Dwelling air permeability at 50Pa	5 m ³ /hm ² , Design value	OK
Air permeability test certificate reference		

4 Space heating

Main heating system 1: Heat pump with radiators or underfloor heating - Electricity

Efficiency	249.9%
Emitter type	Underfloor
Flow temperature	35°C
System type	Air source heat pump
Manufacturer	TBC
Model	TBC
Commissioning	

Secondary heating system: N/A

Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water

Cylinder/store - type: Cylinder

Capacity	125 litres
Declared heat loss	0.013 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	95 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: N/A		
Maximum permitted specific fan power	N/A	
Specific fan power	N/A	N/A
Minimum permitted heat recovery efficiency	N/A	
Heat recovery efficiency	N/A	N/A
Manufacturer/Model		
Commissioning		
9 Local generation		
N/A		
10 Heat networks		
N/A		
11 Supporting documentary evidence		
N/A		
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 information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.		
Signed: Name:	Assessor ID: Date:	
b. Client Declaration		
N/A		

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Property Reference	Flat 2			Issued on Date	30/06/2025
Assessment Reference	As Designed	Prop Type Ref			
Property	Flat 2, Bury Old Road, Prestwich, Manchester, M25 3DE				
SAP Rating	85 B	DER	4.98	TER	14.26
Environmental	97 A	% DER < TER			65.08
CO ₂ Emissions (t/year)	0.21	DFEE	32.72	TFEE	35.58
Compliance Check	See BREL	% DFEE < TFEE			8.03
% DPER < TPER	30.18	DPER	52.45	TPER	75.13
Assessor Details	Mr. Nathaniel Kempson			Assessor ID	R421-0001
Client	Encon Associates, Glenn Miles				

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	44.2600 (1b)	2.5000 (2b)	110.6500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	44.2600		110.6500 (4)
Dwelling volume			110.6500 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1808 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4308 (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) =	0.3984 (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 infiltr rate	0.5080	0.4981	0.4881	0.4383	0.4283	0.3785	0.3785	0.3686	0.3984	0.4283	0.4482	0.4682 (22b)
Effective ac	0.6290	0.6240	0.6191	0.5960	0.5917	0.5716	0.5716	0.5679	0.5794	0.5917	0.6005	0.6096 (25)

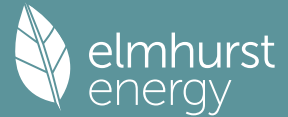
3. Heat losses and heat loss parameter

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			6.9100	0.9615	6.6442		(27)
Heatloss Floor 1			44.2600	0.1200	5.3112	110.0000	4868.6000 (28a)
External Wall 1	28.4500	6.9100	21.5400	0.1800	3.8772	110.0000	2369.4000 (29a)
External Wall Sheltered open	15.3000		15.3000	0.1800	2.7540	110.0000	1683.0000 (29a)
Bay window	0.7200		0.7200	0.1100	0.0792	9.0000	6.4800 (30)
Total net area of external elements Aum(A, m ²)			88.7300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	18.6658		(33)
Main dwelling							
Party Wall Between Corridor			17.9800	0.0000	0.0000	180.0000	3236.4000 (32)
Party Ceiling 1			43.8700			20.0000	877.4000 (32b)
Internal Wall 1			77.5000			9.0000	697.5000 (32c)

Heat capacity Cm = Sum (A x k)	(28)...(30) + (32) + (32a)...(32e) =	13738.7800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		310.4108 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element			
E1 Steel lintel with perforated steel base plate	3.9500	0.3050	1.2047
E3 Sill	3.9500	0.0240	0.0948
E4 Jamb	14.0000	0.0240	0.3360
E5 Ground floor (normal)	17.5000	0.0410	0.7175

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E16 Corner (normal)	2.5000	0.0400	0.1000	
E7 Party floor between dwellings (in blocks of flats)	17.5000	0.0330	0.5775	
E18 Party wall between dwellings	2.5000	0.0300	0.0750	
P1 Party wall - Ground floor	7.1900	0.3200	2.3008	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.1900	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)	2.3200	0.1200	0.2784	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				5.6848 (36)
Point Thermal bridges				0.0000
Total fabric heat loss		(33) + (36) + (36a) =		24.3506 (37)

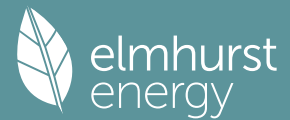
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	22.9691	22.7861	22.6068	21.7644	21.6068	20.8731	20.8731	20.7373	21.1557	21.6068	21.9256	22.2590 (38)
Average = Sum(39)m / 12 =	47.3197	47.1367	46.9574	46.1150	45.9574	45.2237	45.2237	45.0878	45.5063	45.9574	46.2762	46.6095 (39)
												46.1142
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0691	1.0650	1.0609	1.0419	1.0384	1.0218	1.0218	1.0187	1.0282	1.0384	1.0456	1.0531 (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												1.5236 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
Hot water usage for other uses	57.3089	56.4578	55.2592	53.0493	51.3946	49.5597	48.5686	49.7588	51.0546	53.0180	55.2734	57.1152 (42c)
Average daily hot water use (litres/day)	30.2331	29.1338	28.0344	26.9350	25.8356	24.7362	24.7362	25.8356	26.9350	28.0344	29.1338	30.2331 (43)
Daily hot water use	87.5420	85.5915	83.2936	79.9843	77.2301	74.2959	73.3048	75.5944	77.9896	81.0524	84.4072	87.3483 (44)
Energy conte	138.6452	121.8812	128.0192	109.4945	103.9666	91.3555	88.6558	93.6016	96.1690	109.9873	120.2535	136.7663 (45)
Energy content (annual)										Total = Sum(45)m =		1338.7956
Distribution loss (46)m = 0.15 x (45)m	20.7968	18.2822	19.2029	16.4242	15.5950	13.7033	13.2984	14.0402	14.4253	16.4981	18.0380	20.5149 (46)
Water storage loss:												125.0000 (47)
Store volume												0.0130 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.0070 (55)
Enter (49) or (54) in (55)												
Total storage loss	0.2176	0.1966	0.2176	0.2106	0.2176	0.2106	0.2176	0.2176	0.2106	0.2176	0.2106	0.2176 (56)
If cylinder contains dedicated solar storage	0.2176	0.1966	0.2176	0.2106	0.2176	0.2106	0.2176	0.2176	0.2106	0.2176	0.2106	0.2176 (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	162.1252	143.0890	151.4992	132.2171	127.4466	114.0781	112.1358	117.0816	118.8916	133.4673	142.9761	160.2463 (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	162.1252	143.0890	151.4992	132.2171	127.4466	114.0781	112.1358	117.0816	118.8916	133.4673	142.9761	160.2463 (64)
12Total per year (kWh/year)												1615.2539 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	64.8835	57.4917	61.3504	54.5850	53.3529	48.5538	48.2621	49.9065	50.1543	55.3548	58.1624	64.2588 (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	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	70.0009	77.5010	70.0009	72.3343	70.0009	72.3343	70.0009	70.0009	72.3343	70.0009	72.3343	70.0009 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	132.3762	133.7499	130.2883	122.9191	113.6167	104.8738	99.0331	97.6594	101.1210	108.4902	117.7926	126.5354 (68)
Pumps, fans	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180 (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)	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438 (71)
Total internal gains	87.2091	85.5531	82.4602	75.8125	71.7109	67.4358	64.8684	67.0787	69.6587	74.4016	80.7811	86.3694 (72)
	335.4402	342.6580	328.6034	316.9198	301.1825	290.4979	279.7563	280.5930	288.9679	298.7467	316.7618	328.7597 (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											
Northeast	0.8300											2.8620 (75)
East	5.2500											31.5122 (76)
Southeast	0.8300											9.3331 (77)
Solar gains	43.7073	83.3679	133.7677	192.2497	234.8125	240.4224	228.8444	196.8064	154.4140	97.8362	54.0720	36.2385 (83)
Total gains	379.1474	426.0259	462.3711	509.1696	535.9950	530.9202	508.6007	477.3994	443.3819	396.5829	370.8339	364.9982 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	80.6499	80.9630	81.2722	82.7568	83.0406	84.3878	84.3878	84.6421	83.8637	83.0406	82.4685	81.8787
alpha	6.3767	6.3975	6.4181	6.5171	6.5360	6.6259	6.6259	6.6428	6.5909	6.5360	6.4979	6.4586
util living area	0.9952	0.9889	0.9716	0.9032	0.7525	0.5407	0.3908	0.4335	0.6852	0.9334	0.9880	0.9961 (86)
MIT	20.3136	20.4298	20.5934	20.8002	20.9151	20.9494	20.9527	20.9525	20.9371	20.7852	20.5231	20.3025 (87)
Th 2	20.0261	20.0295	20.0329	20.0486	20.0515	20.0652	20.0652	20.0678	20.0599	20.0515	20.0455	20.0393 (88)
util rest of house	0.9933	0.9848	0.9609	0.8711	0.6911	0.4640	0.3080	0.3462	0.6022	0.9033	0.9826	0.9946 (89)
MIT 2	19.2353	19.3850	19.5915	19.8470	19.9639	20.0034	20.0050	20.0076	19.9910	19.8389	19.5175	19.2322 (90)
Living area fraction	fLA = Living area / (4) =											0.5099 (91)
MIT	19.7852	19.9178	20.1024	20.3330	20.4489	20.4858	20.4883	20.4894	20.4734	20.3215	20.0303	19.7780 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7852	19.9178	20.1024	20.3330	20.4489	20.4858	20.4883	20.4894	20.4734	20.3215	20.0303	19.7780 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9927	0.9842	0.9618	0.8816	0.7178	0.4988	0.3455	0.3858	0.6398	0.9130	0.9825	0.9941 (94)
Useful gains	376.3864	419.2816	444.7165	448.8785	384.7479	264.8017	175.7405	184.1792	283.6619	362.0829	364.3584	362.8487 (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	732.7537	707.8888	638.7335	527.2342	402.0784	266.1770	175.8416	184.3831	290.0314	446.7738	598.3639	726.0845 (97)
Space heating kWh	265.1373	193.9440	144.3486	56.4160	12.8940	0.0000	0.0000	0.0000	0.0000	63.0100	168.4840	270.2474 (98a)
Space heating requirement - total per year (kWh/year)	1174.4813											
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	265.1373	193.9440	144.3486	56.4160	12.8940	0.0000	0.0000	0.0000	0.0000	63.0100	168.4840	270.2474 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1174.4813											
Space heating per m2	(98c) / (4) = 26.5360 (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 %)	249.9000 (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	265.1373	193.9440	144.3486	56.4160	12.8940	0.0000	0.0000	0.0000	0.0000	63.0100	168.4840	270.2474 (98)
Space heating efficiency (main heating system 1)	249.9000	249.9000	249.9000	249.9000	249.9000	0.0000	0.0000	0.0000	0.0000	249.9000	249.9000	249.9000 (210)
Space heating fuel (main heating system)	106.0973	77.6087	57.7626	22.5754	5.1596	0.0000	0.0000	0.0000	0.0000	25.2141	67.4206	108.1422 (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	162.1252	143.0890	151.4992	132.2171	127.4466	114.0781	112.1358	117.0816	118.8916	133.4673	142.9761	160.2463 (64)
Efficiency of water heater	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000 (216)
Fuel for water heating, kWh/month	92.5901	81.7184	86.5215	75.5095	72.7851	65.1502	64.0410	66.8656	67.8993	76.2235	81.6540	91.5170 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	14.1479	11.3500	10.2194	7.4872	5.7833	4.7250	5.2757	6.8576	8.9073	11.6869	13.2003	14.5411 (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	469.9805 (211)											
Space heating fuel - main system 2	0.0000 (213)											
Space heating fuel - secondary	0.0000 (215)											
Efficiency of water heater	175.1000											
Water heating fuel used	922.4751 (219)											
Space cooling fuel	0.0000 (221)											
Electricity for pumps and fans:												
Total electricity for the above, kWh/year	0.0000 (231)											
Electricity for lighting (calculated in Appendix L)	114.1815 (232)											
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation	0.0000 (233)											
Wind generation	0.0000 (234)											

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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	1506.6372 (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	469.9805	0.1568	73.6951 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	922.4751	0.1411	130.1231 (264)
Space and water heating			203.8181 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	114.1815	0.1443	16.4799 (268)
Total CO2, kg/year			220.2981 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.9800 (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	469.9805	1.5805	742.8064 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	922.4751	1.5216	1403.6301 (278)
Space and water heating			2146.4365 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	114.1815	1.5338	175.1354 (282)
Total Primary energy kWh/year			2321.5719 (286)
Dwelling Primary energy Rate (DPER)			52.4500 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	44.2600 (1b)	x 2.5000 (2b)	= 110.6500 (1b) - (3b)
Ground floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	44.2600		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 110.6500 (5)

2. Ventilation rate

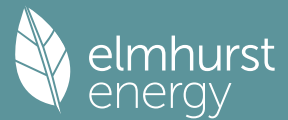
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1808 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4308 (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) = 0.3984 (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	0.5080	0.4981	0.4881	0.4383	0.4283	0.3785	0.3785	0.3686	0.3984	0.4283	0.4482	0.4682 (22b)
Effective ac	0.6290	0.6240	0.6191	0.5960	0.5917	0.5716	0.5716	0.5679	0.5794	0.5917	0.6005	0.6096 (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			6.9100	1.1450	7.9122		(27)
Heatloss Floor 1			44.2600	0.1300	5.7538		(28a)
External Wall 1	28.4500	6.9100	21.5400	0.1800	3.8772		(29a)
External Wall Sheltered open	15.3000		15.3000	0.1800	2.7540		(29a)
Bay window	0.7200		0.7200	0.1100	0.0792		(30)

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Total net area of external elements Aum(A, m2)	88.7300			(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	20.3764		(33)
Main dwelling				
Party Wall Between Corridor	17.9800	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 320.3226 (35)

List of Thermal Bridges				
K1 Element	Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate	3.9500	0.0500	0.1975	
E3 Sill	3.9500	0.0500	0.1975	
E4 Jamb	14.0000	0.0500	0.7000	
E5 Ground floor (normal)	17.5000	0.1600	2.8000	
E16 Corner (normal)	2.5000	0.0900	0.2250	
E7 Party floor between dwellings (in blocks of flats)	17.5000	0.0700	1.2250	
E18 Party wall between dwellings	2.5000	0.0600	0.1500	
P1 Party wall - Ground floor	7.1900	0.0800	0.5752	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.1900	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)	2.3200	0.0600	0.1392	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.2094 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 26.5858 (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	22.9691	22.7861	22.6068	21.7644	21.6068	20.8731	20.8731	20.7373	21.1557	21.6068	21.9256	22.2590
Average = Sum(39)m / 12 =	49.5549	49.3719	49.1926	48.3502	48.1926	47.4589	47.4589	47.3231	47.7415	48.1926	48.5114	48.8448

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1196	1.1155	1.1114	1.0924	1.0889	1.0723	1.0723	1.0692	1.0787	1.0889	1.0961	1.1036
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.5236 (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	57.3089	56.4578	55.2592	53.0493	51.3946	49.5597	48.5686	49.7588	51.0546	53.0180	55.2734	57.1152 (42b)
Hot water usage for other uses	30.2331	29.1338	28.0344	26.9350	25.8356	24.7362	24.7362	25.8356	26.9350	28.0344	29.1338	30.2331 (42c)
Average daily hot water use (litres/day)												80.6191 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	87.5420	85.5915	83.2936	79.9843	77.2301	74.2959	73.3048	75.5944	77.9896	81.0524	84.4072	87.3483 (44)
Energy content (annual)	138.6452	121.8812	128.0192	109.4945	103.9666	91.3555	88.6558	93.6016	96.1690	109.9873	120.2535	136.7663 (45)
Distribution loss (46)m = 0.15 x (45)m	20.7968	18.2822	19.2029	16.4242	15.5950	13.7033	13.2984	14.0402	14.4253	16.4981	18.0380	20.5149 (46)
Water storage loss:												
Store volume												125.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.2537 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.6770 (55)
Total storage loss	20.9878	18.9567	20.9878	20.3107	20.9878	20.3107	20.9878	20.9878	20.3107	20.9878	20.3107	20.9878 (56)
If cylinder contains dedicated solar storage	20.9878	18.9567	20.9878	20.3107	20.9878	20.3107	20.9878	20.9878	20.3107	20.9878	20.3107	20.9878 (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	182.8954	161.8491	172.2693	152.3172	148.2168	134.1782	132.9060	137.8518	138.9917	154.2375	163.0762	181.0165 (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	182.8954	161.8491	172.2693	152.3172	148.2168	134.1782	132.9060	137.8518	138.9917	154.2375	163.0762	181.0165 (64)
12Total per year (kWh/year)												1859.8058 (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	81.4997	72.4998	77.9665	70.6651	69.9690	64.6339	64.8782	66.5227	66.2344	71.9709	74.2425	80.8749 (65)

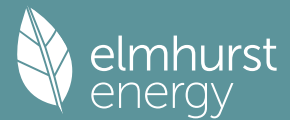
5. Internal gains (see Table 5 and 5a)

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	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	70.0009	77.5010	70.0009	72.3343	70.0009	72.3343	70.0009	70.0009	72.3343	70.0009	72.3343	70.0009 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	132.3762	133.7499	130.2883	122.9191	113.6167	104.8738	99.0331	97.6594	101.1210	108.4902	117.7926	126.5354 (68)
Pumps, fans	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180 (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	3.0000	3.0000	3.0000 (70)
Water heating gains (Table 5)	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438 (71)
Total internal gains	109.5426	107.8866	104.7937	98.1460	94.0444	89.7693	87.2019	89.4122	91.9922	96.7351	103.1146	108.7029 (72)
	360.7737	367.9915	353.9369	342.2533	326.5160	312.8314	302.0898	302.9265	311.3014	324.0802	342.0953	354.0932 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
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	m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W
Northeast	0.8300	11.2829	0.6300	0.7000	0.7700	2.8620 (75)
East	5.2500	19.6403	0.6300	0.7000	0.7700	31.5122 (76)
Southeast	0.8300	36.7938	0.6300	0.7000	0.7700	9.3331 (77)

Solar gains	43.7073	83.3679	133.7677	192.2497	234.8125	240.4224	228.8444	196.8064	154.4140	97.8362	54.0720	36.2385 (83)
Total gains	404.4809	451.3594	487.7046	534.5031	561.3285	553.2537	530.9342	499.7329	465.7154	421.9164	396.1674	390.3317 (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	79.4712	79.7657	80.0565	81.4513	81.7177	82.9810	82.9810	83.2192	82.4898	81.7177	81.1806	80.6266
alpha	6.2981	6.3177	6.3371	6.4301	6.4478	6.5321	6.5321	6.5479	6.4993	6.4478	6.4120	6.3751
util living area	0.9943	0.9877	0.9697	0.9012	0.7521	0.5440	0.3928	0.4345	0.6838	0.9279	0.9861	0.9954 (86)
MIT	20.1533	20.3048	20.5210	20.7934	20.9479	20.9945	20.9994	20.9989	20.9780	20.7806	20.4334	20.1380 (87)
Th 2	19.9848	19.9882	19.9915	20.0070	20.0099	20.0235	20.0235	20.0261	20.0183	20.0099	20.0041	19.9979 (88)
util rest of house	0.9921	0.9829	0.9580	0.8674	0.6882	0.4636	0.3059	0.3432	0.5972	0.8949	0.9798	0.9935 (89)
MIT 2	19.0246	19.2182	19.4891	19.8189	19.9736	20.0211	20.0234	20.0258	20.0069	19.8151	19.3945	19.0152 (90)
Living area fraction										FLA = Living area / (4) =		0.5099 (91)
MIT	19.6002	19.7723	20.0153	20.3158	20.4705	20.5175	20.5211	20.5220	20.5021	20.3075	19.9243	19.5878 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6002	19.7723	20.0153	20.3158	20.4705	20.5175	20.5211	20.5220	20.5021	20.3075	19.9243	19.5878 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9910	0.9817	0.9583	0.8789	0.7190	0.5046	0.3503	0.3898	0.6410	0.9061	0.9792	0.9926 (94)
Useful gains	400.8370	443.0861	467.3727	469.7776	403.6082	279.1783	185.9640	194.8160	298.5429	382.2788	387.9095	387.4300 (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	758.1986	734.2746	664.8530	551.9581	422.6721	280.8375	186.0923	195.0675	305.6476	467.8278	622.1242	751.6112 (97)
Space heating kWh	265.8771	195.6786	146.9253	59.1699	14.1836	0.0000	0.0000	0.0000	0.0000	63.6484	168.6346	270.9508 (98a)
Space heating requirement - total per year (kWh/year)												1185.0684
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	265.8771	195.6786	146.9253	59.1699	14.1836	0.0000	0.0000	0.0000	0.0000	63.6484	168.6346	270.9508 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1185.0684
Space heating per m2										(98c) / (4) =		26.7752 (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	265.8771	195.6786	146.9253	59.1699	14.1836	0.0000	0.0000	0.0000	0.0000	63.6484	168.6346	270.9508 (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)	288.0575	212.0028	159.1824	64.1061	15.3668	0.0000	0.0000	0.0000	0.0000	68.9582	182.7027	293.5545 (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	182.8954	161.8491	172.2693	152.3172	148.2168	134.1782	132.9060	137.8518	138.9917	154.2375	163.0762	181.0165 (64)
Efficiency of water heater (217)m	84.8978	84.4865	83.7050	82.1289	80.5127	79.8000	79.8000	79.8000	79.8000	82.2347	84.1350	79.8000 (216)
Fuel for water heating, kWh/month	215.4301	191.5680	205.8053	185.4613	184.0913	168.1431	166.5488	172.7466	174.1751	187.5577	193.8268	213.0552 (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	14.5448	11.6684	10.5061	7.6972	5.9455	4.8576	5.4237	7.0500	9.1572	12.0148	13.5706	14.9491 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-21.2332	-30.2102	-43.8422	-49.8246	-54.2345	-50.8723	-50.3098	-47.2812	-41.9587	-34.8513	-23.4662	-18.3306 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-11.1694	-23.5888	-47.0322	-70.8288	-93.8007	-94.2414	-93.0680	-78.6779	-57.5507	-33.7224	-14.9151	-8.8203 (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												1283.9311 (211)
Space heating fuel - main system 2												0.0000 (213)

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Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2258.4092 (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)	117.3850 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1093.8307 (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	2651.8945 (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	1283.9311	0.2100	269.6255 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2258.4092	0.2100	474.2659 (264)
Space and water heating			743.8915 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	117.3850	0.1443	16.9423 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-466.4150	0.1343	-62.6610
PV Unit electricity exported	-627.4157	0.1258	-78.9502
Total			-141.6112 (269)
Total CO2, kg/year			631.1518 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.2600 (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	1283.9311	1.1300	1450.8421 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2258.4092	1.1300	2552.0024 (278)
Space and water heating			4002.8445 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	117.3850	1.5338	180.0490 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-466.4150	1.4965	-697.9929
PV Unit electricity exported	-627.4157	0.4619	-289.8008
Total			-987.7937 (283)
Total Primary energy kWh/year			3325.2006 (286)
Target Primary Energy Rate (TPER)			75.1300 (287)

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

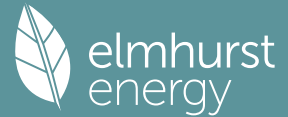
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	44.2600 (1b)	2.5000 (2b)	110.6500 (1b) - (3b)
Ground floor			0.0000 (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	44.2600		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	110.6500 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	20.0000 / (5) = 0.1808 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4308 (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) = 0.3984 (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													
	0.5080	0.4981	0.4881	0.4383	0.4283	0.3785	0.3785	0.3686	0.3984	0.4283	0.4482	0.4682	(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	0.6290	0.6240	0.6191	0.5960	0.5917	0.5716	0.5716	0.5679	0.5794	0.5917	0.6005	0.6096	(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			6.9100	0.9615	6.6442			(27)
Heatloss Floor 1			44.2600	0.1200	5.3112	110.0000	4868.6000	(28a)
External Wall 1	28.4500	6.9100	21.5400	0.1800	3.8772	110.0000	2369.4000	(29a)
External Wall Sheltered open	15.3000		15.3000	0.1800	2.7540	110.0000	1683.0000	(29a)
Bay window	0.7200		0.7200	0.1100	0.0792	9.0000	6.4800	(30)
Total net area of external elements Aum(A, m2)			88.7300					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	18.6658		(33)
Main dwelling								
Party Wall Between Corridor			17.9800	0.0000	0.0000	180.0000	3236.4000	(32)
Party Ceiling 1			43.8700			30.0000	1316.1000	(32b)
Internal Wall 1			77.5000			9.0000	697.5000	(32c)
Heat capacity Cm = Sum(A x k)								(28)...(30) + (32) + (32a)...(32e) =
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								14177.4800 (34)
List of Thermal Bridges								320.3226 (35)
K1 Element					Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate					3.9500	0.3050	1.2047	
E3 Sill					3.9500	0.0240	0.0948	
E4 Jamb					14.0000	0.0240	0.3360	
E5 Ground floor (normal)					17.5000	0.0410	0.7175	
E16 Corner (normal)					2.5000	0.0400	0.1000	
E7 Party floor between dwellings (in blocks of flats)					17.5000	0.0330	0.5775	
E18 Party wall between dwellings					2.5000	0.0300	0.0750	
P1 Party wall - Ground floor					7.1900	0.3200	2.3008	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)					7.1900	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)					2.3200	0.1200	0.2784	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								5.6848 (36)
Point Thermal Bridges								(36a) =
Total fabric heat loss								(33) + (36) + (36a) =
								24.3506 (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	22.9691	22.7861	22.6068	21.7644	21.6068	20.8731	20.8731	20.7373	21.1557	21.6068	21.9256	22.2590	(38)
Average = Sum(39)m / 12 =	47.3197	47.1367	46.9574	46.1150	45.9574	45.2237	45.2237	45.0878	45.5063	45.9574	46.2762	46.6095	(39)
												46.1142	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0691	1.0650	1.0609	1.0419	1.0384	1.0218	1.0218	1.0187	1.0282	1.0384	1.0456	1.0531	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

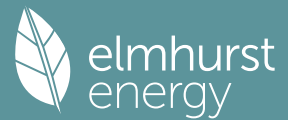
4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.5236 (42)
Hot water usage for mixer showers													0.0000 (42a)
Hot water usage for baths													21.5239 (42b)
Hot water usage for other uses													30.2331 (42c)
Average daily hot water use (litres/day)													47.4407 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	51.7570	50.3380	48.7884	46.8590	45.1382	43.3497	42.9774	44.5238	46.1099	47.9467	49.8931	51.6842	(44)
Energy content (annual)	81.9704	71.6806	74.9860	64.1477	60.7647	53.3035	51.9775	55.1298	56.8581	65.0632	71.0819	80.9250	(45)
Distribution loss (46)m = 0.15 x (45)m													787.8883
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
If cylinder contains dedicated solar storage													
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Total heat required for water heating calculated for each month													
WWHRS	69.6749	60.9285	63.7381	54.5255	51.6500	45.3079	44.1808	46.8603	48.3294	55.3037	60.4196	68.7863	(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	69.6749	60.9285	63.7381	54.5255	51.6500	45.3079	44.1808	46.8603	48.3294	55.3037	60.4196	68.7863	(63d)
12Total per year (kWh/year)													
Electric shower(s)	39.8536	35.5099	38.7754	37.0029	37.6972	35.9595	37.1582	37.6972	37.0029	38.7754	38.0463	39.8536	(64a)
Heat gains from water heating, kWh/month	27.3821	24.1096	25.6284	22.8821	22.3368	20.3169	20.3348	21.1394	21.3331	23.5198	24.6165	27.1600	(65)

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

Metabolic gains (Table 5), Watts

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	70.0009	77.5010	70.0009	72.3343	70.0009	72.3343	70.0009	70.0009	72.3343	70.0009	72.3343	70.0009	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	132.3762	133.7499	130.2883	122.9191	113.6167	104.8738	99.0331	97.6594	101.1210	108.4902	117.7926	126.5354	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	(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)	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	(71)
Water heating gains (Table 5)	36.8039	35.8774	34.4467	31.7807	30.0226	28.2179	27.3317	28.4132	29.6293	31.6126	34.1896	36.5053	(72)
Total internal gains	285.0350	292.9822	280.5899	272.8880	259.4942	251.2799	242.2196	241.9274	248.9385	255.9577	270.1703	278.8956	(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			
Northeast			0.8300	11.2829	0.6300	0.7000	0.7700			2.8620 (75)			
East			5.2500	19.6403	0.6300	0.7000	0.7700			31.5122 (76)			
Southeast			0.8300	36.7938	0.6300	0.7000	0.7700			9.3331 (77)			
Solar gains	43.7073	83.3679	133.7677	192.2497	234.8125	240.4224	228.8444	196.8064	154.4140	97.8362	54.0720	36.2385	(83)
Total gains	328.7423	376.3501	414.3577	465.1378	494.3067	491.7023	471.0640	438.7338	403.3525	353.7939	324.2424	315.1342	(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	83.2252	83.5483	83.8673	85.3993	85.6922	87.0824	87.0824	87.3448	86.5416	85.6922	85.1018	84.4932	
alpha	6.5483	6.5699	6.5912	6.6933	6.7128	6.8055	6.8055	6.8230	6.7694	6.7128	6.6735	6.6329	
util living area	0.9981	0.9949	0.9848	0.9347	0.7993	0.5820	0.4217	0.4712	0.7415	0.9618	0.9948	0.9986	(86)
MIT	20.0732	20.2285	20.4522	20.7518	20.9349	20.9934	20.9993	20.9987	20.9699	20.7226	20.3546	20.0584	(87)
Th 2	20.0261	20.0295	20.0329	20.0486	20.0515	20.0652	20.0652	20.0678	20.0599	20.0515	20.0455	20.0393	(88)
util rest of house	0.9973	0.9929	0.9784	0.9092	0.7394	0.5003	0.3325	0.3766	0.6567	0.9411	0.9923	0.9980	(89)
MIT 2	19.1912	19.3482	19.5709	19.8649	20.0146	20.0629	20.0651	20.0675	20.0471	19.8472	19.4874	19.1874	(90)
Living area fraction									fLA = Living area / (4) =			0.5099	(91)
MIT	19.6410	19.7971	20.0203	20.3172	20.4839	20.5374	20.5415	20.5423	20.5177	20.2936	19.9296	19.6316	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6410	19.7971	20.0203	20.3172	20.4839	20.5374	20.5415	20.5423	20.5177	20.2936	19.9296	19.6316	(93)

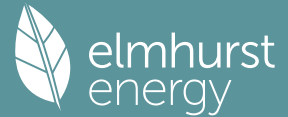
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9969	0.9922	0.9783	0.9173	0.7680	0.5420	0.3781	0.4250	0.6996	0.9473	0.9919	0.9976	(94)
Ext temp.	327.7350	373.4229	405.3614	426.6513	379.6372	266.5075	178.1010	186.4528	282.1871	335.1378	321.6189	314.3898	(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	725.9307	702.2003	634.8773	526.5033	403.6850	268.5108	178.2498	186.7693	292.0464	445.4910	593.7054	719.2576	(97)
Space heating requirement - total per year (kWh/year)	296.2576	220.9384	170.7598	71.8934	17.8916	0.0000	0.0000	0.0000	0.0000	82.1027	195.9023	301.2216	(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 requirement after solar contribution - total per year (kWh/year)	296.2576	220.9384	170.7598	71.8934	17.8916	0.0000	0.0000	0.0000	0.0000	82.1027	195.9023	301.2216	(98c)
Space heating per m ²										(98c) / (4) =		30.6590	(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	
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	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	425.1028	334.6554	342.6676	0.0000	0.0000	0.0000	0.0000	(100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.9538	0.9826	0.9718	0.0000	0.0000	0.0000	0.0000	(101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	405.4691	328.8404	333.0028	0.0000	0.0000	0.0000	0.0000	(102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	548.0210	525.3778	488.9464	0.0000	0.0000	0.0000	0.0000	(103)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	102.6374	146.2238	116.0220	0.0000	0.0000	0.0000	0.0000	(104)
Intermittency factor (Table 10b)									fC = cooled area / (4) =			1.0000	(105)
Space cooling kWh	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 requirement	0.0000	0.0000	0.0000	0.0000	0.0000	25.6593	36.5560	29.0055	0.0000	0.0000	0.0000	0.0000	(107)
Energy for space heating												91.2208	(107)
Energy for space cooling												30.6590	(99)
Total												2.0610	(108)
Fabric Energy Efficiency (DFEE)												32.7200	(109)

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SAP 10 WORKSHEET FOR New Build (As Designed) (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	44.2600 (1b)	x 2.5000 (2b)	= 110.6500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	44.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 110.6500 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1808 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4308 (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) = 0.3984 (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 infiltr rate	0.5080	0.4981	0.4881	0.4383	0.4283	0.3785	0.3785	0.3686	0.3984	0.4283	0.4482	0.4682 (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	0.6290	0.6240	0.6191	0.5960	0.5917	0.5716	0.5716	0.5679	0.5794	0.5917	0.6005	0.6096 (25)

3. Heat losses and heat loss parameter

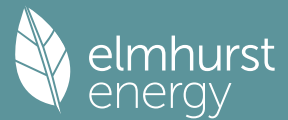
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
TER Opening Type			6.9100	1.1450	7.9122		(27)
Heatloss Floor 1			44.2600	0.1300	5.7538		(28a)
External Wall 1	28.4500	6.9100	21.5400	0.1800	3.8772		(29a)
External Wall Sheltered open	15.3000		15.3000	0.1800	2.7540		(29a)
Bay window	0.7200		0.7200	0.1100	0.0792		(30)
Total net area of external elements Aum(A, m ²)			88.7300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.3764		(33)
Main dwelling							
Party Wall Between Corridor			17.9800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							320.3226 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate				3.9500	0.0500	0.1975	
E3 Sill				3.9500	0.0500	0.1975	
E4 Jamb				14.0000	0.0500	0.7000	
E5 Ground floor (normal)				17.5000	0.1600	2.8000	
E6 Corner (normal)				2.5000	0.0900	0.2250	
E7 Party floor between dwellings (in blocks of flats)				17.5000	0.0700	1.2250	
E18 Party wall between dwellings				2.5000	0.0600	0.1500	
P1 Party wall - Ground floor				7.1900	0.0800	0.5752	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				7.1900	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)				2.3200	0.0600	0.1392	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.2094 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	26.5858 (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	22.9691	22.7861	22.6068	21.7644	21.6068	20.8731	20.8731	20.7373	21.1557	21.6068	21.9256	22.2590 (38)
Heat transfer coeff	49.5549	49.3719	49.1926	48.3502	48.1926	47.4589	47.4589	47.3231	47.7415	48.1926	48.5114	48.8448 (39)
Average = Sum(39)m / 12 =												48.3495
HLP	1.1196	1.1155	1.1114	1.0924	1.0889	1.0723	1.0723	1.0692	1.0787	1.0889	1.0961	Dec 1.1036 (40)
HLP (average)												1.0924
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.5236 (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)

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Hot water usage for baths	21.5239	21.2042	20.7541	19.9241	19.3026	18.6134	18.2412	18.6882	19.1749	19.9123	20.7594	21.4511 (42b)
Hot water usage for other uses	30.2331	29.1338	28.0344	26.9350	25.8356	24.7362	24.7362	25.8356	26.9350	28.0344	29.1338	30.2331 (42c)
Average daily hot water use (litres/day)												47.4407 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	51.7570	50.3380	48.7884	46.8590	45.1382	43.3497	42.9774	44.5238	46.1099	47.9467	49.8931	51.6842 (44)
Distribution loss (46)m = 0.15 x (45)m	81.9704	71.6806	74.9860	64.1477	60.7647	53.3035	51.9775	55.1298	56.8581	65.0632	71.0819	80.9250 (45)
Total = Sum(45)m =	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	787.8883
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Total heat required for water heating calculated for each month												
WWHRS	69.6749	60.9285	63.7381	54.5255	51.6500	45.3079	44.1808	46.8603	48.3294	55.3037	60.4196	68.7863 (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	69.6749	60.9285	63.7381	54.5255	51.6500	45.3079	44.1808	46.8603	48.3294	55.3037	60.4196	68.7863 (64)
12Total per year (kWh/year)												669.7051 (64a)
Electric shower(s)	39.8536	35.5099	38.7754	37.0029	37.6972	35.9595	37.1582	37.6972	37.0029	38.7754	38.0463	39.8536 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												453.3321 (64a)
Heat gains from water heating, kWh/month	27.3821	24.1096	25.6284	22.8821	22.3368	20.3169	20.3348	21.1394	21.3331	23.5198	24.6165	27.1600 (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	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798	76.1798 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	70.0009	77.5010	70.0009	72.3343	70.0009	72.3343	70.0009	70.0009	72.3343	70.0009	72.3343	70.0009 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	132.3762	133.7499	130.2883	122.9191	113.6167	104.8738	99.0331	97.6594	101.1210	108.4902	117.7926	126.5354 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180	30.6180 (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)	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438 (71)
Water heating gains (Table 5)	36.8039	35.8774	34.4467	31.7807	30.0226	28.2179	27.3317	28.4132	29.6293	31.6126	34.1896	36.5053 (72)
Total internal gains	285.0350	292.9822	280.5899	272.8880	259.4942	251.2799	242.2196	241.9274	248.9385	255.9577	270.1703	278.8956 (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		
Northeast				0.8300	11.2829	0.6300	0.7000	0.7700		2.8620 (75)		
East				5.2500	19.6403	0.6300	0.7000	0.7700		31.5122 (76)		
Southeast				0.8300	36.7938	0.6300	0.7000	0.7700		9.3331 (77)		
Solar gains	43.7073	83.3679	133.7677	192.2497	234.8125	240.4224	228.8444	196.8064	154.4140	97.8362	54.0720	36.2385 (83)
Total gains	328.7423	376.3501	414.3577	465.1378	494.3067	491.7023	471.0640	438.7338	403.3525	353.7939	324.2424	315.1342 (84)

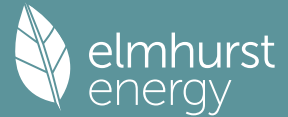
7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	79.4712	79.7657	80.0565	81.4513	81.7177	82.9810	82.9810	83.2192	82.4898	81.7177	81.1806	80.6266
util living area	6.2981	6.3177	6.3371	6.4301	6.4478	6.5321	6.5321	6.5479	6.4993	6.4478	6.4120	6.3751
	0.9982	0.9953	0.9863	0.9427	0.8198	0.6073	0.4421	0.4936	0.7653	0.9664	0.9952	0.9986 (86)
MIT	20.0060	20.1629	20.3930	20.7071	20.9141	20.9897	20.9989	20.9978	20.9585	20.6814	20.2977	19.9907 (87)
Th 2	19.9848	19.9882	19.9915	20.0070	20.0099	20.0235	20.0235	20.0261	20.0183	20.0099	20.0041	19.9979 (88)
util rest of house												
	0.9974	0.9933	0.9804	0.9190	0.7602	0.5198	0.3447	0.3906	0.6782	0.9474	0.9928	0.9980 (89)
MIT 2	19.0904	19.2491	19.4785	19.7881	19.9605	20.0199	20.0233	20.0256	20.0003	19.7734	19.3967	19.0858 (90)
Living area fraction												
MIT	19.5573	19.7151	19.9448	20.2567	20.4468	20.5145	20.5208	20.5213	20.4889	20.2364	19.8561	19.5472 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5573	19.7151	19.9448	20.2567	20.4468	20.5145	20.5208	20.5213	20.4889	20.2364	19.8561	19.5472 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9970	0.9926	0.9801	0.9258	0.7880	0.5645	0.3945	0.4433	0.7220	0.9525	0.9924	0.9977 (94)
Ext temp.	327.7606	373.5839	406.0969	430.6069	389.5349	277.5544	185.8154	194.4974	291.2257	336.9956	321.7746	314.4046 (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)
	756.0740	731.4501	661.3851	549.1002	421.5314	280.6941	186.0765	195.0348	305.0161	464.4045	618.8188	749.6327 (97)
Space heating kWh												

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Space heating requirement - total per year (kWh/year)	318.6652	240.4860	189.9344	85.3152	23.8054	0.0000	0.0000	0.0000	0.0000	94.7923	213.8719	323.8097	(98a)
Solar heating kWh												1490.6800	
Solar heating contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Space heating kWh	318.6652	240.4860	189.9344	85.3152	23.8054	0.0000	0.0000	0.0000	0.0000	94.7923	213.8719	323.8097	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1490.6800	
Space heating per m2										(98c) / (4) =		33.6801	(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													
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	446.1140	351.1961	359.6553	0.0000	0.0000	0.0000	0.0000	(100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.9384	0.9749	0.9607	0.0000	0.0000	0.0000	0.0000	(101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	418.6442	342.3876	345.5338	0.0000	0.0000	0.0000	0.0000	(102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	548.0210	525.3778	488.9464	0.0000	0.0000	0.0000	0.0000	(103)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	93.1513	136.1447	106.6990	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	23.2878	34.0362	26.6747	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement													(107)
Energy for space heating													(107)
Energy for space cooling													(108)
Total													(109)
Fabric Energy Efficiency (TFEE)													(109)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling	44.2600	2.5000	110.6500	(1b) - (3b)
Ground floor				(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	44.2600			(5)
Dwelling volume			110.6500	(5)

2. Ventilation rate

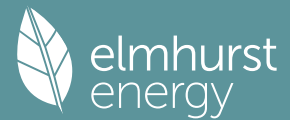
	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	20.0000 / (5) =	0.1808 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.4308	(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) =	0.3984 (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	0.5080	0.4981	0.4881	0.4383	0.4283	0.3785	0.3785	0.3686	0.3984	0.4283	0.4482	0.4682	(22b)
Effective ac	0.6290	0.6240	0.6191	0.5960	0.5917	0.5716	0.5716	0.5679	0.5794	0.5917	0.6005	0.6096	(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			6.9100	0.9615	6.6442			(27)
Heatloss Floor 1			44.2600	0.1200	5.3112	110.0000	4868.6000	(28a)
External Wall 1	28.4500	6.9100	21.5400	0.1800	3.8772	110.0000	2369.4000	(29a)
External Wall Sheltered open	15.3000		15.3000	0.1800	2.7540	110.0000	1683.0000	(29a)
Bay window	0.7200		0.7200	0.1100	0.0792	9.0000	6.4800	(30)
Total net area of external elements Aum(A, m2)			88.7300					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	18.6658		(33)
Main dwelling								

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Party Wall Between Corridor	17.9800	0.0000	0.0000	180.0000	3236.4000 (32)
Party Ceiling 1	43.8700			30.0000	1316.1000 (32b)
Internal Wall 1	77.5000			9.0000	697.5000 (32c)

Heat capacity $C_m = \text{Sum}(A \times k)$ (28)...(30) + (32) + (32a)...(32e) = 14177.4800 (34)
Thermal mass parameter (TMP = C_m / TFA) in kJ/m²K 320.3226 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	3.9500	0.3050	1.2047
E1 Steel lintel with perforated steel base plate	3.9500	0.0240	0.0948
E3 Sill	14.0000	0.0240	0.3360
E4 Jamb	17.5000	0.0410	0.7175
E5 Ground floor (normal)	2.5000	0.0400	0.1000
E16 Corner (normal)	17.5000	0.0330	0.5775
E7 Party floor between dwellings (in blocks of flats)	2.5000	0.0300	0.0750
E18 Party wall between dwellings	7.1900	0.3200	2.3008
P1 Party wall - Ground floor	7.1900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	2.3200	0.1200	0.2784
E10 Eaves (insulation at ceiling level)			

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.6848 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 24.3506 (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 22.9691 22.7861 22.6068 21.7644 21.6068 20.8731 20.8731 20.7373 21.1557 21.6068 21.9256 22.2590 (38)
Average = Sum(39)m / 12 = 47.3197 46.9574 46.1150 45.9574 45.2237 45.2237 45.0878 45.5063 45.9574 46.2762 46.6095 (39)
46.1142

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0691	1.0650	1.0609	1.0419	1.0384	1.0218	1.0218	1.0187	1.0282	1.0384	1.0456	1.0531 (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													1.5236 (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	57.3089	56.4578	55.2592	53.0493	51.3946	49.5597	48.5686	49.7588	51.0546	53.0180	55.2734	57.1152	(42b)
Hot water usage for other uses	30.2331	29.1338	28.0344	26.9350	25.8356	24.7362	24.7362	25.8356	26.9350	28.0344	29.1338	30.2331	(42c)
Average daily hot water use (litres/day)													80.6191 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	87.5420	85.5915	83.2936	79.9843	77.2301	74.2959	73.3048	75.5944	77.9896	81.0524	84.4072	87.3483	(44)
Energy content (annual)	138.6452	121.8812	128.0192	109.4945	103.9666	91.3555	88.6558	93.6016	96.1690	109.9873	120.2535	136.7663	(45)
Distribution loss (46)m = 0.15 x (45)m	20.7968	18.2822	19.2029	16.4242	15.5950	13.7033	13.2984	14.0402	14.4253	16.4981	18.0380	20.5149	(46)
Water storage loss:													
Store volume													125.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													0.0130 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.0070 (55)
Total storage loss	0.2176	0.1966	0.2176	0.2106	0.2176	0.2106	0.2176	0.2176	0.2106	0.2176	0.2106	0.2176	(56)
If cylinder contains dedicated solar storage	0.2176	0.1966	0.2176	0.2106	0.2176	0.2106	0.2176	0.2176	0.2106	0.2176	0.2106	0.2176	(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	162.1252	143.0890	151.4992	132.2171	127.4466	114.0781	112.1358	117.0816	118.8916	133.4673	142.9761	160.2463	(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	162.1252	143.0890	151.4992	132.2171	127.4466	114.0781	112.1358	117.0816	118.8916	133.4673	142.9761	160.2463	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Heat gains from water heating, kWh/month	64.8835	57.4917	61.3504	54.5850	53.3529	48.5538	48.2621	49.9065	50.1543	55.3548	58.1624	64.2588	(65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)

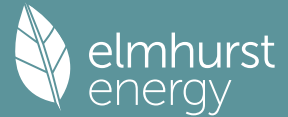
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	91.4157	91.4157	91.4157	91.4157	91.4157	91.4157	91.4157	91.4157	91.4157	91.4157	91.4157	91.4157	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.1636	14.3563	11.6754	8.8390	6.6073	5.5781	6.0274	7.8346	10.5156	13.3519	15.5837	16.6128	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.5765	199.6267	194.4602	183.4613	169.5772	156.5281	147.8105	145.7603	150.9268	161.9257	175.8098	188.8589	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	(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)	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	(71)
Water heating gains (Table 5)	87.2091	85.5531	82.4602	75.8125	71.7109	67.4358	64.8684	67.0787	69.6587	74.4016	80.7811	86.3694	(72)
Total internal gains	377.0862	375.6733	364.7328	344.2499	324.0325	305.6791	294.8433	296.8107	307.2382	325.8163	348.3116	367.9781	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W
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		W/m2	or Table 6b	or Table 6c	Table 6d	
Northeast	0.8300	11.2829	0.6300	0.7000	0.7700	2.8620 (75)
East	5.2500	19.6403	0.6300	0.7000	0.7700	31.5122 (76)
Southeast	0.8300	36.7938	0.6300	0.7000	0.7700	9.3331 (77)

Solar gains	43.7073	83.3679	133.7677	192.2497	234.8125	240.4224	228.8444	196.8064	154.4140	97.8362	54.0720	36.2385 (83)
Total gains	420.7935	459.0412	498.5006	536.4996	558.8450	546.1015	523.6877	493.6171	461.6522	423.6525	402.3836	404.2167 (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	83.2252	83.5483	83.8673	85.3993	85.6922	87.0824	87.0824	87.3448	86.5416	85.6922	85.1018	84.4932
alpha	6.5483	6.5699	6.5912	6.6933	6.7128	6.8055	6.8055	6.8230	6.7694	6.7128	6.6735	6.6329
util living area	0.9924	0.9851	0.9621	0.8865	0.7308	0.5267	0.3796	0.4195	0.6633	0.9165	0.9832	0.9939 (86)
MIT	20.3920	20.4911	20.6498	20.8291	20.9250	20.9516	20.9541	20.9539	20.9423	20.8182	20.5796	20.3783 (87)
Th 2	20.0261	20.0295	20.0329	20.0486	20.0515	20.0652	20.0652	20.0678	20.0599	20.0515	20.0455	20.0393 (88)
util rest of house	0.9895	0.9796	0.9483	0.8507	0.6685	0.4515	0.2992	0.3349	0.5808	0.8810	0.9758	0.9916 (89)
MIT 2	19.3326	19.4599	19.6579	19.8772	19.9723	20.0054	20.0066	20.0092	19.9950	19.8735	19.5859	19.3263 (90)
Living area fraction	FLA = Living area / (4) =											
MIT	19.8728	19.9858	20.1637	20.3626	20.4581	20.4879	20.4897	20.4910	20.4781	20.3552	20.0927	19.8627 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.8728	19.9858	20.1637	20.3626	20.4581	20.4879	20.4897	20.4910	20.4781	20.3552	20.0927	19.8627 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9889	0.9793	0.9504	0.8635	0.6960	0.4857	0.3358	0.3734	0.6183	0.8936	0.9762	0.9911 (94)
Useful gains	416.1227	449.5187	473.7947	463.2521	388.9839	265.2409	175.8384	184.3127	285.4555	378.5812	392.8207	400.6010 (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	736.9008	711.0936	641.6099	528.5974	402.4988	266.2726	175.9081	184.4526	290.2421	448.3251	601.2513	730.0333 (97)
Space heating kWh	238.6589	175.7783	124.8545	47.0486	10.0551	0.0000	0.0000	0.0000	0.0000	51.8894	150.0700	245.0976 (98a)
Space heating requirement - total per year (kWh/year)												1043.4524
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	238.6589	175.7783	124.8545	47.0486	10.0551	0.0000	0.0000	0.0000	0.0000	51.8894	150.0700	245.0976 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1043.4524
Space heating per m2												(98c) / (4) = 23.5755 (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 %)												249.9000 (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	238.6589	175.7783	124.8545	47.0486	10.0551	0.0000	0.0000	0.0000	0.0000	51.8894	150.0700	245.0976 (98)
Space heating efficiency (main heating system 1)	249.9000	249.9000	249.9000	249.9000	249.9000	0.0000	0.0000	0.0000	0.0000	249.9000	249.9000	249.9000 (210)
Space heating fuel (main heating system)	95.5018	70.3395	49.9618	18.8270	4.0236	0.0000	0.0000	0.0000	0.0000	20.7641	60.0520	98.0783 (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	162.1252	143.0890	151.4992	132.2171	127.4466	114.0781	112.1358	117.0816	118.8916	133.4673	142.9761	160.2463 (64)
Water heating requirement	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000 (216)
Efficiency of water heater	92.5901	81.7184	86.5215	75.5095	72.7851	65.1502	64.0410	66.8656	67.8993	76.2235	81.6540	91.5170 (219)
Fuel for water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	14.1479	11.3500	10.2194	7.4872	5.7833	4.7250	5.2757	6.8576	8.9073	11.6869	13.2003	14.5411 (232)
Lighting	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (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												417.5480 (211)
Space heating fuel - main system 1												0.0000 (213)
Space heating fuel - main system 2												0.0000 (215)
Space heating fuel - secondary												0.0000 (215)

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Efficiency of water heater	175.1000
Water heating fuel used	922.4751 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	114.1815 (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	1454.2046 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	417.5480	14.0400	58.6237 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	922.4751	14.0400	129.5155 (247)
Energy for instantaneous electric shower(s)	0.0000	14.0400	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	114.1815	16.4900	18.8285 (250)
Additional standing charges			26.0000 (251)
Total energy cost			232.9678 (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] = 0.9396 (257)
SAP value	84.7691
SAP rating (Section 12)	85 (258)
SAP band	B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	417.5480	0.1570	65.5672 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	922.4751	0.1411	130.1231 (264)
Space and water heating			195.6902 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	114.1815	0.1443	16.4799 (268)
Total CO2, kg/year			212.1701 (272)
CO2 emissions per m2			4.7900 (273)
EI value			96.8148
EI rating			97 (274)
EI band			A

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

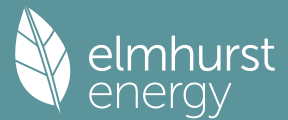
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	44.2600 (1b)	x 2.5000 (2b)	= 110.6500 (1b) - (3b)
Ground floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	44.2600		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 110.6500 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 20.0000 / (5) = 0.1808 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4308 (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

$$(21) = (18) \times (20) = 0.3984 \quad (21)$$

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.6000	4.1000	4.3000	3.7000	3.6000	3.7000	3.7000	4.2000	4.1000	4.3000	(22)
Wind factor	1.1500	1.1250	1.1500	1.0250	1.0750	0.9250	0.9000	0.9250	0.9250	1.0500	1.0250	1.0750	(22a)
Adj infilt rate													
Effective ac	0.4582	0.4482	0.4582	0.4084	0.4283	0.3686	0.3586	0.3686	0.3686	0.4184	0.4084	0.4283	(22b)
	0.6050	0.6005	0.6050	0.5834	0.5917	0.5679	0.5643	0.5679	0.5679	0.5875	0.5834	0.5917	(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			6.9100	0.9615	6.6442			(27)
Heatloss Floor 1			44.2600	0.1200	5.3112	110.0000	4868.6000	(28a)
External Wall 1	28.4500	6.9100	21.5400	0.1800	3.8772	110.0000	2369.4000	(29a)
External Wall Sheltered open	15.3000		15.3000	0.1800	2.7540	110.0000	1683.0000	(29a)
Bay window	0.7200		0.7200	0.1100	0.0792	9.0000	6.4800	(30)
Total net area of external elements Aum(A, m2)			88.7300					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	18.6658		(33)
Main dwelling								
Party Wall Between Corridor			17.9800	0.0000	0.0000	180.0000	3236.4000	(32)
Party Ceiling 1			43.8700			30.0000	1316.1000	(32b)
Internal Wall 1			77.5000			9.0000	697.5000	(32c)

Heat capacity Cm = Sum(A x k)

$$(28)...(30) + (32) + (32a)...(32e) = 14177.4800 \quad (34)$$

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

$$320.3226 \quad (35)$$

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate	3.9500	0.3050	1.2047	
E3 Sill	3.9500	0.0240	0.0948	
E4 Jamb	14.0000	0.0240	0.3360	
E5 Ground floor (normal)	17.5000	0.0410	0.7175	
E16 Corner (normal)	2.5000	0.0400	0.1000	
E7 Party floor between dwellings (in blocks of flats)	17.5000	0.0330	0.5775	
E18 Party wall between dwellings	2.5000	0.0300	0.0750	
P1 Party wall - Ground floor	7.1900	0.3200	2.3008	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.1900	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)	2.3200	0.1200	0.2784	

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

$$5.6848 \quad (36)$$

Point Thermal Bridges

$$(36a) = 0.0000$$

Total fabric heat loss

$$(33) + (36) + (36a) = 24.3506 \quad (37)$$

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

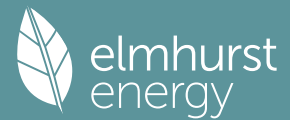
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.0905	21.9256	22.0905	21.3025	21.6068	20.7373	20.6050	20.7373	20.7373	21.4528	21.3025	21.6068	(38)
Heat transfer coeff	46.4411	46.2762	46.4411	45.6530	45.9574	45.0878	44.9556	45.0878	45.0878	45.8034	45.6530	45.9574	(39)
Average = Sum(39)m / 12 =													45.7001

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0493	1.0456	1.0493	1.0315	1.0384	1.0187	1.0157	1.0187	1.0187	1.0349	1.0315	1.0384	(40)
HLP (average)													1.0325
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.5236 (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	57.3089	56.4578	55.2592	53.0493	51.3946	49.5597	48.5686	49.7588	51.0546	53.0180	55.2734	57.1152	(42b)
Hot water usage for other uses	30.2331	29.1338	28.0344	26.9350	25.8356	24.7362	24.7362	25.8356	26.9350	28.0344	29.1338	30.2331	(42c)
Average daily hot water use (litres/day)													80.6191 (43)
Daily hot water use	87.5420	85.5915	83.2936	79.9843	77.2301	74.2959	73.3048	75.5944	77.9896	81.0524	84.4072	87.3483	(44)
Energy conte	138.6452	121.8812	128.0192	109.4945	103.9666	91.3555	88.6558	93.6016	96.1690	109.9873	120.2535	136.7663	(45)
Energy content (annual)										Total = Sum(45)m =			1338.7956
Distribution loss (46)m = 0.15 x (45)m	20.7968	18.2822	19.2029	16.4242	15.5950	13.7033	13.2984	14.0402	14.4253	16.4981	18.0380	20.5149	(46)
Water storage loss:													
Store volume													125.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													0.0130 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.0070 (55)
Total storage loss	0.2176	0.1966	0.2176	0.2106	0.2176	0.2106	0.2176	0.2176	0.2106	0.2176	0.2106	0.2176	(56)
If cylinder contains dedicated solar storage	0.2176	0.1966	0.2176	0.2106	0.2176	0.2106	0.2176	0.2176	0.2106	0.2176	0.2106	0.2176	(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	162.1252	143.0890	151.4992	132.2171	127.4466	114.0781	112.1358	117.0816	118.8916	133.4673	142.9761	160.2463	(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	162.1252	143.0890	151.4992	132.2171	127.4466	114.0781	112.1358	117.0816	118.8916	133.4673	142.9761	160.2463	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)
Heat gains from water heating, kWh/month	64.8835	57.4917	61.3504	54.5850	53.3529	48.5538	48.2621	49.9065	50.1543	55.3548	58.1624	64.2588	(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	91.4157	91.4157	91.4157	91.4157	91.4157	91.4157	91.4157	91.4157	91.4157	91.4157	91.4157	91.4157 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.1636	14.3563	11.6754	8.8390	6.6073	5.5781	6.0274	7.8346	10.5156	13.3519	15.5837	16.6128 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.5765	199.6267	194.4602	183.4613	169.5772	156.5281	147.8105	145.7603	150.9268	161.9257	175.8098	188.8589 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652 (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)	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438 (71)
Water heating gains (Table 5)	87.2091	85.5531	82.4602	75.8125	71.7109	67.4358	64.8684	67.0787	69.6587	74.4016	80.7811	86.3694 (72)
Total internal gains	377.0862	375.6733	364.7328	344.2499	324.0325	305.6791	294.8433	296.8107	307.2382	325.8163	348.3116	367.9781 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d		Gains W
Northeast				0.8300	9.5471		0.6300		0.7000	0.7700		2.4217 (75)
East				5.2500	16.6187		0.6300		0.7000	0.7700		26.6642 (76)
Southeast				0.8300	31.1332		0.6300		0.7000	0.7700		7.8972 (77)
Solar gains	36.9831	74.1048	125.4072	183.2781	218.9137	228.4012	213.1038	180.5103	146.3576	90.4244	47.5178	32.7872 (83)
Total gains	414.0693	449.7781	490.1401	527.5280	542.9462	534.0804	507.9471	477.3210	453.5958	416.2407	395.8294	400.7654 (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	84.7997	85.1018	84.7997	86.2635	85.6922	87.3448	87.6018	87.3448	87.3448	85.9803	86.2635	85.6922
alpha	6.6533	6.6735	6.6533	6.7509	6.7128	6.8230	6.8401	6.8230	6.8230	6.7320	6.7509	6.7128
util living area	0.9915	0.9841	0.9602	0.8763	0.7089	0.5041	0.3803	0.4244	0.6685	0.9151	0.9814	0.9932 (86)
MIT	20.4376	20.5248	20.6684	20.8453	20.9311	20.9525	20.9543	20.9539	20.9425	20.8234	20.6093	20.4162 (87)
Th 2	20.0425	20.0455	20.0425	20.0572	20.0515	20.0678	20.0703	20.0678	20.0678	20.0544	20.0572	20.0515 (88)
util rest of house	0.9881	0.9780	0.9456	0.8378	0.6423	0.4271	0.2982	0.3369	0.5862	0.8784	0.9731	0.9905 (89)
MIT 2	19.4042	19.5161	19.6892	19.9027	19.9775	20.0085	20.0119	20.0092	20.0032	19.8821	19.6330	19.3849 (90)
Living area fraction	19.9312	20.0305	20.1885	20.3834	20.4638	20.4899	20.4925	20.4909	20.4822	20.3621	20.1308	0.5099 (91)
MIT	19.9312	20.0305	20.1885	20.3834	20.4638	20.4899	20.4925	20.4909	20.4822	20.3621	20.1308	19.9108 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9312	20.0305	20.1885	20.3834	20.4638	20.4899	20.4925	20.4909	20.4822	20.3621	20.1308	19.9108 (93)

8. Space heating requirement

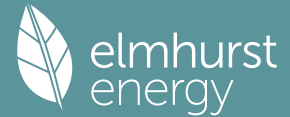
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9876	0.9779	0.9481	0.8521	0.6721	0.4622	0.3355	0.3767	0.6237	0.8917	0.9739	0.9900 (94)
Useful gains	408.9404	439.8265	464.7074	449.5186	364.8931	246.8267	170.4279	179.7990	282.9051	371.1708	385.4794	396.7709 (95)
Ext temp.	4.8000	5.3000	6.8000	9.3000	12.3000	15.0000	16.7000	16.5000	14.1000	10.8000	7.5000	4.6000 (96)
Heat loss rate W	702.7078	681.6713	621.7778	505.9893	375.1867	247.5274	170.4926	179.9433	287.7588	437.9774	576.6359	703.6443 (97)
Space heating kWh	218.5630	162.5197	116.8604	40.6590	7.6585	0.0000	0.0000	0.0000	0.0000	49.7041	137.6327	228.3139 (98a)
Space heating requirement - total per year (kWh/year)												961.9111
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	218.5630	162.5197	116.8604	40.6590	7.6585	0.0000	0.0000	0.0000	0.0000	49.7041	137.6327	228.3139 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												961.9111
Space heating per m2										(98c) / (4) =		21.7332 (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 %)												249.9000 (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	218.5630	162.5197	116.8604	40.6590	7.6585	0.0000	0.0000	0.0000	0.0000	49.7041	137.6327	228.3139 (98)
Space heating efficiency (main heating system 1)	249.9000	249.9000	249.9000	249.9000	249.9000	0.0000	0.0000	0.0000	0.0000	249.9000	249.9000	249.9000 (210)
Space heating fuel (main heating system)	87.4602	65.0339	46.7629	16.2701	3.0646	0.0000	0.0000	0.0000	0.0000	19.8896	55.0751	91.3621 (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

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Efficiency of water heater	162.1252	143.0890	151.4992	132.2171	127.4466	114.0781	112.1358	117.0816	118.8916	133.4673	142.9761	160.2463 (64)
(217)m	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000 (216)
Fuel for water heating, kWh/month	92.5901	81.7184	86.5215	75.5095	72.7851	65.1502	64.0410	66.8656	67.8993	76.2235	81.6540	91.5170 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	14.1479	11.3500	10.2194	7.4872	5.7833	4.7250	5.2757	6.8576	8.9073	11.6869	13.2003	14.5411 (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												384.9184 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												175.1000
Water heating fuel used												922.4751 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												114.1815 (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												1421.5750 (238)

10a. Fuel costs - using BEDF prices (572)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	384.9184	23.6600	91.0717 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	922.4751	23.6600	218.2576 (247)
Energy for instantaneous electric shower(s)	0.0000	23.6600	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	114.1815	26.0600	29.7557 (250)
Additional standing charges			114.0000 (251)
Total energy cost			453.0850 (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	384.9184	0.1571	60.4606 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	922.4751	0.1411	130.1231 (264)
Space and water heating			190.5837 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	114.1815	0.1443	16.4799 (268)
Total CO2, kg/year			207.0636 (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	384.9184	1.5815	608.7504 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	922.4751	1.5216	1403.6301 (278)
Space and water heating			2012.3805 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	114.1815	1.5338	175.1354 (282)
Total Primary energy kWh/year			2187.5159 (286)

SAP 10 EPC IMPROVEMENTS

As Designed

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

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

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

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

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

Fuel prices for cost data on this page from database revision number 572 TEST (30 May 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, North West England):

	Current £453	Potential £453	Saving £0
Electricity			
Space heating	£205	£205	£0
Water heating	£218	£218	£0
Lighting	£30	£30	£0
Total cost of fuels	£453	£453	£0
Total cost of uses	£453	£453	£0
Delivered energy	32 kWh/m²	32 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m²	5 kg/m²	5 kg/m²	0 kg/m²
Primary energy	49 kWh/m²	49 kWh/m²	0 kWh/m²

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	44.2600 (1b)	x 2.5000 (2b)	= 110.6500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	44.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	110.6500 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

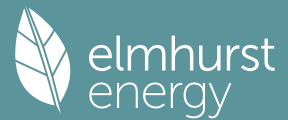
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour
Pressure test		20.0000 / (5) = 0.1808 (8)
Pressure Test Method		Yes
Measured/design AP50		Blower Door
Infiltration rate		5.0000 (17)
Number of sides sheltered		0.4308 (18)
		1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3984 (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	0.5080	0.4981	0.4881	0.4383	0.4283	0.3785	0.3785	0.3686	0.3984	0.4283	0.4482	0.4682 (22b)
Effective ac	0.6290	0.6240	0.6191	0.5960	0.5917	0.5716	0.5716	0.5679	0.5794	0.5917	0.6005	0.6096 (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			6.9100	0.9615	6.6442		(27)
Heatloss Floor 1			44.2600	0.1200	5.3112	110.0000	4868.6000 (28a)
External Wall 1	28.4500	6.9100	21.5400	0.1800	3.8772	110.0000	2369.4000 (29a)
External Wall Sheltered open	15.3000		15.3000	0.1800	2.7540	110.0000	1683.0000 (29a)
Bay window	0.7200		0.7200	0.1100	0.0792	9.0000	6.4800 (30)
Total net area of external elements Aum(A, m2)			88.7300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		18.6658		(33)
Main dwelling							
Party Wall Between Corridor			17.9800	0.0000	0.0000	180.0000	3236.4000 (32)
Party Ceiling 1			43.8700			30.0000	1316.1000 (32b)
Internal Wall 1			77.5000			9.0000	697.5000 (32c)

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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

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	3.9500	0.3050	1.2047
E3 Sill	3.9500	0.0240	0.0948
E4 Jamb	14.0000	0.0240	0.3360
E5 Ground floor (normal)	17.5000	0.0410	0.7175
E16 Corner (normal)	2.5000	0.0400	0.1000
E7 Party floor between dwellings (in blocks of flats)	17.5000	0.0330	0.5775
E8 Party wall between dwellings	2.5000	0.0300	0.0750
P1 Party wall - Ground floor	7.1900	0.3200	2.3008
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.1900	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	2.3200	0.1200	0.2784

Thermal bridges (Sum($L \times \text{Psi}$)) calculated using Appendix K) 5.6848 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 24.3506 (37)

Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)\text{m} \times (5)$
(38)m Jan 22.9691 Feb 22.7861 Mar 22.6068 Apr 21.7644 May 21.6068 Jun 20.8731 Jul 20.8731 Aug 20.7373 Sep 21.1557 Oct 21.6068 Nov 21.9256 Dec 22.2590 (38)
Heat transfer coeff 47.3197 47.1367 46.9574 46.1150 45.9574 45.2237 45.2237 45.0878 45.5063 45.9574 46.2762 46.6095 (39)
Average = Sum(39)m / 12 = 46.1142

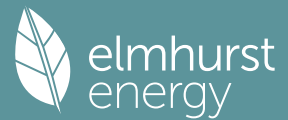
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0691	1.0650	1.0609	1.0419	1.0384	1.0218	1.0218	1.0187	1.0282	1.0384	1.0456	1.0531 (40)
HLP (average)												1.0419
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												1.5236 (42)
Hot water usage for mixer showers												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths												
57.3089	56.4578	55.2592	53.0493	51.3946	49.5597	48.5686	49.7588	51.0546	53.0180	55.2734	57.1152	57.1152 (42b)
Hot water usage for other uses												
30.2331	29.1338	28.0344	26.9350	25.8356	24.7362	24.7362	25.8356	26.9350	28.0344	29.1338	30.2331	30.2331 (42c)
Average daily hot water use (litres/day)												80.6191 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	87.5420	85.5915	83.2936	79.9843	77.2301	74.2959	73.3048	75.5944	77.9896	81.0524	84.4072	87.3483 (44)
Energy content	138.6452	121.8812	128.0192	109.4945	103.9666	91.3555	88.6558	93.6016	96.1690	109.9873	120.2535	136.7663 (45)
Energy content (annual)										Total = Sum(45)m =		1338.7956
Distribution loss (46)m = $0.15 \times (45)\text{m}$												
20.7968	18.2822	19.2029	16.4242	15.5950	13.7033	13.2984	14.0402	14.4253	16.4981	18.0380	20.5149	20.5149 (46)
Water storage loss:												
Store volume												125.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.0130 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.0070 (55)
Total storage loss												
0.2176	0.1966	0.2176	0.2106	0.2176	0.2106	0.2176	0.2176	0.2106	0.2176	0.2106	0.2176	0.2176 (56)
If cylinder contains dedicated solar storage												
0.2176	0.1966	0.2176	0.2106	0.2176	0.2106	0.2176	0.2176	0.2106	0.2176	0.2106	0.2176	0.2176 (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												
162.1252	143.0890	151.4992	132.2171	127.4466	114.0781	112.1358	117.0816	118.8916	133.4673	142.9761	160.2463	160.2463 (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												
162.1252	143.0890	151.4992	132.2171	127.4466	114.0781	112.1358	117.0816	118.8916	133.4673	142.9761	160.2463	160.2463 (64)
Electric shower(s)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
64.8835	57.4917	61.3504	54.5850	53.3529	48.5538	48.2621	49.9065	50.1543	55.3548	58.1624	64.2588	64.2588 (65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m Jan 91.4157 Feb 91.4157 Mar 91.4157 Apr 91.4157 May 91.4157 Jun 91.4157 Jul 91.4157 Aug 91.4157 Sep 91.4157 Oct 91.4157 Nov 91.4157 Dec 91.4157 (66)												
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
16.1636	14.3563	11.6754	8.8390	6.6073	5.5781	6.0274	7.8346	10.5156	13.3519	15.5837	16.6128	16.6128 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
197.5765	199.6267	194.4602	183.4613	169.5772	156.5281	147.8105	145.7603	150.9268	161.9257	175.8098	188.8589	188.8589 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652 (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)												
-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438 (71)
Water heating gains (Table 5)												
87.2091	85.5531	82.4602	75.8125	71.7109	67.4358	64.8684	67.0787	69.6587	74.4016	80.7811	86.3694	86.3694 (72)
Total internal gains												
377.0862	375.6733	364.7328	344.2499	324.0325	305.6791	294.8433	296.8107	307.2382	325.8163	348.3116	367.9781	367.9781 (73)

6. Solar gains							
[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	0.8300	11.2829	0.6300	0.7000	0.7700	2.8620	(75)
East	5.2500	19.6403	0.6300	0.7000	0.7700	31.5122	(76)

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Southeast		0.8300		36.7938		0.6300		0.7000		0.7700		9.3331 (77)	
Solar gains	43.7073	83.3679	133.7677	192.2497	234.8125	240.4224	228.8444	196.8064	154.4140	97.8362	54.0720	36.2385	(83)
Total gains	420.7935	459.0412	498.5006	536.4996	558.8450	546.1015	523.6877	493.6171	461.6522	423.6525	402.3836	404.2167	(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	83.2252	83.5483	83.8673	85.3993	85.6922	87.0824	87.0824	87.3448	86.5416	85.6922	85.1018	84.4932	
alpha	6.5483	6.5699	6.5912	6.6933	6.7128	6.8055	6.8055	6.8230	6.7694	6.7128	6.6735	6.6329	
util living area													
	0.9924	0.9851	0.9621	0.8865	0.7308	0.5267	0.3796	0.4195	0.6633	0.9165	0.9832	0.9939	(86)
MIT	20.3920	20.4911	20.6498	20.8291	20.9250	20.9516	20.9541	20.9539	20.9423	20.8182	20.5796	20.3783	(87)
Th 2	20.0261	20.0295	20.0329	20.0486	20.0515	20.0652	20.0652	20.0678	20.0599	20.0515	20.0455	20.0393	(88)
util rest of house													
	0.9895	0.9796	0.9483	0.8507	0.6685	0.4515	0.2992	0.3349	0.5808	0.8810	0.9758	0.9916	(89)
MIT 2	19.3326	19.4599	19.6579	19.8772	19.9723	20.0054	20.0066	20.0092	19.9950	19.8735	19.5859	19.3263	(90)
Living area fraction													
	19.8728	19.9858	20.1637	20.3626	20.4581	20.4879	20.4897	20.4910	fLA = Living area / (4) =	20.3552	20.0927	0.5099	(91)
MIT	19.8728	19.9858	20.1637	20.3626	20.4581	20.4879	20.4897	20.4910	20.4781	20.3552	20.0927	19.8627	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8728	19.9858	20.1637	20.3626	20.4581	20.4879	20.4897	20.4910	20.4781	20.3552	20.0927	19.8627	(93)

8. Space heating requirement													

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9889	0.9793	0.9504	0.8635	0.6960	0.4857	0.3358	0.3734	0.6183	0.8936	0.9762	0.9911	(94)
Useful gains	416.1227	449.5187	473.7947	463.2521	388.9839	265.2409	175.8384	184.3127	285.4555	378.5812	392.8207	400.6010	(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													
	736.9008	711.0936	641.6099	528.5974	402.4988	266.2726	175.9081	184.4526	290.2421	448.3251	601.2513	730.0333	(97)
Space heating kWh													
	238.6589	175.7783	124.8545	47.0486	10.0551	0.0000	0.0000	0.0000	0.0000	51.8894	150.0700	245.0976	(98a)
Space heating requirement - total per year (kWh/year)												1043.4524	
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													
	238.6589	175.7783	124.8545	47.0486	10.0551	0.0000	0.0000	0.0000	0.0000	51.8894	150.0700	245.0976	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1043.4524	
Space heating per m2										(98c) / (4) =		23.5755	(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 %)												249.9000 (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													
	238.6589	175.7783	124.8545	47.0486	10.0551	0.0000	0.0000	0.0000	0.0000	51.8894	150.0700	245.0976	(98)
Space heating efficiency (main heating system 1)													
	249.9000	249.9000	249.9000	249.9000	249.9000	0.0000	0.0000	0.0000	0.0000	249.9000	249.9000	249.9000	(210)
Space heating fuel (main heating system)													
	95.5018	70.3395	49.9618	18.8270	4.0236	0.0000	0.0000	0.0000	0.0000	20.7641	60.0520	98.0783	(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													
	162.1252	143.0890	151.4992	132.2171	127.4466	114.0781	112.1358	117.0816	118.8916	133.4673	142.9761	160.2463	(64)
Efficiency of water heater												175.1000	(216)
(217)m	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	(217)
Fuel for water heating, kWh/month													
	92.5901	81.7184	86.5215	75.5095	72.7851	65.1502	64.0410	66.8656	67.8993	76.2235	81.6540	91.5170	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting													
	14.1479	11.3500	10.2194	7.4872	5.7833	4.7250	5.2757	6.8576	8.9073	11.6869	13.2003	14.5411	(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												417.5480	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												175.1000	
Water heating fuel used												922.4751	(219)
Space cooling fuel												0.0000	(221)

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Electricity for pumps and fans:
Total electricity for the above, kWh/year 0.0000 (231)
Electricity for lighting (calculated in Appendix L) 114.1815 (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 1454.2046 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	417.5480	14.0400	58.6237 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	922.4751	14.0400	129.5155 (247)
Energy for instantaneous electric shower(s)	0.0000	14.0400	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	114.1815	16.4900	18.8285 (250)
Additional standing charges			26.0000 (251)
Total energy cost			232.9678 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12): 0.3600 (256)
Energy cost factor (ECF) 0.9396 (257)
SAP value 84.7691
SAP rating (Section 12) 85 (258)
SAP band B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	417.5480	0.1570	65.5672 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	922.4751	0.1411	130.1231 (264)
Space and water heating			195.6902 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	114.1815	0.1443	16.4799 (268)
Total CO2, kg/year			212.1701 (272)
CO2 emissions per m2			4.7900 (273)
EI value			96.8148
EI rating			97 (274)
EI band			A

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

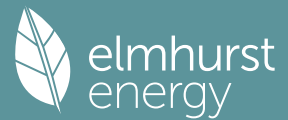
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	44.2600 (1b)	x 2.5000 (2b)	= 110.6500 (1b) - (3b)
Ground floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	44.2600		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 110.6500 (5)
Dwelling volume			

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1808 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4308 (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) = 0.3984 (21)

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Wind speed	Jan 4.6000	Feb 4.5000	Mar 4.6000	Apr 4.1000	May 4.3000	Jun 3.7000	Jul 3.6000	Aug 3.7000	Sep 3.7000	Oct 4.2000	Nov 4.1000	Dec 4.3000 (22)
Wind factor	1.1500	1.1250	1.1500	1.0250	1.0750	0.9250	0.9000	0.9250	0.9250	1.0500	1.0250	1.0750 (22a)
Adj infilt rate												
Effective ac	0.4582	0.4482	0.4582	0.4084	0.4283	0.3686	0.3586	0.3686	0.3686	0.4184	0.4084	0.4283 (22b)
	0.6050	0.6005	0.6050	0.5834	0.5917	0.5679	0.5643	0.5679	0.5679	0.5875	0.5834	0.5917 (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			6.9100	0.9615	6.6442		(27)
Heatloss Floor 1			44.2600	0.1200	5.3112	110.0000	4868.6000 (28a)
External Wall 1	28.4500	6.9100	21.5400	0.1800	3.8772	110.0000	2369.4000 (29a)
External Wall Sheltered open	15.3000		15.3000	0.1800	2.7540	110.0000	1683.0000 (29a)
Bay window	0.7200		0.7200	0.1100	0.0792	9.0000	6.4800 (30)
Total net area of external elements Aum(A, m2)			88.7300				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	18.6658	(33)
Main dwelling							
Party Wall Between Corridor			17.9800	0.0000	0.0000	180.0000	3236.4000 (32)
Party Ceiling 1			43.8700			30.0000	1316.1000 (32b)
Internal Wall 1			77.5000			9.0000	697.5000 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 14177.4800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							320.3226 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate				3.9500	0.3050	1.2047	
E3 Sill				3.9500	0.0240	0.0948	
E4 Jamb				14.0000	0.0240	0.3360	
E5 Ground floor (normal)				17.5000	0.0410	0.7175	
E16 Corner (normal)				2.5000	0.0400	0.1000	
E7 Party floor between dwellings (in blocks of flats)				17.5000	0.0330	0.5775	
E18 Party wall between dwellings				2.5000	0.0300	0.0750	
P1 Party wall - Ground floor				7.1900	0.3200	2.3008	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				7.1900	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)				2.3200	0.1200	0.2784	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.6848 (36)
Point Thermal bridges							(36a) = 0.0000
Total fabric heat loss							(33) + (36) + (36a) = 24.3506 (37)

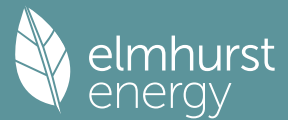
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 22.0905	Feb 21.9256	Mar 22.0905	Apr 21.3025	May 21.6068	Jun 20.7373	Jul 20.6050	Aug 20.7373	Sep 20.7373	Oct 21.4528	Nov 21.3025	Dec 21.6068 (38)
Heat transfer coeff	46.4411	46.2762	46.4411	45.6530	45.9574	45.0878	44.9556	45.0878	45.0878	45.8034	45.6530	45.9574 (39)
Average = Sum(39)m / 12 =												45.7001
HLP	Jan 1.0493	Feb 1.0456	Mar 1.0493	Apr 1.0315	May 1.0384	Jun 1.0187	Jul 1.0157	Aug 1.0187	Sep 1.0187	Oct 1.0349	Nov 1.0315	Dec 1.0384 (40)
HLP (average)												1.0325
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.5236 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths												57.3089
Hot water usage for other uses												30.2331
Average daily hot water use (litres/day)												80.6191 (43)
Daily hot water use	Jan 87.5420	Feb 85.5915	Mar 83.2936	Apr 79.9843	May 77.2301	Jun 74.2959	Jul 73.3048	Aug 75.5944	Sep 77.9896	Oct 81.0524	Nov 84.4072	Dec 87.3483 (44)
Energy conte	138.6452	121.8812	128.0192	109.4945	103.9666	91.3555	88.6558	93.6016	96.1690	109.9873	120.2535	136.7663 (45)
Energy content (annual)										Total = Sum(45)m =		1338.7956
Distribution loss (46)m = 0.15 x (45)m												
	20.7968	18.2822	19.2029	16.4242	15.5950	13.7033	13.2984	14.0402	14.4253	16.4981	18.0380	20.5149 (46)
Water storage loss:												
Store volume												125.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.0130 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.0070 (55)
Total storage loss												
	0.2176	0.1966	0.2176	0.2106	0.2176	0.2106	0.2176	0.2176	0.2106	0.2176	0.2106	0.2176 (56)
If cylinder contains dedicated solar storage												
	0.2176	0.1966	0.2176	0.2106	0.2176	0.2106	0.2176	0.2176	0.2106	0.2176	0.2106	0.2176 (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												
	162.1252	143.0890	151.4992	132.2171	127.4466	114.0781	112.1358	117.0816	118.8916	133.4673	142.9761	160.2463 (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	162.1252	143.0890	151.4992	132.2171	127.4466	114.0781	112.1358	117.0816	118.8916	133.4673	142.9761	160.2463 (64)
								Total per year (kWh/year) = Sum(64)m =				1615.2539 (64)
Electric shower(s)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
	64.8835	57.4917	61.3504	54.5850	53.3529	48.5538	48.2621	49.9065	50.1543	55.3548	58.1624	64.2588 (65)

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

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Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	91.4157	91.4157	91.4157	91.4157	91.4157	91.4157	91.4157	91.4157	91.4157	91.4157	91.4157	91.4157	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.1636	14.3563	11.6754	8.8390	6.6073	5.5781	6.0274	7.8346	10.5156	13.3519	15.5837	16.6128	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.5765	199.6267	194.4602	183.4613	169.5772	156.5281	147.8105	145.7603	150.9268	161.9257	175.8098	188.8589	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	45.6652	(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)	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	-60.9438	(71)
Water heating gains (Table 5)	87.2091	85.5531	82.4602	75.8125	71.7109	67.4358	64.8684	67.0787	69.6587	74.4016	80.7811	86.3694	(72)
Total internal gains	377.0862	375.6733	364.7328	344.2499	324.0325	305.6791	294.8433	296.8107	307.2382	325.8163	348.3116	367.9781	(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				
Northeast					0.8300	9.5471		0.6300	0.7000	0.7700		2.4217 (75)				
East					5.2500	16.6187		0.6300	0.7000	0.7700		26.6642 (76)				
Southeast					0.8300	31.1332		0.6300	0.7000	0.7700		7.8972 (77)				
Solar gains					36.9831	74.1048	125.4072	183.2781	218.9137	228.4012	213.1038	180.5103	146.3576	90.4244	47.5178	32.7872 (83)
Total gains					414.0693	449.7781	490.1401	527.5280	542.9462	534.0804	507.9471	477.3210	453.5958	416.2407	395.8294	400.7654 (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	84.7997	85.1018	84.7997	86.2635	85.6922	87.3448	87.6018	87.3448	87.3448	85.9803	86.2635	85.6922	
alpha	6.6533	6.6735	6.6533	6.7509	6.7128	6.8230	6.8401	6.8230	6.8230	6.7320	6.7509	6.7128	
util living area	0.9915	0.9841	0.9602	0.8763	0.7089	0.5041	0.3803	0.4244	0.6685	0.9151	0.9814	0.9932	(86)
MIT	20.4376	20.5248	20.6684	20.8453	20.9311	20.9525	20.9543	20.9539	20.9425	20.8234	20.6093	20.4162	(87)
Th 2	20.0425	20.0455	20.0425	20.0572	20.0515	20.0678	20.0703	20.0678	20.0678	20.0544	20.0572	20.0515	(88)
util rest of house	0.9881	0.9780	0.9456	0.8378	0.6423	0.4271	0.2982	0.3369	0.5862	0.8784	0.9731	0.9905	(89)
MIT 2	19.4042	19.5161	19.6892	19.9027	19.9775	20.0085	20.0119	20.0092	20.0032	19.8821	19.6330	19.3849	(90)
Living area fraction	19.9312	20.0305	20.1885	20.3834	20.4638	20.4899	20.4925	20.4909	20.4822	20.3621	20.1308	19.9108	(91)
MIT	19.9312	20.0305	20.1885	20.3834	20.4638	20.4899	20.4925	20.4909	20.4822	20.3621	20.1308	19.9108	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9312	20.0305	20.1885	20.3834	20.4638	20.4899	20.4925	20.4909	20.4822	20.3621	20.1308	19.9108	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9876	0.9779	0.9481	0.8521	0.6721	0.4622	0.3355	0.3767	0.6237	0.8917	0.9739	0.9900	(94)
Useful gains	408.9404	439.8265	464.7074	449.5186	364.8931	246.8267	170.4279	179.7990	282.9051	371.1708	385.4794	396.7709	(95)
Ext temp.	4.8000	5.3000	6.8000	9.3000	12.3000	15.0000	16.7000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W	702.7078	681.6713	621.7778	505.9893	375.1867	247.5274	170.4926	179.9433	287.7588	437.9774	576.6359	703.6443	(97)
Space heating kWh	218.5630	162.5197	116.8604	40.6590	7.6585	0.0000	0.0000	0.0000	0.0000	49.7041	137.6327	228.3139	(98a)
Space heating requirement - total per year (kWh/year)												961.9111	
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	218.5630	162.5197	116.8604	40.6590	7.6585	0.0000	0.0000	0.0000	0.0000	49.7041	137.6327	228.3139	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												961.9111	
Space heating per m2										(98c) / (4) =		21.7332	(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 %)													249.9000 (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	
	218.5630	162.5197	116.8604	40.6590	7.6585	0.0000	0.0000	0.0000	0.0000	49.7041	137.6327	228.3139	(98)
Space heating efficiency (main heating system 1)	249.9000	249.9000	249.9000	249.9000	249.9000	0.0000	0.0000	0.0000	0.0000	249.9000	249.9000	249.9000	(210)
Space heating fuel (main heating system)	87.4602	65.0339	46.7629	16.2701	3.0646	0.0000	0.0000	0.0000	0.0000	19.8896	55.0751	91.3621	(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	162.1252	143.0890	151.4992	132.2171	127.4466	114.0781	112.1358	117.0816	118.8916	133.4673	142.9761	160.2463	(64)
Efficiency of water heater	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	(216)
(217)m	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	(217)
Fuel for water heating, kWh/month													

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	92.5901	81.7184	86.5215	75.5095	72.7851	65.1502	64.0410	66.8656	67.8993	76.2235	81.6540	91.5170 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	14.1479	11.3500	10.2194	7.4872	5.7833	4.7250	5.2757	6.8576	8.9073	11.6869	13.2003	14.5411 (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												384.9184 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												175.1000
Water heating fuel used												922.4751 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												114.1815 (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												1421.5750 (238)

10a. Fuel costs - using BEDF prices (572)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	384.9184	23.6600	91.0717 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	922.4751	23.6600	218.2576 (247)
Energy for instantaneous electric shower(s)	0.0000	23.6600	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	114.1815	26.0600	29.7557 (250)
Additional standing charges			114.0000 (251)
Total energy cost			453.0850 (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	384.9184	0.1571	60.4606 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	922.4751	0.1411	130.1231 (264)
Space and water heating			190.5837 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	114.1815	0.1443	16.4799 (268)
Total CO2, kg/year			207.0636 (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	384.9184	1.5815	608.7504 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	922.4751	1.5216	1403.6301 (278)
Space and water heating			2012.3805 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	114.1815	1.5338	175.1354 (282)
Total Primary energy kWh/year			2187.5159 (286)

Thermal Bridging

Property Reference	Flat 2	Issued on Date	30/06/2025
Assessment Reference	As Designed	Prop Type Ref	Semi-Detached Flat
Property	Flat 2, Bury Old Road, Prestwich, Manchester, M25 3DE		

SAP Rating	85 B	DER	4.98	TER	14.26
Environmental	97 A	% DER < TER			65.08
CO ₂ Emissions (t/year)	0.21	DFEE	32.72	TFEE	35.58
Compliance Check	See BREL	% DFEE < TFEE			8.03
% DPER < TPER	30.18	DPER	52.45	TPER	75.13

Assessor Details	Mr. Nathaniel Kempson	Assessor ID	R421-0001
Client	Encon Associates, Glenn Miles		

	Junction details	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E1 Steel lintel with perforated steel base plate	Non Gov Approved Schemes	0.305	3.95	1.20	Knauf
External wall	E3 Sill	Non Gov Approved Schemes	0.024	3.95	0.09	Knauf
External wall	E4 Jamb	Non Gov Approved Schemes	0.024	14.00	0.34	Knauf
External wall	E5 Ground floor (normal)	Non Gov Approved Schemes	0.041	17.50	0.72	Knauf
External wall	E16 Corner (normal)	Non Gov Approved Schemes	0.040	2.50	0.10	Knauf
External wall	E7 Party floor between dwellings (in blocks of flats)	Non Gov Approved Schemes	0.033	17.50	0.58	Knauf
External wall	E18 Party wall between dwellings	Non Gov Approved Schemes	0.030	2.50	0.07	Knauf
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.320	7.19	2.30	
Party wall	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	0.000	7.19	0.00	
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Default	0.120	2.32	0.28	

Total: 78.60 W/mK:
Y-Value: 0.06 W/m²K:

Building Regulations England Part L (BREL) Compliance Report

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

Date: Mon 30 Jun 2025 11:02:10

Project Information			
Assessed By	Nathaniel Kempson	Building Type	Flat, Semi-detached
OCDEA Registration	EES/020528	Assessment Date	2025-06-30

Dwelling Details			
Assessment Type	As designed	Total Floor Area	44 m ²
Site Reference	Flat 3	Plot Reference	As Designed
Address	Flat 3 Bury Old Road, Prestwich, M25 3DE		

Client Details	
Name	Glenn Miles
Company	Encon Associates Ltd
Address	10 Chapel Lane, Nottingham, NG5 7DR

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	14.21 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	4.88 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	74.85 kWh _{PE} /m ²		
Dwelling primary energy	51.48 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	35.2 kWh/m ²		
Dwelling fabric energy efficiency	31.1 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	0.18	Walls (1) (0.18)	OK
Party walls	0.2	0	Party Wall (1) (0)	N/A
Curtain walls	1.6	0	N/A	N/A
Floors	0.18	0.12	Heatloss Floor 1 (0.12)	OK
Roofs	0.16	0.11	Roof (1) (0.11)	OK
Windows, doors, and roof windows	1.6	1	East Windows (1)	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)	35.3375	0.18	
Party wall: Party Wall (1)	15.28	0 (!)	
Party wall: Party Wall (2)	8.83	0 (!)	
Ground floor: Heatloss Floor 1, Heatloss Floor 1	43.91	0.12	
Exposed roof: Roof (1)	4.2	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]
East Windows, Windows	2.625	East	0.7	1 (!)
East Windows, Windows	2.625	East	0.7	1 (!)
North East Windows, Windows	0.83125	North East	0.7	1 (!)
South East Windows, Windows	0.83125	South East	0.7	1 (!)

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	E1: Steel lintel with perforated steel base plate	Not government-approved scheme	0.305	Knauf

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E3: Sill	Not government-approved scheme	0.024 (!)	Knauf
External wall	E4: Jamb	Not government-approved scheme	0.024 (!)	Knauf
External wall	E5: Ground floor (normal)	Not government-approved scheme	0.041	Knauf
External wall	E16: Corner (normal)	Not government-approved scheme	0.04	Knauf
External wall	E7: Party floor between dwellings (in blocks of flats)	Not government-approved scheme	0.033 (!)	Knauf
External wall	E18: Party wall between dwellings	Not government-approved scheme	0.03 (!)	Knauf
Party wall	P1: Ground floor	SAP table default	0.32	
Party wall	P3: Intermediate floor between dwellings (in blocks of flats)	SAP table default	0 (!)	

3 Air permeability (better than typically expected values are flagged with a subsequent (!))

Maximum permitted air permeability at 50Pa	8 m ³ /hm ²	
Dwelling air permeability at 50Pa	5 m ³ /hm ² , Design value	OK
Air permeability test certificate reference		

4 Space heating

Main heating system 1: Heat pump with radiators or underfloor heating - Electricity		
Efficiency	249.9%	
Emitter type	Underfloor	
Flow temperature	35°C	
System type	Air source heat pump	
Manufacturer	TBC	
Model	TBC	
Commissioning		
Secondary heating system: N/A		
Fuel	N/A	
Efficiency	N/A	
Commissioning		

5 Hot water

Cylinder/store - type: Cylinder		
Capacity	125 litres	
Declared heat loss	0.013 kWh/day	
Primary pipework insulated	Yes	
Manufacturer		
Model		
Commissioning		
Waste water heat recovery system 1 - type: N/A		
Efficiency		
Manufacturer		
Model		

6 Controls

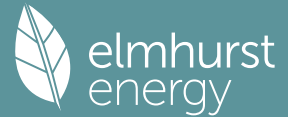
Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: Cylinder thermostat and HW separately timed		
Manufacturer		
Model		

7 Lighting

Minimum permitted light source efficacy	75 lm/W	
Lowest light source efficacy	95 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: N/A		
Maximum permitted specific fan power	N/A	
Specific fan power	N/A	N/A
Minimum permitted heat recovery efficiency	N/A	
Heat recovery efficiency	N/A	N/A
Manufacturer/Model		
Commissioning		
9 Local generation		
N/A		
10 Heat networks		
N/A		
11 Supporting documentary evidence		
N/A		
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 information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.		
Signed: Name:	Assessor ID: Date:	
b. Client Declaration		
N/A		

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Property Reference	Flat 3				Issued on Date	30/06/2025	
Assessment Reference	As Designed			Prop Type Ref			
Property	Flat 3, Bury Old Road, Prestwich, Manchester, M25 3DE						
SAP Rating	85 B		DER	4.88		TER	14.21
Environmental	97 A		% DER < TER				65.66
CO ₂ Emissions (t/year)	0.2		DFEE	31.10		TFEE	35.17
Compliance Check	See BREL		% DFEE < TFEE				11.58
% DPER < TPER	31.22		DPER	51.48		TPER	74.85
Assessor Details	Mr. Nathaniel Kempson					Assessor ID	R421-0001
Client	Encon Associates, Glenn Miles						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	43.9100	2.5000	109.7750
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.9100		
Dwelling volume			109.7750

2. Ventilation rate

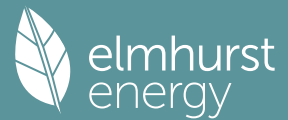
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	20.0000 / (5) = 0.1822 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4322 (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) = 0.3998 (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	0.5097	0.4997	0.4897	0.4398	0.4298	0.3798	0.3798	0.3698	0.3998	0.4298	0.4497	0.4697 (22b)
Effective ac	0.6299	0.6249	0.6199	0.5967	0.5923	0.5721	0.5721	0.5684	0.5799	0.5923	0.6011	0.6103 (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			6.9100	0.9615	6.6442		(27)
Heatloss Floor 1			43.9100	0.1200	5.2692	110.0000	4830.1000 (28a)
External Wall 1	42.2500	6.9100	35.3400	0.1800	6.3612	110.0000	3887.4000 (29a)
Balcony Roof	4.2000		4.2000	0.1100	0.4620	9.0000	37.8000 (30)
Total net area of external elements Aum(A, m ²)			90.3600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	18.7366		(33)
Main dwelling							
Party Wall Between Flats			15.2800	0.0000	0.0000	180.0000	2750.4000 (32)
Party Wall Between Corridor			8.8300	0.0000	0.0000	180.0000	1589.4000 (32)
Party Ceiling 1			39.7100			20.0000	794.2000 (32b)
Internal Wall 1			77.5000			9.0000	697.5000 (32c)
Heat capacity Cm = Sum (A x k)						(28)...(30) + (32) + (32a)...(32e) =	14586.8000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							332.1977 (35)
List of Thermal Bridges							
K1 Element					Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate					3.9500	0.3050	1.2047
E3 Sill					3.9500	0.0240	0.0948
E4 Jamb					14.0000	0.0240	0.3360
E5 Ground floor (normal)					16.9000	0.0410	0.6929

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E16 Corner (normal)	2.5000	0.0400	0.1000
E7 Party floor between dwellings (in blocks of flats)	16.9000	0.0330	0.5577
E18 Party wall between dwellings	2.5000	0.0300	0.0750
P1 Party wall - Ground floor	3.5300	0.3200	1.1296
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	3.5300	0.0000	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			4.1908 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	22.9274 (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	22.8188	22.6360	22.4569	21.6156	21.4582	20.7255	20.7255	20.5898	21.0077	21.4582	21.7766	22.1095 (38)
Average = Sum(39)m / 12 =	45.7462	45.5634	45.3843	44.5430	44.3856	43.6528	43.6528	43.5171	43.9351	44.3856	44.7040	45.0369 (39)
												44.5422
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0418	1.0377	1.0336	1.0144	1.0108	0.9941	0.9941	0.9911	1.0006	1.0108	1.0181	1.0257 (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												1.5137 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths												56.9237 (42b)
Hot water usage for other uses												30.1318 (42c)
Average daily hot water use (litres/day)												80.3487 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	87.2485	85.3046	83.0143	79.7161	76.9712	74.0468	73.0590	75.3409	77.7281	80.7806	84.1242	87.0554 (44)
Energy content (annual)	138.1803	121.4725	127.5899	109.1274	103.6180	91.0492	88.3585	93.2878	95.8465	109.6185	119.8503	136.3078 (45)
Distribution loss (46)m = 0.15 x (45)m												1334.3068
Water storage loss:												
Store volume												125.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.0130 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.0070 (55)
Total storage loss												
If cylinder contains dedicated solar storage												
Primary loss	0.2176	0.1966	0.2176	0.2106	0.2176	0.2106	0.2176	0.2176	0.2106	0.2176	0.2106	0.2176 (57)
Combi loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
WWHRS	161.6603	142.6803	151.0699	131.8500	127.0981	113.7718	111.8386	116.7678	118.5691	133.0985	142.5729	159.7878 (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)
Total per year (kWh/year)	161.6603	142.6803	151.0699	131.8500	127.0981	113.7718	111.8386	116.7678	118.5691	133.0985	142.5729	159.7878 (64)
Electric shower(s)												1610.7651 (64)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
	64.7290	57.3558	61.2077	54.4629	53.2370	48.4519	48.1632	49.8022	50.0471	55.2322	58.0283	64.1063 (65)

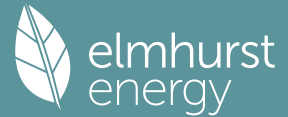
5. Internal gains (see Table 5 and 5a)

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	75.6849	75.6849	75.6849	75.6849	75.6849	75.6849	75.6849	75.6849	75.6849	75.6849	75.6849	75.6849 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	69.4142	76.8514	69.4142	71.7280	69.4142	71.7280	69.4142	69.4142	71.7280	69.4142	71.7280	69.4142 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	131.4771	132.8415	129.4034	122.0842	112.8451	104.1616	98.3604	96.9961	100.4342	107.7533	116.9925	125.6760 (68)
Pumps, fans	30.5685	30.5685	30.5685	30.5685	30.5685	30.5685	30.5685	30.5685	30.5685	30.5685	30.5685	30.5685 (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)	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479 (71)
Total internal gains	87.0013	85.3509	82.2684	75.6430	71.5551	67.2943	64.7355	66.9384	69.5098	74.2368	80.5949	86.1644 (72)
	333.5981	340.7493	326.7915	315.1607	299.5199	288.8894	278.2156	279.0542	287.3774	297.1098	315.0209	326.9601 (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
Northeast	0.8300	11.2829	0.6300	0.7000	0.7700	2.8620 (75)
East	5.2500	19.6403	0.6300	0.7000	0.7700	31.5122 (76)
Southeast	0.8300	36.7938	0.6300	0.7000	0.7700	9.3331 (77)
Solar gains	43.7073	83.3679	133.7677	192.2497	234.8125	240.4224
Total gains	377.3054	424.1172	460.5592	507.4104	534.3323	529.3117
						228.8444
						196.8064
						154.4140
						97.8362
						54.0720
						36.2385 (83)
						363.1987 (84)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	88.5733	88.9286	89.2795	90.9658	91.2884	92.8208	92.8208	93.1102	92.2245	91.2884	90.6381	89.9682	21.0000 (85)
alpha	6.9049	6.9286	6.9520	7.0644	7.0859	7.1881	7.1881	7.2073	7.1483	7.0859	7.0425	6.9979	
util living area	0.9961	0.9904	0.9733	0.9008	0.7403	0.5253	0.3786	0.4202	0.6709	0.9333	0.9895	0.9969	(86)
MIT	20.3820	20.4920	20.6452	20.8346	20.9306	20.9547	20.9566	20.9565	20.9465	20.8182	20.5763	20.3717	(87)
Th 2	20.0486	20.0521	20.0554	20.0713	20.0743	20.0882	20.0882	20.0908	20.0829	20.0743	20.0683	20.0620	(88)
util rest of house	0.9945	0.9865	0.9627	0.8673	0.6785	0.4518	0.3003	0.3374	0.5890	0.9020	0.9845	0.9957	(89)
MIT 2	19.3369	19.4789	19.6721	19.9054	20.0006	20.0319	20.0327	20.0353	20.0220	19.8957	19.6003	19.3351	(90)
Living area fraction									fLA = Living area / (4) =			0.5140	(91)
MIT	19.8741	19.9997	20.1723	20.3830	20.4786	20.5062	20.5076	20.5088	20.4972	20.3698	20.1020	19.8679	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8741	19.9997	20.1723	20.3830	20.4786	20.5062	20.5076	20.5088	20.4972	20.3698	20.1020	19.8679	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9941	0.9863	0.9642	0.8795	0.7064	0.4857	0.3363	0.3755	0.6268	0.9132	0.9847	0.9953	(94)
Useful gains	375.0880	418.2948	444.0734	446.2547	377.4353	257.0699	170.5309	178.7081	276.9236	360.6798	363.4449	361.5010	(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	712.4538	687.9918	620.5071	511.4874	389.6447	257.8234	170.5758	178.8045	281.0604	433.6403	581.2410	705.6361	(97)
Space heating kWh	251.0001	181.2364	131.2666	46.9676	9.0838	0.0000	0.0000	0.0000	0.0000	54.2826	156.8132	256.0365	(98a)
Space heating requirement - total per year (kWh/year)												1086.6868	
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	251.0001	181.2364	131.2666	46.9676	9.0838	0.0000	0.0000	0.0000	0.0000	54.2826	156.8132	256.0365	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1086.6868	
Space heating per m2										(98c) / (4) =		24.7480	(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 %)													249.9000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	251.0001	181.2364	131.2666	46.9676	9.0838	0.0000	0.0000	0.0000	0.0000	54.2826	156.8132	256.0365	(98)
Space heating efficiency (main heating system 1)	249.9000	249.9000	249.9000	249.9000	249.9000	0.0000	0.0000	0.0000	0.0000	249.9000	249.9000	249.9000	(210)
Space heating fuel (main heating system)	100.4402	72.5236	52.5277	18.7946	3.6350	0.0000	0.0000	0.0000	0.0000	21.7217	62.7504	102.4556	(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	161.6603	142.6803	151.0699	131.8500	127.0981	113.7718	111.8386	116.7678	118.5691	133.0985	142.5729	159.7878	(64)
Efficiency of water heater (217)m	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	(216)
Fuel for water heating, kWh/month	92.3246	81.4850	86.2764	75.2998	72.5860	64.9753	63.8713	66.6863	67.7151	76.0129	81.4237	91.2552	(219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	13.9825	11.2172	10.0999	7.3996	5.7157	4.6698	5.2140	6.7774	8.8032	11.5502	13.0460	14.3711	(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												434.8487	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												175.1000	
Water heating fuel used												919.9115	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												112.8465	(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)

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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	1467.6067 (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	434.8487	0.1571	68.3094 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	919.9115	0.1411	129.7602 (264)
Space and water heating			198.0696 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	112.8465	0.1443	16.2872 (268)
Total CO2, kg/year			214.3569 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.8800 (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	434.8487	1.5815	687.7329 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	919.9115	1.5216	1399.7247 (278)
Space and water heating			2087.4576 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	112.8465	1.5338	173.0877 (282)
Total Primary energy kWh/year			2260.5453 (286)
Dwelling Primary energy Rate (DPER)			51.4800 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	43.9100 (1b)	x 2.5000 (2b)	= 109.7750 (1b) - (3b)
Ground floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.9100		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 109.7750 (5)

2. Ventilation rate

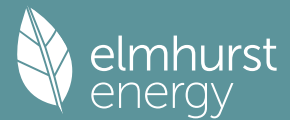
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 20.0000 / (5) = 0.1822 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4322 (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) = 0.3998 (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	0.5097	0.4997	0.4897	0.4398	0.4298	0.3798	0.3798	0.3698	0.3998	0.4298	0.4497	0.4697 (22b)
Effective ac	0.6299	0.6249	0.6199	0.5967	0.5923	0.5721	0.5721	0.5684	0.5799	0.5923	0.6011	0.6103 (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			6.9100	1.1450	7.9122		(27)
Heatloss Floor 1			43.9100	0.1300	5.7083		(28a)
External Wall 1	42.2500	6.9100	35.3400	0.1800	6.3612		(29a)
Balcony Roof	4.2000		4.2000	0.1100	0.4620		(30)
Total net area of external elements Aum(A, m2)			90.3600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.4437		(33)

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Main dwelling													
Party Wall Between Flats	15.2800	0.0000	0.0000										(32)
Party Wall Between Corridor	8.8300	0.0000	0.0000										(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												341.2412	(35)
List of Thermal Bridges													
K1 Element													
E1 Steel lintel with perforated steel base plate													
E3 Sill													
E4 Jamb													
E5 Ground floor (normal)													
E16 Corner (normal)													
E7 Party floor between dwellings (in blocks of flats)													
E18 Party wall between dwellings													
P1 Party wall - Ground floor													
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)													
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												5.6394	(36)
Point Thermal bridges												(36a) =	0.0000
Total fabric heat loss												(33) + (36) + (36a) =	26.0831 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	22.8188	22.6360	22.4569	21.6156	21.4582	20.7255	20.7255	20.5898	21.0077	21.4582	21.7766	22.1095	(38)
Heat transfer coeff	48.9019	48.7191	48.5400	47.6987	47.5413	46.8086	46.8086	46.6729	47.0908	47.5413	47.8597	48.1927	(39)
Average = Sum(39)m / 12 =												47.6980	
HLP	1.1137	1.1095	1.1054	1.0863	1.0827	1.0660	1.0660	1.0629	1.0724	1.0827	1.0900	1.0975	(40)
HLP (average)												1.0863	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)													

Assumed occupancy													1.5137 (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	57.1167	56.2685	55.0739	52.8714	51.2222	49.3935	48.4057	49.5919	50.8834	52.8402	55.0881	56.9237	(42b)
Hot water usage for other uses	30.1318	29.0361	27.9404	26.8447	25.7490	24.6533	24.6533	25.7490	26.8447	27.9404	29.0361	30.1318	(42c)
Average daily hot water use (litres/day)												80.3487	(43)
Daily hot water use	87.2485	85.3046	83.0143	79.7161	76.9712	74.0468	73.0590	75.3409	77.7281	80.7806	84.1242	87.0554	(44)
Energy conte	138.1803	121.4725	127.5899	109.1274	103.6180	91.0492	88.3585	93.2878	95.8465	109.6185	119.8503	136.3078	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m	20.7270	18.2209	19.1385	16.3691	15.5427	13.6574	13.2538	13.9932	14.3770	16.4428	17.9775	20.4462	(46)
Water storage loss:													
Store volume												125.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.2537	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.6770	(55)
Total storage loss	20.9878	18.9567	20.9878	20.3107	20.9878	20.3107	20.9878	20.9878	20.3107	20.9878	20.3107	20.9878	(56)
If cylinder contains dedicated solar storage	20.9878	18.9567	20.9878	20.3107	20.9878	20.3107	20.9878	20.9878	20.3107	20.9878	20.3107	20.9878	(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	182.4305	161.4404	171.8401	151.9501	147.8682	133.8719	132.6087	137.5379	138.6693	153.8687	162.6731	180.5579	(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	182.4305	161.4404	171.8401	151.9501	147.8682	133.8719	132.6087	137.5379	138.6693	153.8687	162.6731	180.5579	(64)
12Total per year (kWh/year)												1855.3169	(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	81.3451	72.3639	77.8238	70.5431	69.8531	64.5320	64.7794	66.4183	66.1272	71.8483	74.1084	80.7225	(65)

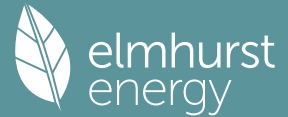
5. Internal gains (see Table 5 and 5a)													

Metabolic gains (Table 5), Watts													
(66)m	75.6849	75.6849	75.6849	75.6849	75.6849	75.6849	75.6849	75.6849	75.6849	75.6849	75.6849	75.6849	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.4142	76.8514	69.4142	71.7280	69.4142	71.7280	69.4142	69.4142	71.7280	69.4142	71.7280	69.4142	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	131.4771	132.8415	129.4034	122.0842	112.8451	104.1616	98.3604	96.9961	100.4342	107.7533	116.9925	125.6760	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.5685	30.5685	30.5685	30.5685	30.5685	30.5685	30.5685	30.5685	30.5685	30.5685	30.5685	30.5685	(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)	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	(71)
Water heating gains (Table 5)	109.3348	107.6844	104.6019	97.9765	93.8886	89.6278	87.0690	89.2719	91.8433	96.5703	102.9284	108.4979	(72)
Total internal gains	358.9316	366.0828	352.1250	340.4942	324.8534	311.2229	300.5491	301.3877	309.7109	322.4433	340.3544	352.2936	(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				

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Northeast	0.8300	11.2829	0.6300	0.7000	0.7700	2.8620 (75)
East	5.2500	19.6403	0.6300	0.7000	0.7700	31.5122 (76)
Southeast	0.8300	36.7938	0.6300	0.7000	0.7700	9.3331 (77)

Solar gains	43.7073	83.3679	133.7677	192.2497	234.8125	240.4224	228.8444	196.8064	154.4140	97.8362	54.0720	36.2385 (83)
Total gains	402.6389	449.4507	485.8927	532.7439	559.6658	551.6452	529.3935	498.1941	464.1249	420.2795	394.4264	388.5322 (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	85.1132	85.4324	85.7477	87.2601	87.5490	88.9195	88.9195	89.1780	88.3866	87.5490	86.9665	86.3657	
alpha	6.6742	6.6955	6.7165	6.8173	6.8366	6.9280	6.9280	6.9452	6.8924	6.8366	6.7978	6.7577	
util living area	0.9955	0.9896	0.9727	0.9042	0.7507	0.5394	0.3887	0.4302	0.6810	0.9314	0.9881	0.9963 (86)	
MIT	20.2080	20.3529	20.5592	20.8175	20.9579	20.9961	20.9997	20.9993	20.9830	20.8030	20.4736	20.1935 (87)	
Th 2	19.9897	19.9931	19.9964	20.0121	20.0150	20.0287	20.0287	20.0312	20.0234	20.0150	20.0090	20.0028 (88)	
util rest of house	0.9935	0.9853	0.9614	0.8698	0.6857	0.4595	0.3031	0.3401	0.5937	0.8981	0.9824	0.9948 (89)	
MIT 2	19.0923	19.2779	19.5365	19.8486	19.9867	20.0271	20.0286	20.0311	20.0151	19.8428	19.4442	19.0842 (90)	
Living area fraction									fLA = Living area / (4) =				0.5140 (91)
MIT	19.6658	19.8304	20.0622	20.3466	20.4859	20.5252	20.5277	20.5288	20.5126	20.3364	19.9733	19.6544 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.6658	19.8304	20.0622	20.3466	20.4859	20.5252	20.5277	20.5288	20.5126	20.3364	19.9733	19.6544 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9927	0.9844	0.9623	0.8825	0.7178	0.5006	0.3471	0.3865	0.6385	0.9104	0.9821	0.9941 (94)
Useful gains	399.7098	442.4405	467.5829	470.1620	401.7484	276.1685	183.7727	192.5397	296.3307	382.6146	387.3636	386.2297 (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	751.4161	727.3977	658.3094	545.9889	417.6934	277.3503	183.8516	192.7011	301.9740	462.8805	616.1129	744.7865 (97)
Space heating kWh	261.6695	191.4912	141.9005	54.5954	11.8631	0.0000	0.0000	0.0000	0.0000	59.7178	164.6995	266.7663 (98a)
Space heating requirement - total per year (kWh/year)												1152.7033
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	261.6695	191.4912	141.9005	54.5954	11.8631	0.0000	0.0000	0.0000	0.0000	59.7178	164.6995	266.7663 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1152.7033
Space heating per m2										(98c) / (4) =		26.2515 (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	261.6695	191.4912	141.9005	54.5954	11.8631	0.0000	0.0000	0.0000	0.0000	59.7178	164.6995	266.7663 (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)	283.4989	207.4661	153.7384	59.1500	12.8527	0.0000	0.0000	0.0000	0.0000	64.6997	178.4393	289.0209 (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	182.4305	161.4404	171.8401	151.9501	147.8682	133.8719	132.6087	137.5379	138.6693	153.8687	162.6731	180.5579 (64)
Efficiency of water heater (217)m	84.8681	84.4436	83.6338	81.9967	80.4052	79.8000	79.8000	79.8000	79.8000	82.1273	84.0876	79.8000 (216)
Fuel for water heating, kWh/month	214.9576	191.1814	205.4674	185.3125	183.9037	167.7593	166.1763	172.3533	173.7710	187.3540	193.4567	84.9335 (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	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	14.4229	11.5706	10.4180	7.6327	5.8957	4.8168	5.3783	6.9909	9.0805	11.9140	13.4569	14.8238 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-21.0731	-29.9865	-43.5242	-49.4715	-53.8584	-50.5235	-49.9657	-46.9541	-41.6623	-34.5978	-23.2910	-18.1919 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-11.0733	-23.3871	-46.6316	-70.2278	-93.0062	-93.4427	-92.2783	-78.0089	-57.0602	-33.4336	-14.7868	-8.7442 (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												1248.8660 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.8000

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Water heating fuel used	2254.2806 (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)	116.4011 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1085.1809 (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	2620.3669 (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	1248.8660	0.2100	262.2619 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2254.2806	0.2100	473.3989 (264)
Space and water heating			735.6608 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	116.4011	0.1443	16.8003 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-463.1001	0.1343	-62.2139
PV Unit electricity exported	-622.0808	0.1258	-78.2785
Total			-140.4924 (269)
Total CO2, kg/year			623.8979 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.2100 (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	1248.8660	1.1300	1411.2186 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2254.2806	1.1300	2547.3371 (278)
Space and water heating			3958.5557 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	116.4011	1.5338	178.5399 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-463.1001	1.4965	-693.0257
PV Unit electricity exported	-622.0808	0.4619	-287.3351
Total			-980.3608 (283)
Total Primary energy kWh/year			3286.8356 (286)
Target Primary Energy Rate (TPER)			74.8500 (287)

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

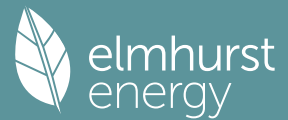
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	43.9100 (1b)	x 2.5000 (2b)	= 109.7750 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.9100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	109.7750 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1822 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4322 (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) = 0.3998 (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	0.5097	0.4997	0.4897	0.4398	0.4298	0.3798	0.3798	0.3698	0.3998	0.4298	0.4497	0.4697 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.6299	0.6249	0.6199	0.5967	0.5923	0.5721	0.5721	0.5684	0.5799	0.5923	0.6011	0.6103 (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			6.9100	0.9615	6.6442		(27)
Heatloss Floor 1			43.9100	0.1200	5.2692	110.0000	4830.1000 (28a)
External Wall 1	42.2500	6.9100	35.3400	0.1800	6.3612	110.0000	3887.4000 (29a)
Balcony Roof	4.2000		4.2000	0.1100	0.4620	9.0000	37.8000 (30)
Total net area of external elements Aum(A, m2)			90.3600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		18.7366		(33)
Main dwelling							
Party Wall Between Flats			15.2800	0.0000	0.0000	180.0000	2750.4000 (32)
Party Wall Between Corridor			8.8300	0.0000	0.0000	180.0000	1589.4000 (32)
Party Ceiling 1			39.7100			30.0000	1191.3000 (32b)
Internal Wall 1			77.5000			9.0000	697.5000 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 14983.9000 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 341.2412 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	3.9500	0.3050	1.2047
E3 Sill	3.9500	0.0240	0.0948
E4 Jamb	14.0000	0.0240	0.3360
E5 Ground floor (normal)	16.9000	0.0410	0.6929
E16 Corner (normal)	2.5000	0.0400	0.1000
E7 Party floor between dwellings (in blocks of flats)	16.9000	0.0330	0.5577
E18 Party wall between dwellings	2.5000	0.0300	0.0750
P1 Party wall - Ground floor	3.5300	0.3200	1.1296
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	3.5300	0.0000	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			4.1908 (36)
Point Thermal bridges			0.0000 (36a)
Total fabric heat loss			(33) + (36) + (36a) = 22.9274 (37)

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

(38)m	Jan 22.8188	Feb 22.6360	Mar 22.4569	Apr 21.6156	May 21.4582	Jun 20.7255	Jul 20.7255	Aug 20.5898	Sep 21.0077	Oct 21.4582	Nov 21.7766	Dec 22.1095 (38)
Heat transfer coeff	45.7462	45.5634	45.3843	44.5430	44.3856	43.6528	43.6528	43.5171	43.9351	44.3856	44.7040	45.0369 (39)
Average = Sum(39)m / 12 =												44.5422
HLP	Jan 1.0418	Feb 1.0377	Mar 1.0336	Apr 1.0144	May 1.0108	Jun 0.9941	Jul 0.9941	Aug 0.9911	Sep 1.0006	Oct 1.0108	Nov 1.0181	Dec 1.0257 (40)
HLP (average)												1.0144
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

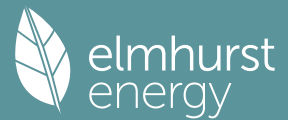
4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.5137 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
Hot water usage for other uses	21.4525	21.1339	20.6852	19.8580	19.2386	18.5517	18.1807	18.6262	19.1113	19.8463	20.6906	21.3800 (42c)
Average daily hot water use (litres/day)	30.1318	29.0361	27.9404	26.8447	25.7490	24.6533	24.6533	25.7490	26.8447	27.9404	29.0361	30.1318 (43)
Daily hot water use	Jan 51.5843	Feb 50.1700	Mar 48.6256	Apr 46.7027	May 44.9875	Jun 43.2050	Jul 42.8340	Aug 44.3752	Sep 45.9560	Oct 47.7867	Nov 49.7266	Dec 51.5117 (44)
Energy conte	81.6969	71.4414	74.7358	63.9336	60.5619	53.1256	51.8040	54.9458	56.6683	64.8460	70.8447	80.6549 (45)
Energy content (annual)										Total = Sum(45)m =		785.2589
Distribution loss	(46)m = 0.15 x (45)m											
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	69.4423	60.7252	63.5254	54.3436	51.4776	45.1567	44.0334	46.7039	48.1681	55.1191	60.2180	68.5567 (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	69.4423	60.7252	63.5254	54.3436	51.4776	45.1567	44.0334	46.7039	48.1681	55.1191	60.2180	68.5567 (64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				667.4701 (64)
Electric shower(s)	39.7207	35.3914	38.6461	36.8795	37.5715	35.8396	37.0342	37.5715	36.8795	38.6461	37.9194	39.7207 (64a)
Heat gains from water heating, kWh/month	27.2908	24.0291	25.5429	22.8058	22.2623	20.2491	20.2669	21.0689	21.2619	23.4413	24.5343	27.0693 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan 75.6849	Feb 75.6849	Mar 75.6849	Apr 75.6849	May 75.6849	Jun 75.6849	Jul 75.6849	Aug 75.6849	Sep 75.6849	Oct 75.6849	Nov 75.6849	Dec 75.6849 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												

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Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	69.4142	76.8514	69.4142	71.7280	69.4142	71.7280	69.4142	69.4142	71.7280	69.4142	71.7280	69.4142 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	131.4771	132.8415	129.4034	122.0842	112.8451	104.1616	98.3604	96.9961	100.4342	107.7533	116.9925	125.6760 (68)
Pumps, fans	30.5685	30.5685	30.5685	30.5685	30.5685	30.5685	30.5685	30.5685	30.5685	30.5685	30.5685	30.5685 (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)	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479 (71)
Total internal gains	36.6811	35.7577	34.3318	31.6747	29.9224	28.1237	27.2405	28.3184	29.5304	31.5071	34.0755	36.3835 (72)
	283.2779	291.1560	278.8549	271.1924	257.8872	249.7188	240.7206	240.4341	247.3980	254.3801	268.5015	277.1792 (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
Northeast			0.8300		11.2829		0.6300		0.7000		0.7700		2.8620 (75)
East			5.2500		19.6403		0.6300		0.7000		0.7700		31.5122 (76)
Southeast			0.8300		36.7938		0.6300		0.7000		0.7700		9.3331 (77)
Solar gains	43.7073	83.3679	133.7677	192.2497	234.8125	240.4224	228.8444	196.8064	154.4140	97.8362	54.0720	36.2385	(83)
Total gains	326.9852	374.5240	412.6226	463.4421	492.6996	490.1411	469.5650	437.2405	401.8121	352.2164	322.5735	313.4177	(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	90.9846	91.3495	91.7100	93.4422	93.7736	95.3476	95.3476	95.6449	94.7351	93.7736	93.1056	92.4174
alpha	7.0656	7.0900	7.1140	7.2295	7.2516	7.3565	7.3565	7.3763	7.3157	7.2516	7.2070	7.1612
util living area	0.9986	0.9958	0.9862	0.9339	0.7888	0.5660	0.4087	0.4570	0.7284	0.9627	0.9957	0.9989 (86)
MIT	20.1583	20.3057	20.5162	20.7949	20.9533	20.9962	20.9997	20.9993	20.9797	20.7632	20.4204	20.1446 (87)
Th 2	20.0486	20.0521	20.0554	20.0713	20.0743	20.0882	20.0882	20.0908	20.0829	20.0743	20.0683	20.0620 (88)
util rest of house	0.9979	0.9940	0.9800	0.9073	0.7278	0.4875	0.3242	0.3672	0.6437	0.9415	0.9935	0.9985 (89)
MIT 2	19.2903	19.4396	19.6493	19.9224	20.0490	20.0870	20.0882	20.0907	20.0747	19.9025	19.5677	19.2878 (90)
Living area fraction	19.7365	19.8848	20.0949	20.3709	20.5138	20.5544	20.5567	20.5577	20.5399	20.3449	20.0060	0.5140 (91)
MIT	19.7365	19.8848	20.0949	20.3709	20.5138	20.5544	20.5567	20.5577	20.5399	20.3449	20.0060	19.7282 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7365	19.8848	20.0949	20.3709	20.5138	20.5544	20.5567	20.5577	20.5399	20.3449	20.0060	19.7282 (93)

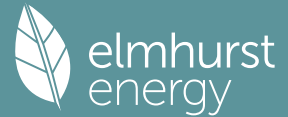
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9977	0.9936	0.9803	0.9168	0.7579	0.5279	0.3677	0.4134	0.6872	0.9487	0.9933	0.9982 (94)
Ext temp.	326.2218	372.1113	404.5019	424.8948	373.4261	258.7700	172.6514	180.7744	276.1375	334.1535	320.4017	312.8651 (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	706.1593	682.7594	616.9953	510.9468	391.2060	259.9243	172.7210	180.9326	282.9373	432.5325	576.9510	699.3429 (97)
Space heating requirement - total per year (kWh/year)	282.6735	208.7555	158.0951	61.9574	13.2282	0.0000	0.0000	0.0000	0.0000	73.1940	184.7155	287.5395 (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)	282.6735	208.7555	158.0951	61.9574	13.2282	0.0000	0.0000	0.0000	0.0000	73.1940	184.7155	287.5395 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1270.1587
Space heating per m2												28.9264 (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	410.3366	323.0310	330.7303	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9667	0.9889	0.9809	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	396.6769	319.4383	324.4074	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	546.5452	523.9600	487.5223	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	107.9052	152.1642	121.3574	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	26.9763	38.0410	30.3394	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												95.3567 (107)
Energy for space heating												28.9264 (99)
Energy for space cooling												2.1716 (108)
Total												31.0981 (109)
Fabric Energy Efficiency (DFEE)												31.1 (109)

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1. Overall dwelling characteristics

Main dwelling		Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor		43.9100 (1b)	x 2.5000 (2b)	= 109.7750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.9100			(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 109.7750 (5)

2. Ventilation rate

m ³ per hour												
Number of open chimneys												0 * 80 = 0.0000 (6a)
Number of open flues												0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire												0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler												0 * 20 = 0.0000 (6d)
Number of flues attached to other heater												0 * 35 = 0.0000 (6e)
Number of blocked chimneys												0 * 20 = 0.0000 (6f)
Number of intermittent extract fans												2 * 10 = 20.0000 (7a)
Number of passive vents												0 * 10 = 0.0000 (7b)
Number of flueless gas fires												0 * 40 = 0.0000 (7c)
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =										20.0000 / (5) =	0.1822 (8)
Pressure test	Yes											
Pressure Test Method	Blower Door											
Measured/design AP50	5.0000 (17)											
Infiltration rate	0.4322 (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) =										0.3998 (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)
	0.5097	0.4997	0.4897	0.4398	0.4298	0.3798	0.3798	0.3698	0.3998	0.4298	0.4497	0.4697 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.6299	0.6249	0.6199	0.5967	0.5923	0.5721	0.5721	0.5684	0.5799	0.5923	0.6011	0.6103 (25)

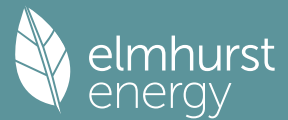
3. Heat losses and heat loss parameter

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			6.9100	1.1450	7.9122		(27)					
Heatloss Floor 1			43.9100	0.1300	5.7083		(28a)					
External Wall 1	42.2500	6.9100	35.3400	0.1800	6.3612		(29a)					
Balcony Roof	4.2000		4.2000	0.1100	0.4620		(30)					
Total net area of external elements Aum(A, m2)			90.3600				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	20.4437		(33)					
Main dwelling												
Party Wall Between Flats			15.2800	0.0000	0.0000		(32)					
Party Wall Between Corridor			8.8300	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							341.2412 (35)					
List of Thermal Bridges												
K1 Element				Length	Psi-value	Total						
E1 Steel lintel with perforated steel base plate				3.9500	0.0500	0.1975						
E3 Sill				3.9500	0.0500	0.1975						
E4 Jamb				14.0000	0.0500	0.7000						
E5 Ground floor (normal)				16.9000	0.1600	2.7040						
E16 Corner (normal)				2.5000	0.0900	0.2250						
E7 Party floor between dwellings (in blocks of flats)				16.9000	0.0700	1.1830						
E18 Party wall between dwellings				2.5000	0.0600	0.1500						
P1 Party wall - Ground floor				3.5300	0.0800	0.2824						
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				3.5300	0.0000	0.0000						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.6394 (36)					
Point Thermal bridges						(36a) =	0.0000					
Total fabric heat loss						(33) + (36) + (36a) =	26.0831 (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	22.8188	22.6360	22.4569	21.6156	21.4582	20.7255	20.7255	20.5898	21.0077	21.4582	21.7766	22.1095 (38)
Average = Sum(39)m / 12 =	48.9019	48.7191	48.5400	47.6987	47.5413	46.8086	46.8086	46.6729	47.0908	47.5413	47.8597	48.1927 (39)
												47.6980
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1137	1.1095	1.1054	1.0863	1.0827	1.0660	1.0660	1.0629	1.0724	1.0827	1.0900	1.0975 (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												1.5137 (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												
	21.4525	21.1339	20.6852	19.8580	19.2386	18.5517	18.1807	18.6262	19.1113	19.8463	20.6906	21.3800 (42b)
Hot water usage for other uses												
	30.1318	29.0361	27.9404	26.8447	25.7490	24.6533	24.6533	25.7490	26.8447	27.9404	29.0361	30.1318 (42c)

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Average daily hot water use (litres/day)												47.2824 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	51.5843	50.1700	48.6256	46.7027	44.9875	43.2050	42.8340	44.3752	45.9560	47.7867	49.7266	51.5117 (44)
Energy content (annual)	81.6969	71.4414	74.7358	63.9336	60.5619	53.1256	51.8040	54.9458	56.6683	64.8460	70.8447	80.6549 (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:	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)
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 (57)
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 (59)
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 (61)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (62)
Total heat required for water heating calculated for each month	69.4423	60.7252	63.5254	54.3436	51.4776	45.1567	44.0334	46.7039	48.1681	55.1191	60.2180	68.5567 (63a)
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 (63b)
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 (63c)
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 (63d)
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 (64)
Output from w/h	69.4423	60.7252	63.5254	54.3436	51.4776	45.1567	44.0334	46.7039	48.1681	55.1191	60.2180	68.5567 (64)
12Total per year (kWh/year)												667.4701 (64)
Electric shower(s)	39.7207	35.3914	38.6461	36.8795	37.5715	35.8396	37.0342	37.5715	36.8795	38.6461	37.9194	39.7207 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												451.8202 (64a)
Heat gains from water heating, kWh/month	27.2908	24.0291	25.5429	22.8058	22.2623	20.2491	20.2669	21.0689	21.2619	23.4413	24.5343	27.0693 (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	75.6849	75.6849	75.6849	75.6849	75.6849	75.6849	75.6849	75.6849	75.6849	75.6849	75.6849	75.6849 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.4142	76.8514	69.4142	71.7280	69.4142	71.7280	69.4142	69.4142	71.7280	69.4142	71.7280	69.4142 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	131.4771	132.8415	129.4034	122.0842	112.8451	104.1616	98.3604	96.9961	100.4342	107.7533	116.9925	125.6760 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.5685	30.5685	30.5685	30.5685	30.5685	30.5685	30.5685	30.5685	30.5685	30.5685	30.5685	30.5685 (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)	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479 (71)
Water heating gains (Table 5)	36.6811	35.7577	34.3318	31.6747	29.9224	28.1237	27.2405	28.3184	29.5304	31.5071	34.0755	36.3835 (72)
Total internal gains	283.2779	291.1560	278.8549	271.1924	257.8872	249.7188	240.7206	240.4341	247.3980	254.3801	268.5015	277.1792 (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
Northeast				0.8300	11.2829		0.6300		0.7000		0.7700		2.8620 (75)
East				5.2500	19.6403		0.6300		0.7000		0.7700		31.5122 (76)
Southeast				0.8300	36.7938		0.6300		0.7000		0.7700		9.3331 (77)
Solar gains	43.7073	83.3679	133.7677	192.2497	234.8125	240.4224	228.8444	196.8064	154.4140	97.8362	54.0720		36.2385 (83)
Total gains	326.9852	374.5240	412.6226	463.4421	492.6996	490.1411	469.5650	437.2405	401.8121	352.2164	322.5735		313.4177 (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	85.1132	85.4324	85.7477	87.2601	87.5490	88.9195	88.9195	89.1780	88.3866	87.5490	86.9665	86.3657
alpha	6.6742	6.6955	6.7165	6.8173	6.8366	6.9280	6.9280	6.9452	6.8924	6.8366	6.7978	6.7577
util living area	0.9987	0.9963	0.9884	0.9462	0.8206	0.6032	0.4378	0.4892	0.7646	0.9696	0.9962	0.9990 (86)
MIT	20.0666	20.2163	20.4356	20.7349	20.9276	20.9925	20.9993	20.9985	20.9661	20.7075	20.3429	20.0522 (87)
Th 2	19.9897	19.9931	19.9964	20.0121	20.0150	20.0287	20.0287	20.0312	20.0234	20.0150	20.0090	20.0028 (88)
util rest of house	0.9981	0.9946	0.9829	0.9226	0.7595	0.5158	0.3417	0.3873	0.6760	0.9511	0.9942	0.9985 (89)
MIT 2	19.1500	19.3017	19.5206	19.8162	19.9746	20.0262	20.0286	20.0310	20.0094	19.7996	19.4413	19.1465 (90)
Living area fraction	19.6212	19.7718	19.9909	20.2884	20.4645	20.5229	20.5275	20.5283	20.5012	20.2662	19.9047	19.6121 (91)
MIT	19.6212	19.7718	19.9909	20.2884	20.4645	20.5229	20.5275	20.5283	20.5012	20.2662	19.9047	19.6121 (92)
Temperature adjustment	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (93)
adjusted MIT	19.6212	19.7718	19.9909	20.2884	20.4645	20.5229	20.5275	20.5283	20.5012	20.2662	19.9047	19.6121 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9978	0.9941	0.9829	0.9301	0.7889	0.5608	0.3912	0.4398	0.7214	0.9567	0.9939	0.9983 (94)
Ext temp.	326.2559	372.3291	405.5618	431.0275	388.7108	274.8911	183.6723	192.3142	289.8516	336.9717	320.6129	312.8852 (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	749.2331	724.5432	654.8497	543.2121	416.6749	277.2410	183.8412	192.6785	301.4358	459.5462	612.8299	742.7476 (97)
Space heating requirement - total per year (kWh/year)	314.6951	236.6878	185.4702	80.7729	20.8053	0.0000	0.0000	0.0000	0.0000	91.1954	210.3962	319.8177 (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)

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Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh												
	314.6951	236.6878	185.4702	80.7729	20.8053	0.0000	0.0000	0.0000	0.0000	91.1954	210.3962	319.8177 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1459.8406
Space heating per m2												(98c) / (4) = 33.2462 (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	440.0005	346.3834	354.7138	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9471	0.9800	0.9675	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	416.7352	339.4485	343.1783	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	546.5452	523.9600	487.5223	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	93.4632	137.2766	107.3919	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	23.3658	34.3191	26.8480	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												84.5329 (107)
Energy for space heating												33.2462 (99)
Energy for space cooling												1.9251 (108)
Total												35.1713 (109)
Fabric Energy Efficiency (TFEE)												35.2 (109)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	43.9100 (1b)	x 2.5000 (2b)	= 109.7750 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.9100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	109.7750 (5)

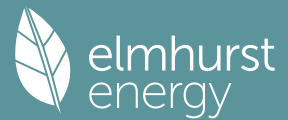
2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1822 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4322 (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) = 0.3998 (21)

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			6.9100	0.9615	6.6442		(27)
Heatloss Floor 1			43.9100	0.1200	5.2692	110.0000	4830.1000 (28a)
External Wall 1	42.2500	6.9100	35.3400	0.1800	6.3612	110.0000	3887.4000 (29a)
Balcony Roof	4.2000		4.2000	0.1100	0.4620	9.0000	37.8000 (30)
Total net area of external elements Aum(A, m2)			90.3600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		18.7366		(33)
Main dwelling							
Party Wall Between Flats			15.2800	0.0000	0.0000	180.0000	2750.4000 (32)
Party Wall Between Corridor			8.8300	0.0000	0.0000	180.0000	1589.4000 (32)
Party Ceiling 1			39.7100			30.0000	1191.3000 (32b)
Internal Wall 1			77.5000			9.0000	697.5000 (32c)

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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

	Length	Psi-value	Total
K1 Element			
E1 Steel lintel with perforated steel base plate	3.9500	0.3050	1.2047
E3 Sill	3.9500	0.0240	0.0948
E4 Jamb	14.0000	0.0240	0.3360
E5 Ground floor (normal)	16.9000	0.0410	0.6929
E16 Corner (normal)	2.5000	0.0400	0.1000
E7 Party floor between dwellings (in blocks of flats)	16.9000	0.0330	0.5577
E18 Party wall between dwellings	2.5000	0.0300	0.0750
P1 Party wall - Ground floor	3.5300	0.3200	1.1296
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	3.5300	0.0000	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			4.1908 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss			(33) + (36) + (36a) = 22.9274 (37)

Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)\text{m} \times (5)$	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.8188	22.6360	22.4569	21.6156	21.4582	20.7255	20.7255	20.5898	21.0077	21.4582	21.7766	22.1095	(38)
Heat transfer coeff	45.7462	45.5634	45.3843	44.5430	44.3856	43.6528	43.6528	43.5171	43.9351	44.3856	44.7040	45.0369	(39)
Average = Sum(39)m / 12 =												44.5422	
HLP	1.0418	1.0377	1.0336	1.0144	1.0108	0.9941	0.9941	0.9911	1.0006	1.0108	1.0181	1.0257	(40)
HLP (average)												1.0144	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.5137 (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	57.1167	56.2685	55.0739	52.8714	51.2222	49.3935	48.4057	49.5919	50.8834	52.8402	55.0881	56.9237	(42b)
Hot water usage for other uses	30.1318	29.0361	27.9404	26.8447	25.7490	24.6533	24.6533	25.7490	26.8447	27.9404	29.0361	30.1318	(42c)
Average daily hot water use (litres/day)												80.3487	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
87.2485	85.3046	83.0143	79.7161	76.9712	74.0468	73.0590	75.3409	77.7281	80.7806	84.1242	87.0554		(44)
Energy content (annual)	138.1803	121.4725	127.5899	109.1274	103.6180	91.0492	88.3585	93.2878	95.8465	109.6185	119.8503	136.3078	(45)
Distribution loss (46)m = 0.15 x (45)m	20.7270	18.2209	19.1385	16.3691	15.5427	13.6574	13.2538	13.9932	14.3770	16.4428	17.9775	20.4462	(46)
Water storage loss:													
Store volume													125.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													0.0130 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.0070 (55)
Total storage loss	0.2176	0.1966	0.2176	0.2106	0.2176	0.2106	0.2176	0.2176	0.2106	0.2176	0.2106	0.2176	(56)
If cylinder contains dedicated solar storage	0.2176	0.1966	0.2176	0.2106	0.2176	0.2106	0.2176	0.2176	0.2106	0.2176	0.2106	0.2176	(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	161.6603	142.6803	151.0699	131.8500	127.0981	113.7718	111.8386	116.7678	118.5691	133.0985	142.5729	159.7878	(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	161.6603	142.6803	151.0699	131.8500	127.0981	113.7718	111.8386	116.7678	118.5691	133.0985	142.5729	159.7878	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	64.7290	57.3558	61.2077	54.4629	53.2370	48.4519	48.1632	49.8022	50.0471	55.2322	58.0283	64.1063	(65)

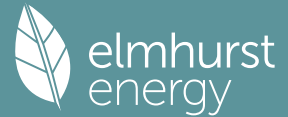
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	90.8218	90.8218	90.8218	90.8218	90.8218	90.8218	90.8218	90.8218	90.8218	90.8218	90.8218	90.8218	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.9746	14.1885	11.5389	8.7357	6.5300	5.5129	5.9569	7.7430	10.3926	13.1958	15.4015	16.4186	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	196.2345	198.2709	193.1394	182.2153	168.4255	155.4650	146.8066	144.7703	149.9017	160.8259	174.6157	187.5762	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.5959	45.5959	45.5959	45.5959	45.5959	45.5959	45.5959	45.5959	45.5959	45.5959	45.5959	45.5959	(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)	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	(71)
Water heating gains (Table 5)	87.0013	85.3509	82.2684	75.6430	71.5551	67.2943	64.7355	66.9384	69.5098	74.2368	80.5949	86.1644	(72)
Total internal gains	375.0803	373.6801	362.8165	342.4637	322.3804	304.1421	293.3689	295.3216	305.6740	324.1283	346.4819	366.0290	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	0.8300	11.2829	0.6300	0.7000	0.7700	2.8620 (75)
East	5.2500	19.6403	0.6300	0.7000	0.7700	31.5122 (76)
Southeast	0.8300	36.7938	0.6300	0.7000	0.7700	9.3331 (77)

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Solar gains	43.7073	83.3679	133.7677	192.2497	234.8125	240.4224	228.8444	196.8064	154.4140	97.8362	54.0720	36.2385 (83)
Total gains	418.7875	457.0480	496.5842	534.7134	557.1929	544.5644	522.2132	492.1280	460.0880	421.9646	400.5539	402.2675 (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	90.9846	91.3495	91.7100	93.4422	93.7736	95.3476	95.3476	95.6449	94.7351	93.7736	93.1056	92.4174
alpha	7.0656	7.0900	7.1140	7.2295	7.2516	7.3565	7.3565	7.3763	7.3157	7.2516	7.2070	7.1612
util living area	0.9935	0.9865	0.9631	0.8819	0.7170	0.5112	0.3677	0.4064	0.6479	0.9144	0.9846	0.9949 (86)
MIT	20.4540	20.5480	20.6965	20.8594	20.9379	20.9563	20.9576	20.9576	20.9502	20.8473	20.6281	20.4411 (87)
Th 2	20.0486	20.0521	20.0554	20.0713	20.0743	20.0882	20.0882	20.0908	20.0829	20.0743	20.0683	20.0620 (88)
util rest of house	0.9908	0.9812	0.9490	0.8446	0.6549	0.4394	0.2916	0.3263	0.5672	0.8773	0.9774	0.9928 (89)
MIT 2	19.4265	19.5475	19.7325	19.9307	20.0066	20.0334	20.0339	20.0366	20.0248	19.9257	19.6632	19.4216 (90)
Living area fraction	19.9546	20.0618	20.2280	20.4080	20.4853	20.5077	20.5087	20.5100	20.5004	20.3994	20.1592	19.9456 (91)
MIT	19.9546	20.0618	20.2280	20.4080	20.4853	20.5077	20.5087	20.5100	20.5004	20.3994	20.1592	19.9456 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9546	20.0618	20.2280	20.4080	20.4853	20.5077	20.5087	20.5100	20.5004	20.3994	20.1592	19.9456 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9905	0.9812	0.9520	0.8591	0.6832	0.4725	0.3267	0.3633	0.6046	0.8917	0.9782	0.9925 (94)
Useful gains	414.8090	448.4765	472.7290	459.3962	380.6552	257.3326	170.5954	178.7909	278.1706	376.2673	391.8334	399.2348 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	14.1000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	716.1378	690.8221	623.0368	512.6021	389.9402	257.8893	170.6261	178.8560	281.2032	434.9518	583.7972	709.1340 (97)
Space heating kWh	224.1886	162.8562	111.8290	38.3083	6.9080	0.0000	0.0000	0.0000	0.0000	43.6613	138.2139	230.5650 (98a)
Space heating requirement - total per year (kWh/year)												956.5304
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	224.1886	162.8562	111.8290	38.3083	6.9080	0.0000	0.0000	0.0000	0.0000	43.6613	138.2139	230.5650 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												956.5304
Space heating per m2										(98c) / (4) =		21.7839 (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 %)	249.9000 (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	224.1886	162.8562	111.8290	38.3083	6.9080	0.0000	0.0000	0.0000	0.0000	43.6613	138.2139	230.5650 (98)
Space heating efficiency (main heating system 1)	249.9000	249.9000	249.9000	249.9000	249.9000	0.0000	0.0000	0.0000	0.0000	249.9000	249.9000	249.9000 (210)
Space heating fuel (main heating system)	89.7113	65.1686	44.7495	15.3294	2.7643	0.0000	0.0000	0.0000	0.0000	17.4715	55.3077	92.2629 (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	161.6603 142.6803 151.0699 131.8500 127.0981 113.7718 111.8386 116.7678 118.5691 133.0985 142.5729 159.7878 (64)
Efficiency of water heater	175.1000 175.1000 175.1000 175.1000 175.1000 175.1000 175.1000 175.1000 175.1000 175.1000 175.1000 175.1000 (216)
Fuel for water heating, kWh/month	92.3246 81.4850 86.2764 75.2998 72.5860 64.9753 63.8713 66.6863 67.7151 76.0129 81.4237 91.2552 (219)
Space cooling fuel requirement	
(221)m	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (221)
Pumps and Fa	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (231)
Lighting	13.9825 11.2172 10.0999 7.3996 5.7157 4.6698 5.2140 6.7774 8.8032 11.5502 13.0460 14.3711 (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	382.7653 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	175.1000
Water heating fuel used	919.9115 (219)
Space cooling fuel	0.0000 (221)

Electricity for pumps and fans:

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Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	112.8465 (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	1415.5233 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	382.7653	14.0400	53.7402 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	919.9115	14.0400	129.1556 (247)
Energy for instantaneous electric shower(s)	0.0000	14.0400	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	112.8465	16.4900	18.6084 (250)
Additional standing charges			26.0000 (251)
Total energy cost			227.5042 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] = 0.9212 (257)$
SAP value	85.0678
SAP rating (Section 12)	85 (258)
SAP band	B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	382.7653	0.1573	60.2200 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	919.9115	0.1411	129.7602 (264)
Space and water heating			189.9802 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	112.8465	0.1443	16.2872 (268)
Total CO2, kg/year			206.2675 (272)
CO2 emissions per m2			4.7000 (273)
EI value			96.8913
EI rating			97 (274)
EI band			A

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

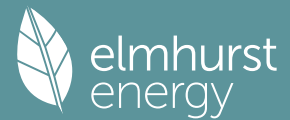
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	43.9100 (1b)	2.5000 (2b)	109.7750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.9100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	109.7750 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1822 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4322 (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) = 0.3998 (21)

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Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	4.6000	4.5000	4.6000	4.1000	4.3000	3.7000	3.6000	3.7000	3.7000	4.2000	4.1000	4.3000	(22)
Wind factor	1.1500	1.1250	1.1500	1.0250	1.0750	0.9250	0.9000	0.9250	0.9250	1.0500	1.0250	1.0750	(22a)
Adj infilt rate													
	0.4597	0.4497	0.4597	0.4098	0.4298	0.3698	0.3598	0.3698	0.3698	0.4198	0.4098	0.4298	(22b)
Effective ac	0.6057	0.6011	0.6057	0.5840	0.5923	0.5684	0.5647	0.5684	0.5684	0.5881	0.5840	0.5923	(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			6.9100	0.9615	6.6442			(27)
Heatloss Floor 1			43.9100	0.1200	5.2692	110.0000	4830.1000	(28a)
External Wall 1	42.2500	6.9100	35.3400	0.1800	6.3612	110.0000	3887.4000	(29a)
Balcony Roof	4.2000		4.2000	0.1100	0.4620	9.0000	37.8000	(30)
Total net area of external elements Aum(A, m2)			90.3600					(31)
Fabric heat loss, W/K = Sum (A x U)								(33)
Main dwelling								
Party Wall Between Flats			15.2800	0.0000	0.0000	180.0000	2750.4000	(32)
Party Wall Between Corridor			8.8300	0.0000	0.0000	180.0000	1589.4000	(32)
Party Ceiling 1			39.7100			30.0000	1191.3000	(32b)
Internal Wall 1			77.5000			9.0000	697.5000	(32c)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
(28)...(30) + (32) + (32a)...(32e) = 14983.9000 (34)
341.2412 (35)

List of Thermal Bridges	Length	Psi-value	Total	
K1 Element				
E1 Steel lintel with perforated steel base plate	3.9500	0.3050	1.2047	
E3 Sill	3.9500	0.0240	0.0948	
E4 Jamb	14.0000	0.0240	0.3360	
E5 Ground floor (normal)	16.9000	0.0410	0.6929	
E16 Corner (normal)	2.5000	0.0400	0.1000	
E7 Party floor between dwellings (in blocks of flats)	16.9000	0.0330	0.5577	
E18 Party wall between dwellings	2.5000	0.0300	0.0750	
P1 Party wall - Ground floor	3.5300	0.3200	1.1296	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	3.5300	0.0000	0.0000	

Thermal bridges (Sum(L x Psi) calculated using Appendix K)
(36a) = 0.0000
Point Thermal bridges
(33) + (36) + (36a) = 22.9274 (37)
Total fabric heat loss

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	21.9413	21.7766	21.9413	21.1542	21.4582	20.5898	20.4577	20.5898	20.5898	21.3044	21.1542	21.4582	(38)
Average = Sum(39)m / 12 =	44.8687	44.7040	44.8687	44.0816	44.3856	43.5171	43.3851	43.5171	43.5171	44.2318	44.0816	44.3856	(39)
													44.1287

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0218	1.0181	1.0218	1.0039	1.0108	0.9911	0.9880	0.9911	0.9911	1.0073	1.0039	1.0108	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

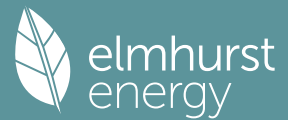
Assumed occupancy													1.5137 (42)
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	57.1167	56.2685	55.0739	52.8714	51.2222	49.3935	48.4057	49.5919	50.8834	52.8402	55.0881	56.9237	(42b)
Hot water usage for other uses													
	30.1318	29.0361	27.9404	26.8447	25.7490	24.6533	24.6533	25.7490	26.8447	27.9404	29.0361	30.1318	(42c)
Average daily hot water use (litres/day)													80.3487 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	87.2485	85.3046	83.0143	79.7161	76.9712	74.0468	73.0590	75.3409	77.7281	80.7806	84.1242	87.0554	(44)
Energy conte	138.1803	121.4725	127.5899	109.1274	103.6180	91.0492	88.3585	93.2878	95.8465	109.6185	119.8503	136.3078	(45)
Energy content (annual)													Total = Sum(45)m = 1334.3068
Distribution loss (46)m = 0.15 x (45)m													
	20.7270	18.2209	19.1385	16.3691	15.5427	13.6574	13.2538	13.9932	14.3770	16.4428	17.9775	20.4462	(46)
Water storage loss:													
Store volume													125.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													0.0130 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.0070 (55)
Total storage loss													
	0.2176	0.1966	0.2176	0.2106	0.2176	0.2106	0.2176	0.2176	0.2106	0.2176	0.2106	0.2176	(56)
If cylinder contains dedicated solar storage													
	0.2176	0.1966	0.2176	0.2106	0.2176	0.2106	0.2176	0.2176	0.2106	0.2176	0.2106	0.2176	(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													
	161.6603	142.6803	151.0699	131.8500	127.0981	113.7718	111.8386	116.7678	118.5691	133.0985	142.5729	159.7878	(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													
	161.6603	142.6803	151.0699	131.8500	127.0981	113.7718	111.8386	116.7678	118.5691	133.0985	142.5729	159.7878	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)
Heat gains from water heating, kWh/month													
	64.7290	57.3558	61.2077	54.4629	53.2370	48.4519	48.1632	49.8022	50.0471	55.2322	58.0283	64.1063	(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	
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(66)m	90.8218	90.8218	90.8218	90.8218	90.8218	90.8218	90.8218	90.8218	90.8218	90.8218	90.8218	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.9746	14.1885	11.5389	8.7357	6.5300	5.5129	5.9569	7.7430	10.3926	13.1958	15.4015	16.4186 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	196.2345	198.2709	193.1394	182.2153	168.4255	155.4650	146.8066	144.7703	149.9017	160.8259	174.6157	187.5762 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.5959	45.5959	45.5959	45.5959	45.5959	45.5959	45.5959	45.5959	45.5959	45.5959	45.5959	45.5959 (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)	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479 (71)
Water heating gains (Table 5)	87.0013	85.3509	82.2684	75.6430	71.5551	67.2943	64.7355	66.9384	69.5098	74.2368	80.5949	86.1644 (72)
Total internal gains	375.0803	373.6801	362.8165	342.4637	322.3804	304.1421	293.3689	295.3216	305.6740	324.1283	346.4819	366.0290 (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	Access factor Table 6d	Gains W	
Northeast				0.8300	9.5471	0.6300		0.7000		0.7700	2.4217 (75)	
East				5.2500	16.6187	0.6300		0.7000		0.7700	26.6642 (76)	
Southeast				0.8300	31.1332	0.6300		0.7000		0.7700	7.8972 (77)	
Solar gains	36.9831	74.1048	125.4072	183.2781	218.9137	228.4012	213.1038	180.5103	146.3576	90.4244	47.5178	32.7872 (83)
Total gains	412.0634	447.7849	488.2237	525.7418	541.2942	532.5433	506.4726	475.8319	452.0316	414.5527	393.9997	398.8162 (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	92.7640	93.1056	92.7640	94.4202	93.7736	95.6449	95.9361	95.6449	95.6449	94.0996	94.4202	93.7736
alpha	7.1843	7.2070	7.1843	7.2947	7.2516	7.3763	7.3957	7.3763	7.3763	7.2733	7.2947	7.2516
util living area	0.9926	0.9854	0.9611	0.8708	0.6946	0.4890	0.3682	0.4112	0.6530	0.9129	0.9827	0.9942 (86)
MIT	20.4967	20.5795	20.7137	20.8733	20.9423	20.9568	20.9578	20.9576	20.9504	20.8518	20.6557	20.4767 (87)
Th 2	20.0652	20.0683	20.0652	20.0801	20.0743	20.0908	20.0933	20.0908	20.0908	20.0772	20.0801	20.0743 (88)
util rest of house	0.9895	0.9796	0.9460	0.8306	0.6284	0.4156	0.2907	0.3283	0.5725	0.8746	0.9746	0.9918 (89)
MIT 2	19.4949	19.6012	19.7621	19.9537	20.0102	20.0363	20.0393	20.0366	20.0331	19.9334	19.7078	19.4775 (90)
Living area fraction	20.0098	20.1041	20.2512	20.4264	20.4893	20.5095	20.5114	20.5100	20.5046	20.4055	20.1950	0.5140 (91)
MIT	20.0098	20.1041	20.2512	20.4264	20.4893	20.5095	20.5114	20.5100	20.5046	20.4055	20.1950	19.9911 (92)
Temperature adjustment	20.0098	20.1041	20.2512	20.4264	20.4893	20.5095	20.5114	20.5100	20.5046	20.4055	20.1950	0.0000
adjusted MIT	20.0098	20.1041	20.2512	20.4264	20.4893	20.5095	20.5114	20.5100	20.5046	20.4055	20.1950	19.9911 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9893	0.9798	0.9494	0.8468	0.6588	0.4495	0.3264	0.3666	0.6098	0.8897	0.9758	0.9915 (94)
Ext temp.	4.8000	5.3000	6.8000	9.3000	12.3000	15.0000	16.7000	16.5000	14.1000	10.8000	7.5000	4.6000 (96)
Heat loss rate W	682.4440	661.8016	603.5378	490.4688	363.4874	239.7557	165.3594	174.5040	278.7100	424.8674	559.6176	683.1422 (97)
Space heating kWh	204.4547	149.8919	104.1613	32.6014	5.1407	0.0000	0.0000	0.0000	0.0000	41.7087	126.1105	214.0610 (98a)
Space heating requirement - total per year (kWh/year)												878.1302
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	204.4547	149.8919	104.1613	32.6014	5.1407	0.0000	0.0000	0.0000	0.0000	41.7087	126.1105	214.0610 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												878.1302
Space heating per m2										(98c) / (4) =		19.9984 (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 %)	249.9000 (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
204.4547	149.8919	104.1613	32.6014	5.1407	0.0000	0.0000	0.0000	0.0000	0.0000	41.7087	126.1105	214.0610 (98)
Space heating efficiency (main heating system 1)	249.9000	249.9000	249.9000	249.9000	249.9000	0.0000	0.0000	0.0000	0.0000	249.9000	249.9000	249.9000 (210)
Space heating fuel (main heating system)	81.8146	59.9808	41.6812	13.0458	2.0571	0.0000	0.0000	0.0000	0.0000	16.6902	50.4644	85.6587 (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	161.6603	142.6803	151.0699	131.8500	127.0981	113.7718	111.8386	116.7678	118.5691	133.0985	142.5729	159.7878 (64)
Water heating requirement	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000 (216)
Efficiency of water heater (217)m	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000 (217)
Fuel for water heating, kWh/month	92.3246	81.4850	86.2764	75.2998	72.5860	64.9753	63.8713	66.6863	67.7151	76.0129	81.4237	91.2552 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	13.9825	11.2172	10.0999	7.3996	5.7157	4.6698	5.2140	6.7774	8.8032	11.5502	13.0460	14.3711	(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												351.3927	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												175.1000	
Water heating fuel used												919.9115	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												112.8465	(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												1384.1507	(238)

10a. Fuel costs - using BEDF prices (572)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	351.3927	23.6600	83.1395 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	919.9115	23.6600	217.6511 (247)
Energy for instantaneous electric shower(s)	0.0000	23.6600	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	112.8465	26.0600	29.4078 (250)
Additional standing charges			114.0000 (251)
Total energy cost			444.1984 (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	351.3927	0.1574	55.2994 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	919.9115	0.1411	129.7602 (264)
Space and water heating			185.0596 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	112.8465	0.1443	16.2872 (268)
Total CO2, kg/year			201.3468 (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	351.3927	1.5826	556.1134 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	919.9115	1.5216	1399.7247 (278)
Space and water heating			1955.8381 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	112.8465	1.5338	173.0877 (282)
Total Primary energy kWh/year			2128.9258 (286)

SAP 10 EPC IMPROVEMENTS

As Designed

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

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

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

Typical annual savings Energy Environmental
efficiency impact

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Recommended measures
(none)

Total Savings £0 0.00 kg/m²

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

Fuel prices for cost data on this page from database revision number 572 TEST (30 May 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, North West England):

	Current £444	Potential £444	Saving £0
Electricity			
Space heating	£197	£197	£0
Water heating	£218	£218	£0
Lighting	£29	£29	£0
Total cost of fuels	£444	£444	£0
Total cost of uses	£444	£444	£0
Delivered energy	32 kWh/m²	32 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m²	5 kg/m²	5 kg/m²	0 kg/m²
Primary energy	48 kWh/m²	48 kWh/m²	0 kWh/m²

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

1. Overall dwelling characteristics

	Area (m²)	Storey height (m)	Volume (m³)
Main dwelling	43.9100 (1b)	2.5000 (2b)	109.7750 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.9100		109.7750 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 109.7750 (5)

2. Ventilation rate

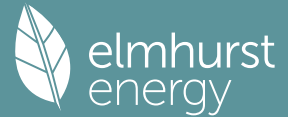
	m³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1822 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4322 (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) = 0.3998 (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	0.5097	0.4997	0.4897	0.4398	0.4298	0.3798	0.3798	0.3698	0.3998	0.4298	0.4497	0.4697 (22b)
Effective ac	0.6299	0.6249	0.6199	0.5967	0.5923	0.5721	0.5721	0.5684	0.5799	0.5923	0.6011	0.6103 (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			6.9100	0.9615	6.6442		(27)
Heatloss Floor 1			43.9100	0.1200	5.2692	110.0000	4830.1000 (28a)
External Wall 1	42.2500	6.9100	35.3400	0.1800	6.3612	110.0000	3887.4000 (29a)
Balcony Roof	4.2000		4.2000	0.1100	0.4620	9.0000	37.8000 (30)
Total net area of external elements Aum(A, m²)			90.3600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	18.7366		(33)
Main dwelling							
Party Wall Between Flats			15.2800	0.0000	0.0000	180.0000	2750.4000 (32)
Party Wall Between Corridor			8.8300	0.0000	0.0000	180.0000	1589.4000 (32)
Party Ceiling 1			39.7100			30.0000	1191.3000 (32b)
Internal Wall 1			77.5000			9.0000	697.5000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	14983.9000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K							341.2412 (35)
List of Thermal Bridges							
K1 Element					Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate					3.9500	0.3050	1.2047
E3 Sill					3.9500	0.0240	0.0948

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E4 Jamb	14.0000	0.0240	0.3360	
E5 Ground floor (normal)	16.9000	0.0410	0.6929	
E16 Corner (normal)	2.5000	0.0400	0.1000	
E7 Party floor between dwellings (in blocks of flats)	16.9000	0.0330	0.5577	
E18 Party wall between dwellings	2.5000	0.0300	0.0750	
P1 Party wall - Ground floor	3.5300	0.3200	1.1296	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	3.5300	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				4.1908 (36)
Point Thermal bridges				0.0000
Total fabric heat loss		(33) + (36) + (36a) =		22.9274 (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	22.8188	22.6360	22.4569	21.6156	21.4582	20.7255	20.7255	20.5898	21.0077	21.4582	21.7766	22.1095 (38)
Average = Sum(39)m / 12 =	45.7462	45.5634	45.3843	44.5430	44.3856	43.6528	43.6528	43.5171	43.9351	44.3856	44.7040	45.0369 (39)
												44.5422
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0418	1.0377	1.0336	1.0144	1.0108	0.9941	0.9941	0.9911	1.0006	1.0108	1.0181	1.0257 (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													1.5137 (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	57.1167	56.2685	55.0739	52.8714	51.2222	49.3935	48.4057	49.5919	50.8834	52.8402	55.0881	56.9237	(42b)
Hot water usage for other uses	30.1318	29.0361	27.9404	26.8447	25.7490	24.6533	24.6533	25.7490	26.8447	27.9404	29.0361	30.1318	(42c)
Average daily hot water use (litres/day)													80.3487 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	87.2485	85.3046	83.0143	79.7161	76.9712	74.0468	73.0590	75.3409	77.7281	80.7806	84.1242	87.0554	(44)
Energy content (annual)	138.1803	121.4725	127.5899	109.1274	103.6180	91.0492	88.3585	93.2878	95.8465	109.6185	119.8503	136.3078	(45)
Distribution loss (46)m = 0.15 x (45)m	20.7270	18.2209	19.1385	16.3691	15.5427	13.6574	13.2538	13.9932	14.3770	16.4428	17.9775	20.4462	(46)
Water storage loss:													
Store volume													125.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													0.0130 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.0070 (55)
Total storage loss	0.2176	0.1966	0.2176	0.2106	0.2176	0.2106	0.2176	0.2176	0.2106	0.2176	0.2106	0.2176	(56)
If cylinder contains dedicated solar storage	0.2176	0.1966	0.2176	0.2106	0.2176	0.2106	0.2176	0.2176	0.2106	0.2176	0.2106	0.2176	(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	161.6603	142.6803	151.0699	131.8500	127.0981	113.7718	111.8386	116.7678	118.5691	133.0985	142.5729	159.7878	(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	161.6603	142.6803	151.0699	131.8500	127.0981	113.7718	111.8386	116.7678	118.5691	133.0985	142.5729	159.7878	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Heat gains from water heating, kWh/month	64.7290	57.3558	61.2077	54.4629	53.2370	48.4519	48.1632	49.8022	50.0471	55.2322	58.0283	64.1063	(65)
Total per year (kWh/year) = Sum(64)m =													1610.7651 (64)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)

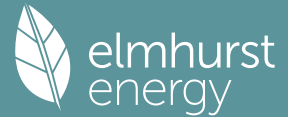
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	90.8218	90.8218	90.8218	90.8218	90.8218	90.8218	90.8218	90.8218	90.8218	90.8218	90.8218	90.8218	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.9746	14.1885	11.5389	8.7357	6.5300	5.5129	5.9569	7.7430	10.3926	13.1958	15.4015	16.4186	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	196.2345	198.2709	193.1394	182.2153	168.4255	155.4650	146.8066	144.7703	149.9017	160.8259	174.6157	187.5762	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.5959	45.5959	45.5959	45.5959	45.5959	45.5959	45.5959	45.5959	45.5959	45.5959	45.5959	45.5959	(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)	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	(71)
Water heating gains (Table 5)	87.0013	85.3509	82.2684	75.6430	71.5551	67.2943	64.7355	66.9384	69.5098	74.2368	80.5949	86.1644	(72)
Total internal gains	375.0803	373.6801	362.8165	342.4637	322.3804	304.1421	293.3689	295.3216	305.6740	324.1283	346.4819	366.0290	(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
Northeast				0.8300	11.2829		0.6300		0.7000		0.7700		2.8620 (75)
East				5.2500	19.6403		0.6300		0.7000		0.7700		31.5122 (76)
Southeast				0.8300	36.7938		0.6300		0.7000		0.7700		9.3331 (77)
Solar gains	43.7073	83.3679	133.7677	192.2497	234.8125	240.4224	228.8444	196.8064	154.4140	97.8362	54.0720		36.2385 (83)
Total gains	418.7875	457.0480	496.5842	534.7134	557.1929	544.5644	522.2132	492.1280	460.0880	421.9646	400.5539	402.2675	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	90.9846	91.3495	91.7100	93.4422	93.7736	95.3476	95.3476	95.6449	94.7351	93.7736	93.1056	92.4174
alpha	7.0656	7.0900	7.1140	7.2295	7.2516	7.3565	7.3565	7.3763	7.3157	7.2516	7.2070	7.1612
util living area	0.9935	0.9865	0.9631	0.8819	0.7170	0.5112	0.3677	0.4064	0.6479	0.9144	0.9846	0.9949 (86)
MIT	20.4540	20.5480	20.6965	20.8594	20.9379	20.9563	20.9576	20.9576	20.9502	20.8473	20.6281	20.4411 (87)
Th 2	20.0486	20.0521	20.0554	20.0713	20.0743	20.0882	20.0882	20.0908	20.0829	20.0743	20.0683	20.0620 (88)
util rest of house	0.9908	0.9812	0.9490	0.8446	0.6549	0.4394	0.2916	0.3263	0.5672	0.8773	0.9774	0.9928 (89)
MIT 2	19.4265	19.5475	19.7325	19.9307	20.0066	20.0334	20.0339	20.0366	20.0248	19.9257	19.6632	19.4216 (90)
Living area fraction	fLA = Living area / (4) =											0.5140 (91)
MIT	19.9546	20.0618	20.2280	20.4080	20.4853	20.5077	20.5087	20.5100	20.5004	20.3994	20.1592	19.9456 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9546	20.0618	20.2280	20.4080	20.4853	20.5077	20.5087	20.5100	20.5004	20.3994	20.1592	19.9456 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9905	0.9812	0.9520	0.8591	0.6832	0.4725	0.3267	0.3633	0.6046	0.8917	0.9782	0.9925 (94)
Useful gains	414.8090	448.4765	472.7290	459.3962	380.6552	257.3326	170.5954	178.7909	278.1706	376.2673	391.8334	399.2348 (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	716.1378	690.8221	623.0368	512.6021	389.9402	257.8893	170.6261	178.8560	281.2032	434.9518	583.7972	709.1340 (97)
Space heating kWh	224.1886	162.8562	111.8290	38.3083	6.9080	0.0000	0.0000	0.0000	0.0000	43.6613	138.2139	230.5650 (98a)
Space heating requirement - total per year (kWh/year)												956.5304
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	224.1886	162.8562	111.8290	38.3083	6.9080	0.0000	0.0000	0.0000	0.0000	43.6613	138.2139	230.5650 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												956.5304
Space heating per m2												(98c) / (4) = 21.7839 (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 %)													249.9000 (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	224.1886	162.8562	111.8290	38.3083	6.9080	0.0000	0.0000	0.0000	0.0000	43.6613	138.2139	230.5650 (98)	
Space heating efficiency (main heating system 1)	249.9000	249.9000	249.9000	249.9000	249.9000	0.0000	0.0000	0.0000	0.0000	249.9000	249.9000	249.9000 (210)	
Space heating fuel (main heating system)	89.7113	65.1686	44.7495	15.3294	2.7643	0.0000	0.0000	0.0000	0.0000	17.4715	55.3077	92.2629 (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	161.6603	142.6803	151.0699	131.8500	127.0981	113.7718	111.8386	116.7678	118.5691	133.0985	142.5729	159.7878 (64)	
Efficiency of water heater	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000 (216)	
Fuel for water heating, kWh/month	92.3246	81.4850	86.2764	75.2998	72.5860	64.9753	63.8713	66.6863	67.7151	76.0129	81.4237	91.2552 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)	
Lighting	13.9825	11.2172	10.0999	7.3996	5.7157	4.6698	5.2140	6.7774	8.8032	11.5502	13.0460	14.3711 (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												382.7653 (211)	
Space heating fuel - main system 2												0.0000 (213)	
Space heating fuel - secondary												0.0000 (215)	
Efficiency of water heater												175.1000	
Water heating fuel used												919.9115 (219)	
Space cooling fuel												0.0000 (221)	
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000 (231)	
Electricity for lighting (calculated in Appendix L)												112.8465 (232)	
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000 (233)	
Wind generation												0.0000 (234)	

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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	1415.5233 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	382.7653	14.0400	53.7402 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	919.9115	14.0400	129.1556 (247)
Energy for instantaneous electric shower(s)	0.0000	14.0400	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	112.8465	16.4900	18.6084 (250)
Additional standing charges			26.0000 (251)
Total energy cost			227.5042 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	0.9212 (257)
SAP value	85.0678
SAP rating (Section 12)	85 (258)
SAP band	B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	382.7653	0.1573	60.2200 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	919.9115	0.1411	129.7602 (264)
Space and water heating			189.9802 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	112.8465	0.1443	16.2872 (268)
Total CO2, kg/year			206.2675 (272)
CO2 emissions per m2			4.7000 (273)
EI value			96.8913
EI rating			97 (274)
EI band			A

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	43.9100 (1b)	x 2.5000 (2b)	= 109.7750 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.9100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	109.7750 (5)

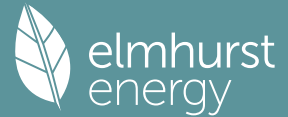
2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1822 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4322	(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) =		0.3998 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.6000	4.5000	4.6000	4.1000	4.3000	3.7000	3.6000	3.7000	3.7000	4.2000	4.1000	4.3000 (22)
Wind factor	1.1500	1.1250	1.1500	1.0250	1.0750	0.9250	0.9000	0.9250	0.9250	1.0500	1.0250	1.0750 (22a)
Adj infilt rate	0.4597	0.4497	0.4597	0.4098	0.4298	0.3698	0.3598	0.3698	0.3698	0.4198	0.4098	0.4298 (22b)

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Effective ac 0.6057 0.6011 0.6057 0.5840 0.5923 0.5684 0.5647 0.5684 0.5684 0.5881 0.5840 0.5923 (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			6.9100	0.9615	6.6442		(27)
Heatloss Floor 1			43.9100	0.1200	5.2692	110.0000	4830.1000 (28a)
External Wall 1	42.2500	6.9100	35.3400	0.1800	6.3612	110.0000	3887.4000 (29a)
Balcony Roof	4.2000		4.2000	0.1100	0.4620	9.0000	37.8000 (30)
Total net area of external elements Aum(A, m2)			90.3600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		18.7366		(33)
Main dwelling							
Party Wall Between Flats			15.2800	0.0000	0.0000	180.0000	2750.4000 (32)
Party Wall Between Corridor			8.8300	0.0000	0.0000	180.0000	1589.4000 (32)
Party Ceiling 1			39.7100			30.0000	1191.3000 (32b)
Internal Wall 1			77.5000			9.0000	697.5000 (32c)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
(28)...(30) + (32) + (32a)...(32e) = 14983.9000 (34)
341.2412 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	3.9500	0.3050	1.2047
E3 Sill	3.9500	0.0240	0.0948
E4 Jamb	14.0000	0.0240	0.3360
E5 Ground floor (normal)	16.9000	0.0410	0.6929
E6 Corner (normal)	2.5000	0.0400	0.1000
E7 Party floor between dwellings (in blocks of flats)	16.9000	0.0330	0.5577
E18 Party wall between dwellings	2.5000	0.0300	0.0750
P1 Party wall - Ground floor	3.5300	0.3200	1.1296
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	3.5300	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Point Thermal bridges
Total fabric heat loss
(33) + (36) + (36a) = 0.0000
22.9274 (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	21.9413	21.7766	21.9413	21.1542	21.4582	20.5898	20.4577	20.5898	20.5898	21.3044	21.1542	21.4582 (38)
Average = Sum(39)m / 12 =	44.8687	44.7040	44.8687	44.0816	44.3856	43.5171	43.3851	43.5171	43.5171	44.2318	44.0816	44.3856 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0218	1.0181	1.0218	1.0039	1.0108	0.9911	0.9880	0.9911	0.9911	1.0073	1.0039	1.0108 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

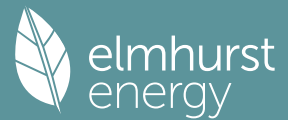
4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.5137 (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	57.1167	56.2685	55.0739	52.8714	51.2222	49.3935	48.4057	49.5919	50.8834	52.8402	55.0881	56.9237	(42b)
Hot water usage for other uses	30.1318	29.0361	27.9404	26.8447	25.7490	24.6533	24.6533	25.7490	26.8447	27.9404	29.0361	30.1318	(42c)
Average daily hot water use (litres/day)													80.3487 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	87.2485	85.3046	83.0143	79.7161	76.9712	74.0468	73.0590	75.3409	77.7281	80.7806	84.1242	87.0554	(44)
Energy content (annual)	138.1803	121.4725	127.5899	109.1274	103.6180	91.0492	88.3585	93.2878	95.8465	109.6185	119.8503	136.3078	(45)
Distribution loss (46)m = 0.15 x (45)m	20.7270	18.2209	19.1385	16.3691	15.5427	13.6574	13.2538	13.9932	14.3770	16.4428	17.9775	20.4462	(46)
Water storage loss:													
Store volume													125.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													0.0130 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.0070 (55)
Total storage loss	0.2176	0.1966	0.2176	0.2106	0.2176	0.2106	0.2176	0.2176	0.2106	0.2176	0.2106	0.2176	(56)
If cylinder contains dedicated solar storage	0.2176	0.1966	0.2176	0.2106	0.2176	0.2106	0.2176	0.2176	0.2106	0.2176	0.2106	0.2176	(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	161.6603	142.6803	151.0699	131.8500	127.0981	113.7718	111.8386	116.7678	118.5691	133.0985	142.5729	159.7878	(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	161.6603	142.6803	151.0699	131.8500	127.0981	113.7718	111.8386	116.7678	118.5691	133.0985	142.5729	159.7878	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Heat gains from water heating, kWh/month	64.7290	57.3558	61.2077	54.4629	53.2370	48.4519	48.1632	49.8022	50.0471	55.2322	58.0283	64.1063	(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	90.8218	90.8218	90.8218	90.8218	90.8218	90.8218	90.8218	90.8218	90.8218	90.8218	90.8218	90.8218 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.9746	14.1885	11.5389	8.7357	6.5300	5.5129	5.9569	7.7430	10.3926	13.1958	15.4015	16.4186 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	196.2345	198.2709	193.1394	182.2153	168.4255	155.4650	146.8066	144.7703	149.9017	160.8259	174.6157	187.5762 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												

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Pumps, fans	45.5959	45.5959	45.5959	45.5959	45.5959	45.5959	45.5959	45.5959	45.5959	45.5959	45.5959	45.5959 (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)
-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479	-60.5479 (71)
Water heating gains (Table 5)	87.0013	85.3509	82.2684	75.6430	71.5551	67.2943	64.7355	66.9384	69.5098	74.2368	80.5949	86.1644 (72)
Total internal gains	375.0803	373.6801	362.8165	342.4637	322.3804	304.1421	293.3689	295.3216	305.6740	324.1283	346.4819	366.0290 (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				
Northeast					0.8300	9.5471		0.6300	0.7000	0.7700		2.4217 (75)				
East					5.2500	16.6187		0.6300	0.7000	0.7700		26.6642 (76)				
Southeast					0.8300	31.1332		0.6300	0.7000	0.7700		7.8972 (77)				
Solar gains					36.9831	74.1048	125.4072	183.2781	218.9137	228.4012	213.1038	180.5103	146.3576	90.4244	47.5178	32.7872 (83)
Total gains					412.0634	447.7849	488.2237	525.7418	541.2942	532.5433	506.4726	475.8319	452.0316	414.5527	393.9997	398.8162 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	92.7640	93.1056	92.7640	94.4202	93.7736	95.6449	95.9361	95.6449	95.6449	94.0996	94.4202	93.7736
util living area	7.1843	7.2070	7.1843	7.2947	7.2516	7.3763	7.3957	7.3763	7.3763	7.2733	7.2947	7.2516
	0.9926	0.9854	0.9611	0.8708	0.6946	0.4890	0.3682	0.4112	0.6530	0.9129	0.9827	0.9942 (86)
MIT	20.4967	20.5795	20.7137	20.8733	20.9423	20.9568	20.9578	20.9576	20.9504	20.8518	20.6557	20.4767 (87)
Th 2	20.0652	20.0683	20.0652	20.0801	20.0743	20.0908	20.0933	20.0908	20.0908	20.0772	20.0801	20.0743 (88)
util rest of house	0.9895	0.9796	0.9460	0.8306	0.6284	0.4156	0.2907	0.3283	0.5725	0.8746	0.9746	0.9918 (89)
MIT 2	19.4949	19.6012	19.7621	19.9537	20.0102	20.0363	20.0393	20.0366	20.0331	19.9334	19.7078	19.4775 (90)
Living area fraction	20.0098	20.1041	20.2512	20.4264	20.4893	20.5095	20.5114	20.5100	20.5046	20.4055	20.1950	0.5140 (91)
MIT	20.0098	20.1041	20.2512	20.4264	20.4893	20.5095	20.5114	20.5100	20.5046	20.4055	20.1950	19.9911 (92)
Temperature adjustment	20.0098	20.1041	20.2512	20.4264	20.4893	20.5095	20.5114	20.5100	20.5046	20.4055	20.1950	0.0000
adjusted MIT	20.0098	20.1041	20.2512	20.4264	20.4893	20.5095	20.5114	20.5100	20.5046	20.4055	20.1950	19.9911 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9893	0.9798	0.9494	0.8468	0.6588	0.4495	0.3264	0.3666	0.6098	0.8897	0.9758	0.9915 (94)
Ext temp.	407.6392	438.7481	463.5360	445.1892	356.5779	239.3893	165.3311	174.4364	275.6388	368.8073	384.4641	395.4258 (95)
Heat loss rate W	4.8000	5.3000	6.8000	9.3000	12.3000	15.0000	16.7000	16.5000	14.1000	10.8000	7.5000	4.6000 (96)
Space heating kWh	682.4440	661.8016	603.5378	490.4688	363.4874	239.7557	165.3594	174.5040	278.7100	424.8674	559.6176	683.1422 (97)
Space heating requirement - total per year (kWh/year)	204.4547	149.8919	104.1613	32.6014	5.1407	0.0000	0.0000	0.0000	0.0000	41.7087	126.1105	214.0610 (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
Space heating kWh	204.4547	149.8919	104.1613	32.6014	5.1407	0.0000	0.0000	0.0000	0.0000	41.7087	126.1105	214.0610 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	204.4547	149.8919	104.1613	32.6014	5.1407	0.0000	0.0000	0.0000	0.0000	41.7087	126.1105	214.0610 (98c)
Space heating per m ²	(98c) / (4) =											19.9984 (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 %)											249.9000 (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	204.4547	149.8919	104.1613	32.6014	5.1407	0.0000	0.0000	0.0000	0.0000	41.7087	126.1105	214.0610 (98)
Space heating efficiency (main heating system 1)	249.9000	249.9000	249.9000	249.9000	249.9000	0.0000	0.0000	0.0000	0.0000	249.9000	249.9000	249.9000 (210)
Space heating fuel (main heating system)	81.8146	59.9808	41.6812	13.0458	2.0571	0.0000	0.0000	0.0000	0.0000	16.6902	50.4644	85.6587 (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	161.6603	142.6803	151.0699	131.8500	127.0981	113.7718	111.8386	116.7678	118.5691	133.0985	142.5729	159.7878 (64)
Water heating requirement	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000 (216)
Efficiency of water heater (217)m	92.3246	81.4850	86.2764	75.2998	72.5860	64.9753	63.8713	66.6863	67.7151	76.0129	81.4237	91.2552 (219)
Fuel for water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
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 (231)
Pumps and Fa	13.9825	11.2172	10.0999	7.3996	5.7157	4.6698	5.2140	6.7774	8.8032	11.5502	13.0460	14.3711 (232)
Lighting	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
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)												

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(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												351.3927	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												175.1000	
Water heating fuel used												919.9115	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												112.8465	(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												1384.1507	(238)

10a. Fuel costs - using BEDF prices (572)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	351.3927	23.6600	83.1395	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	919.9115	23.6600	217.6511	(247)
Energy for instantaneous electric shower(s)	0.0000	23.6600	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	112.8465	26.0600	29.4078	(250)
Additional standing charges			114.0000	(251)
Total energy cost			444.1984	(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	351.3927	0.1574	55.2994	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	919.9115	0.1411	129.7602	(264)
Space and water heating			185.0596	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	112.8465	0.1443	16.2872	(268)
Total CO2, kg/year			201.3468	(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	351.3927	1.5826	556.1134	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	919.9115	1.5216	1399.7247	(278)
Space and water heating			1955.8381	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	112.8465	1.5338	173.0877	(282)
Total Primary energy kWh/year			2128.9258	(286)

Thermal Bridging

Property Reference	Flat 3	Issued on Date	30/06/2025
Assessment Reference	As Designed	Prop Type Ref	Semi-Detached Flat
Property	Flat 3, Bury Old Road, Prestwich, Manchester, M25 3DE		

SAP Rating	85 B	DER	4.88	TER	14.21
Environmental	97 A	% DER < TER			65.66
CO ₂ Emissions (t/year)	0.2	DFEE	31.10	TFEE	35.17
Compliance Check	See BREL	% DFEE < TFEE			11.58
% DPER < TPER	31.22	DPER	51.48	TPER	74.85

Assessor Details	Mr. Nathaniel Kempson	Assessor ID	R421-0001
Client	Encon Associates, Glenn Miles		

	Junction details	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E1 Steel lintel with perforated steel base plate	Non Gov Approved Schemes	0.305	3.95	1.20	Knauf
External wall	E3 Sill	Non Gov Approved Schemes	0.024	3.95	0.09	Knauf
External wall	E4 Jamb	Non Gov Approved Schemes	0.024	14.00	0.34	Knauf
External wall	E5 Ground floor (normal)	Non Gov Approved Schemes	0.041	16.90	0.69	Knauf
External wall	E16 Corner (normal)	Non Gov Approved Schemes	0.040	2.50	0.10	Knauf
External wall	E7 Party floor between dwellings (in blocks of flats)	Non Gov Approved Schemes	0.033	16.90	0.56	Knauf
External wall	E18 Party wall between dwellings	Non Gov Approved Schemes	0.030	2.50	0.07	Knauf
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.320	3.53	1.13	
Party wall	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	0.000	3.53	0.00	

Total: 67.76 W/mK:
Y-Value: 0.05 W/m²K:

Building Regulations England Part L (BREL) Compliance Report

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

Date: Mon 30 Jun 2025 11:02:31

Project Information			
Assessed By	Nathaniel Kempson	Building Type	Flat, Semi-detached
OCDEA Registration	EES/020528	Assessment Date	2025-06-30

Dwelling Details			
Assessment Type	As designed	Total Floor Area	89 m ²
Site Reference	Flat 4	Plot Reference	As Designed
Address	Flat 4 Bury Old Road, Prestwich, M25 3DE		

Client Details	
Name	Glenn Miles
Company	Encon Associates Ltd
Address	10 Chapel Lane, Nottingham, NG5 7DR

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	9.84 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	4.49 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	51.29 kWh _{PE} /m ²		
Dwelling primary energy	47.24 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	30.9 kWh/m ²		
Dwelling fabric energy efficiency	30.0 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	0.18	Walls (1) (0.18)	OK
Party walls	0.2	0	Party Wall (1) (0)	N/A
Curtain walls	1.6	0	N/A	N/A
Floors	0.18	0.12	Heatloss Floor over void (0.12)	OK
Roofs	0.16	0.11	Roof (1) (0.11)	OK
Windows, doors, and roof windows	1.6	1	East Windows (1)	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)	60.64	0.18
Party wall: Party Wall (1)	39.73	0 (!)
Party floor: Heatloss Floor over void, Heatloss Floor over void	4.14	0.12
Exposed roof: Roof (1)	89.42	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]
East Windows, Windows	1.76	East	0.7	1 (!)
East Windows, Windows	1.76	East	0.7	1 (!)
West Windows, Windows	1.76	West	0.7	1 (!)
West Windows, Windows	4.4	West	0.7	1 (!)

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	E1: Steel lintel with perforated steel base plate	Not government-approved scheme	0.305	Knauf

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E3: Sill	Not government-approved scheme	0.024 (!)	Knauf
External wall	E4: Jamb	Not government-approved scheme	0.024 (!)	Knauf
External wall	E7: Party floor between dwellings (in blocks of flats)	Not government-approved scheme	0.033 (!)	Knauf
External wall	E16: Corner (normal)	Not government-approved scheme	0.04	Knauf
External wall	E18: Party wall between dwellings	Not government-approved scheme	0.03 (!)	Knauf
External wall	E17: Corner (inverted - internal area greater than external area)	Not government-approved scheme	-0.086	Knauf
External wall	E10: Eaves (insulation at ceiling level)	Not government-approved scheme	0.082	Knauf
External wall	E12: Gable (insulation at ceiling level)	Not government-approved scheme	0.046	Knauf
External wall	E8: Balcony within a dwelling - wall insulation continuous	SAP table default	0.1	
Party wall	P7: Exposed floor (normal)	SAP table default	0.48	
Party wall	P3: Intermediate floor between dwellings (in blocks of flats)	SAP table default	0 (!)	
Party wall	P4: Roof (insulation at ceiling level)	Not government-approved scheme	0.035 (!)	Knauf

3 Air permeability (better than typically expected values are flagged with a subsequent (!))			
Maximum permitted air permeability at 50Pa	8 m ³ /hm ²		
Dwelling air permeability at 50Pa	5 m ³ /hm ² , Design value		OK
Air permeability test certificate reference			

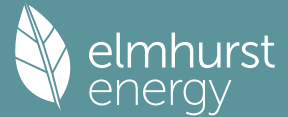
4 Space heating	
Main heating system 1: Heat pump with radiators or underfloor heating - Electricity	
Efficiency	249.9%
Emitter type	Underfloor
Flow temperature	35°C
System type	Air source heat pump
Manufacturer	TBC
Model	TBC
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water	
Cylinder/store - type: Cylinder	
Capacity	200 litres
Declared heat loss	0.009 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	95 lm/W	OK
External lights control	N/A	
8 Mechanical ventilation		
System type: N/A		
Maximum permitted specific fan power	N/A	
Specific fan power	N/A	N/A
Minimum permitted heat recovery efficiency	N/A	
Heat recovery efficiency	N/A	N/A
Manufacturer/Model		
Commissioning		
9 Local generation		
N/A		
10 Heat networks		
N/A		
11 Supporting documentary evidence		
N/A		
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 information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.		
Signed:	Assessor ID:	
Name:	Date:	
b. Client Declaration		
N/A		

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Property Reference	Flat 4			Issued on Date	30/06/2025
Assessment Reference	As Designed	Prop Type Ref			
Property	Flat 4, Bury Old Road, Prestwich, Manchester, M25 3DE				
SAP Rating	82 B	DER	4.49	TER	9.84
Environmental	96 A	% DER < TER			54.37
CO ₂ Emissions (t/year)	0.38	DFEE	30.01	TFEE	30.89
Compliance Check	See BREL	% DFEE < TFEE			2.82
% DPER < TPER	7.90	DPER	47.24	TPER	51.29
Assessor Details	Mr. Nathaniel Kempson			Assessor ID	R421-0001
Client	Encon Associates, Glenn Miles				

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	89.4200 (1b)	2.5000 (2b)	223.5500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.4200		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	223.5500 (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) = 0.1342 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3842 (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) = 0.3554 (21)

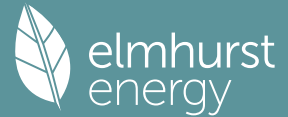
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4531	0.4442	0.4353	0.3909	0.3820	0.3376	0.3376	0.3287	0.3554	0.3820	0.3998	0.4176 (22b)
Effective ac	0.6027	0.5987	0.5948	0.5764	0.5730	0.5570	0.5570	0.5540	0.5631	0.5730	0.5799	0.5872 (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			9.6800	0.9615	9.3077		(27)
Heatloss Floor over void			4.1400	0.1200	0.4968	20.0000	82.8000 (28b)
External Wall 1	70.3250	9.6800	60.6450	0.1800	10.9161	110.0000	6670.9500 (29a)
Main Roof	89.4200		89.4200	0.1100	9.8362	9.0000	804.7800 (30)
Total net area of external elements Aum(A, m ²)			163.8850				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.5568		(33)
Main dwelling							
Party Wall Between Corridor			39.7300	0.0000	0.0000	180.0000	7151.4000 (32)
Party Floor 1			85.2800			30.0000	2558.4000 (32d)
Internal Wall 1			127.5300			9.0000	1147.7700 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	18416.1000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							205.9506 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	5.3000	0.3050	1.6165
E1 Steel lintel with perforated steel base plate	3.1000	0.0240	0.0744
E3 Sill	14.0000	0.0240	0.3360
E4 Jamb	28.1300	0.0330	0.9283
E7 Party floor between dwellings (in blocks of flats)	5.0000	0.0400	0.2000
E16 Corner (normal)			

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E18 Party wall between dwellings	7.5000	0.0300	0.2250
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0860	-0.2150
E10 Eaves (insulation at ceiling level)	13.0700	0.0820	1.0717
E12 Gable (insulation at ceiling level)	14.7100	0.0460	0.6767
E8 Balcony within a dwelling, wall insulation continuous	4.8800	0.1000	0.4880
P7 Party Wall - Exposed floor (normal)	4.4300	0.4800	2.1264
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.1900	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	11.1900	0.0350	0.3916
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			7.9196 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	38.4764 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 44.4588	Feb 44.1648	Mar 43.8765	Apr 42.5226	May 42.2693	Jun 41.0901	Jul 41.0901	Aug 40.8717	Sep 41.5443	Oct 42.2693	Nov 42.7818	Dec 43.3175 (38)
Heat transfer coeff	82.9353	82.6412	82.3529	80.9991	80.7457	79.5665	79.5665	79.3482	80.0208	80.7457	81.2582	81.7939 (39)
Average = Sum(39)m / 12 =												80.9978
HLP	Jan 0.9275	Feb 0.9242	Mar 0.9210	Apr 0.9058	May 0.9030	Jun 0.8898	Jul 0.8898	Aug 0.8874	Sep 0.8949	Oct 0.9030	Nov 0.9087	Dec 0.9147 (40)
HLP (average)												0.9058
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

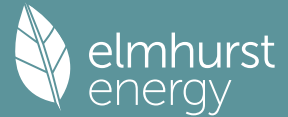
4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.6177 (42)
Hot water usage for mixer showers												
93.6512	92.2438	90.1929	86.2690	83.3732	80.1439	78.3084	80.3437	82.5748	86.0421	90.0503	93.2924 (42a)	
Hot water usage for baths												
29.4127	28.9759	28.3608	27.2266	26.3773	25.4356	24.9269	25.5378	26.2028	27.2105	28.3681	29.3133 (42b)	
Hot water usage for other uses												
41.4378	39.9310	38.4242	36.9174	35.4105	33.9037	33.9037	35.4105	36.9174	38.4242	39.9310	41.4378 (42c)	
Average daily hot water use (litres/day)												151.2843 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
164.5018	161.1507	156.9779	150.4129	145.1611	139.4832	137.1390	141.2920	145.6950	151.6768	158.3494	164.0435 (44)	
Energy content	260.5306	229.4765	241.2692	205.9078	195.4147	171.5109	165.8577	174.9490	179.6565	205.8240	225.5977	256.8525 (45)
Energy content (annual)	Total = Sum(45)m =											2512.8469
Distribution loss (46)m = 0.15 x (45)m												
39.0796	34.4215	36.1904	30.8862	29.3122	25.7266	24.8787	26.2423	26.9485	30.8736	33.8397	38.5279 (46)	
Water storage loss:												
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.0090 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.0049 (55)
Total storage loss												
0.1507	0.1361	0.1507	0.1458	0.1507	0.1458	0.1507	0.1507	0.1458	0.1507	0.1458	0.1507 (56)	
If cylinder contains dedicated solar storage												
0.1507	0.1361	0.1507	0.1458	0.1507	0.1458	0.1507	0.1507	0.1458	0.1507	0.1458	0.1507 (57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)	
Total heat required for water heating calculated for each month												
283.9436	250.6237	264.6822	228.5656	218.8277	194.1687	189.2708	198.3620	202.3143	229.2370	248.2555	280.2655 (62)	
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)	
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)	
Output from w/h	283.9436	250.6237	264.6822	228.5656	218.8277	194.1687	189.2708	198.3620	202.3143	229.2370	248.2555 (64)	
Total per year (kWh/year)												2788.5168 (64)
Electric shower(s)	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											2789 (64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)	
Heat gains from water heating, kWh/month												0.0000 (64a)
105.3569	93.2187	98.9524	86.5906	83.7058	75.1536	73.8781	76.9010	77.8620	87.1669	93.1375	104.1339 (65)	

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	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	136.2931	150.8960	136.2931	140.8362	136.2931	140.8362	136.2931	136.2931	140.8362	136.2931	140.8362	136.2931 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	238.0066	240.4764	234.2527	221.0031	204.2779	188.5585	178.0571	175.5873	181.8110	195.0606	211.7858	227.5052 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885 (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)	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079 (71)
Water heating gains (Table 5)	141.6087	138.7184	133.0006	120.2647	112.5078	104.3800	99.2986	103.3615	108.1417	117.1598	129.3576	139.9649 (72)
Total internal gains	578.1739	592.3562	565.8119	544.3695	515.3443	496.0403	475.9142	477.5074	493.0544	510.7790	544.2451	566.0287 (73)

6. Solar gains												
[Jan]												
	Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	
East	3.5200		19.6403		0.6300		0.7000		0.7700		21.1282 (76)	
West	6.1600		19.6403		0.6300		0.7000		0.7700		36.9743 (80)	
Solar gains	58.1025	113.6607	187.1830	272.9953	334.5660	342.4878	326.0624	280.0828	217.7016	134.8680	72.4469	47.7806 (83)
Total gains	636.2764	706.0169	752.9949	817.3648	849.9103	838.5281	801.9766	757.5902	710.7560	645.6471	616.6921	613.8093 (84)

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7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.6816	61.9011	62.1178	63.1561	63.3542	64.2931	64.2931	64.4701	63.9282	63.3542	62.9547	62.5423	21.0000 (85)
alpha	5.1121	5.1267	5.1412	5.2104	5.2236	5.2862	5.2862	5.2980	5.2619	5.2236	5.1970	5.1695	
util living area	0.9898	0.9814	0.9633	0.9047	0.7832	0.5894	0.4334	0.4765	0.7190	0.9273	0.9800	0.9914	(86)
MIT	20.1115	20.2400	20.4251	20.6754	20.8467	20.9248	20.9386	20.9371	20.8957	20.6750	20.3623	20.0984	(87)
Th 2	20.1442	20.1470	20.1497	20.1625	20.1650	20.1762	20.1762	20.1783	20.1718	20.1650	20.1601	20.1550	(88)
util rest of house	0.9872	0.9768	0.9540	0.8813	0.7363	0.5203	0.3538	0.3940	0.6514	0.9043	0.9742	0.9892	(89)
MIT 2	19.1016	19.2665	19.5008	19.8150	20.0071	20.0905	20.0998	20.1013	20.0638	19.8222	19.4331	19.0936	(90)
Living area fraction									fLA = Living area / (4) =				0.4516 (91)
MIT	19.5576	19.7061	19.9182	20.2035	20.3863	20.4673	20.4786	20.4787	20.4395	20.2073	19.8527	19.5473	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5576	19.7061	19.9182	20.2035	20.3863	20.4673	20.4786	20.4787	20.4395	20.2073	19.8527	19.5473	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9850	0.9739	0.9510	0.8826	0.7494	0.5453	0.3833	0.4245	0.6743	0.9056	0.9716	0.9872	(94)
Useful gains	626.7193	687.5675	716.1099	721.3805	636.9409	457.2353	307.3859	321.5810	479.2772	584.6984	599.1624	605.9478	(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	1265.3946	1223.5948	1105.0294	915.5754	701.3784	466.8369	308.6077	323.6377	507.2914	775.7489	1036.2618	1255.3197	(97)
Space heating kWh	475.1745	360.2103	289.3561	139.8204	47.9415	0.0000	0.0000	0.0000	0.0000	142.1416	314.7116	483.1327	(98a)
Space heating requirement - total per year (kWh/year)												2252.4886	
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	475.1745	360.2103	289.3561	139.8204	47.9415	0.0000	0.0000	0.0000	0.0000	142.1416	314.7116	483.1327	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2252.4886	
Space heating per m2										(98c) / (4) =		25.1900	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)

Fraction of space heat from main system(s)

Efficiency of main space heating system 1 (in %)

Efficiency of main space heating system 2 (in %)

Efficiency of secondary/supplementary heating system, %

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	475.1745	360.2103	289.3561	139.8204	47.9415	0.0000	0.0000	0.0000	0.0000	142.1416	314.7116	483.1327	(98)
Space heating efficiency (main heating system 1)	249.9000	249.9000	249.9000	249.9000	249.9000	0.0000	0.0000	0.0000	0.0000	249.9000	249.9000	249.9000	(210)
Space heating fuel (main heating system)	190.1458	144.1418	115.7888	55.9505	19.1843	0.0000	0.0000	0.0000	0.0000	56.8794	125.9350	193.3304	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	283.9436	250.6237	264.6822	228.5656	218.8277	194.1687	189.2708	198.3620	202.3143	229.2370	248.2555	280.2655	(64)
Efficiency of water heater (217)m	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	(216)
Fuel for water heating, kWh/month	162.1608	143.1318	151.1606	130.5343	124.9730	110.8902	108.0930	113.2850	115.5421	130.9178	141.7793	160.0603	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	30.5179	24.4826	22.0439	16.1503	12.4749	10.1921	11.3801	14.7922	19.2136	25.2093	28.4739	31.3661	(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												901.3560	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												175.1000	
Water heating fuel used												1592.5281	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												246.2970	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(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	2740.1811 (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	901.3560	0.1560	140.5700 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1592.5281	0.1413	225.0162 (264)
Space and water heating			365.5863 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	246.2970	0.1443	35.5483 (268)
Total CO2, kg/year			401.1345 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.4900 (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	901.3560	1.5774	1421.7749 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1592.5281	1.5225	2424.5880 (278)
Space and water heating			3846.3629 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	246.2970	1.5338	377.7786 (282)
Total Primary energy kWh/year			4224.1414 (286)
Dwelling Primary energy Rate (DPER)			47.2400 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	89.4200 (1b)	x 2.5000 (2b)	= 223.5500 (1b) - (3b)
Ground floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.4200		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 223.5500 (5)

2. Ventilation rate

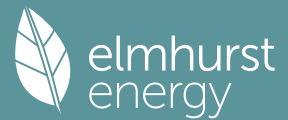
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) = 0.1342 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3842 (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) = 0.3554 (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	0.4531	0.4442	0.4353	0.3909	0.3820	0.3376	0.3376	0.3287	0.3554	0.3820	0.3998	0.4176 (22b)
Effective ac	0.6027	0.5987	0.5948	0.5764	0.5730	0.5570	0.5570	0.5540	0.5631	0.5730	0.5799	0.5872 (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			9.6800	1.1450	11.0840		(27)
Heatloss Floor over void			4.1400	0.1300	0.5382		(28b)
External Wall 1	70.3250	9.6800	60.6450	0.1800	10.9161		(29a)
Main Roof	89.4200		89.4200	0.1100	9.8362		(30)

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Total net area of external elements Aum(A, m2)	163.8850			(31)
Fabric heat loss, W/K = Sum (A x U)	(26) ... (30) + (32) =	32.3745		(33)
Main dwelling				
Party Wall Between Corridor	39.7300	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 205.9506 (35)

List of Thermal Bridges				
K1 Element	Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate	5.3000	0.0500	0.2650	
E3 Sill	3.1000	0.0500	0.1550	
E4 Jamb	14.0000	0.0500	0.7000	
E7 Party floor between dwellings (in blocks of flats)	28.1300	0.0700	1.9691	
E16 Corner (normal)	5.0000	0.0900	0.4500	
E18 Party wall between dwellings	7.5000	0.0600	0.4500	
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250	
E10 Eaves (insulation at ceiling level)	13.0700	0.0600	0.7842	
E12 Gable (insulation at ceiling level)	14.7100	0.0600	0.8826	
E8 Balcony within a dwelling, wall insulation continuous	4.8800	0.0000	0.0000	
P7 Party Wall - Exposed floor (normal)	4.4300	0.1600	0.7088	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.1900	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	11.1900	0.1200	1.3428	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.4825 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 39.8570 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	44.4588	44.1648	43.8765	42.5226	42.2693	41.0901	41.0901	40.8717	41.5443	42.2693	42.7818	43.3175
Average = Sum(39)m / 12 =	84.3158	84.0217	83.7335	82.3796	82.1263	80.9471	80.9471	80.7287	81.4013	82.1263	82.6387	83.1745

Days in mont	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9429	0.9396	0.9364	0.9213	0.9184	0.9052	0.9052	0.9028	0.9103	0.9184	0.9242	0.9302
HLP (average)												0.9213
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

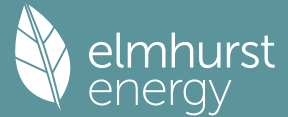
Assumed occupancy												2.6177
Hot water usage for mixer showers												67.8490
Hot water usage for baths												29.3133
Hot water usage for other uses												41.4378
Average daily hot water use (litres/day)												127.7361
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	138.9605	135.9933	132.3798	126.8850	122.4229	117.6258	115.7822	119.3801	123.1746	128.2108	133.7902	138.6001
Energy content (annual)	220.0795	193.6527	203.4628	173.6992	164.8048	144.6346	140.0285	147.8174	151.8866	173.9808	190.6087	217.0143
Distribution loss (46)m = 0.15 x (45)m	33.0119	29.0479	30.5194	26.0549	24.7207	21.6952	21.0043	22.1726	22.7830	26.0971	28.5913	32.5521
Water storage loss:												
Store volume												200.0000
a) If manufacturer declared loss factor is known (kWh/day):												1.6525
Temperature factor from Table 2b												0.5400
Enter (49) or (54) in (55)												0.8924
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
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
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
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
Total heat required for water heating calculated for each month	271.0056	239.6504	254.3889	222.9825	215.7308	193.9179	190.9546	198.7435	201.1699	224.9069	239.8920	267.9404
WWHRS	-31.1370	-27.5378	-28.8360	-23.8774	-22.2529	-19.0419	-17.8488	-18.9804	-19.7015	-23.2259	-26.3121	-30.5604
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
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
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
Output from w/h	239.8685	212.1126	225.5529	199.1052	193.4780	174.8760	173.1058	179.7631	181.4684	201.6810	213.5798	237.3800
12Total per year (kWh/year)												2431.9711
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
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000
Heat gains from water heating, kWh/month	113.9173	101.1877	108.3923	97.1816	95.5384	87.5176	87.3003	89.8902	89.9289	98.5895	102.8040	112.8981

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	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	136.2931	150.8960	136.2931	140.8362	136.2931	140.8362	136.2931	136.2931	140.8362	136.2931	140.8362	136.2931
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	238.0066	240.4764	234.2527	221.0031	204.2779	188.5585	178.0571	175.5873	181.8110	195.0606	211.7858	227.5052
Pumps, fans	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885
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	3.0000	3.0000	3.0000
Water heating gains (Table 5)	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079
Total internal gains	153.1146	150.5769	145.6885	134.9745	128.4119	121.5523	117.3391	120.8201	124.9013	132.5127	142.7834	151.7448
	592.6799	607.2148	581.4998	562.0793	534.2484	513.2125	493.9548	494.9660	509.8140	529.1319	560.6709	580.8085

6. Solar gains

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[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
East				3.5200	19.6403	0.6300		0.7000		0.7700		21.1282 (76)
West				6.1600	19.6403	0.6300		0.7000		0.7700		36.9743 (80)

Solar gains	58.1025	113.6607	187.1830	272.9953	334.5660	342.4878	326.0624	280.0828	217.7016	134.8680	72.4469	47.7806 (83)
Total gains	650.7823	720.8755	768.6828	835.0746	868.8144	855.7004	820.0172	775.0488	727.5156	664.0000	633.1178	628.5892 (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	60.6717	60.8840	61.0936	62.0977	62.2892	63.1966	63.1966	63.3676	62.8440	62.2892	61.9030	61.5043
alpha	5.0448	5.0589	5.0729	5.1398	5.1526	5.2131	5.2131	5.2245	5.1896	5.1526	5.1269	5.1003
util living area	0.9889	0.9802	0.9615	0.9014	0.7791	0.5872	0.4311	0.4737	0.7145	0.9228	0.9783	0.9906 (86)
MIT	19.8864	20.0581	20.3070	20.6428	20.8728	20.9770	20.9961	20.9939	20.9386	20.6465	20.2258	19.8684 (87)
Th 2	20.1312	20.1339	20.1367	20.1495	20.1519	20.1630	20.1630	20.1651	20.1587	20.1519	20.1470	20.1419 (88)
util rest of house	0.9862	0.9753	0.9517	0.8774	0.7314	0.5173	0.3507	0.3904	0.6460	0.8986	0.9720	0.9882 (89)
MIT 2	18.8358	19.0548	19.3687	19.7851	20.0417	20.1486	20.1615	20.1625	20.1150	19.7989	19.2784	18.8208 (90)
Living area fraction	fLA = Living area / (4) = 0.4516 (91)											
MIT	19.3102	19.5079	19.7924	20.1724	20.4170	20.5227	20.5384	20.5379	20.4869	20.1817	19.7062	19.2939 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.3102	19.5079	19.7924	20.1724	20.4170	20.5227	20.5384	20.5379	20.4869	20.1817	19.7062	19.2939 (93)

8. Space heating requirement												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9827	0.9709	0.9471	0.8781	0.7472	0.5479	0.3870	0.4280	0.6739	0.8996	0.9680	0.9851 (94)
Useful gains	639.5489	699.8921	728.0195	733.3079	649.1402	468.8504	317.3845	331.6957	490.2510	597.3139	612.8292	619.2370 (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	1265.5982	1227.3815	1113.0224	928.6172	715.8947	479.4265	318.8036	334.0484	519.9023	786.9063	1041.7586	1255.4264 (97)
Space heating kWh	465.7807	354.4729	286.4421	140.6227	49.6653	0.0000	0.0000	0.0000	0.0000	141.0567	308.8291	473.3249 (98a)
Space heating requirement - total per year (kWh/year)	2220.1944											
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	465.7807	354.4729	286.4421	140.6227	49.6653	0.0000	0.0000	0.0000	0.0000	141.0567	308.8291	473.3249 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2220.1944											
Space heating per m2	(98c) / (4) = 24.8288 (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	465.7807	354.4729	286.4421	140.6227	49.6653	0.0000	0.0000	0.0000	0.0000	141.0567	308.8291	473.3249 (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)	504.6378	384.0443	310.3382	152.3539	53.8086	0.0000	0.0000	0.0000	0.0000	152.8242	334.5928	512.8114 (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	239.8685	212.1126	225.5529	199.1052	193.4780	174.8760	173.1058	179.7631	181.4684	201.6810	213.5798	237.3800 (64)
Efficiency of water heater (217)m	85.5213	85.2026	84.5968	83.2944	81.4870	79.8000	79.8000	79.8000	79.8000	83.2735	84.8860	79.8000 (216)
Fuel for water heating, kWh/month	280.4781	248.9509	266.6209	239.0380	237.4342	219.1428	216.9245	225.2671	227.4040	242.1910	251.6080	277.3897 (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	28.3190	22.7186	20.4556	14.9866	11.5761	9.4578	10.5601	13.7264	17.8293	23.3929	26.4223	29.1061 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-41.4041	-58.1363	-83.2068	-93.1125	-100.0029	-93.1739	-92.0222	-87.0897	-78.2943	-66.2940	-45.4377	-35.8240 (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	-24.0601	-50.5557	-100.3899	-150.6478	-199.0777	-200.0044	-197.6489	-167.3898	-122.7480	-72.2478	-32.1054	-19.0298 (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												

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Space heating fuel - main system 1	2405.4111	(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	2932.4492	(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)	228.5507	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2209.9038	(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	3442.5072	(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	2405.4111	0.2100	505.1363	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2932.4492	0.2100	615.8143	(264)
Space and water heating			1120.9507	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	228.5507	0.1443	32.9869	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-873.9985	0.1347	-117.7145	
PV Unit electricity exported	-1335.9052	0.1259	-168.2183	
Total			-285.9328	(269)
Total CO2, kg/year			879.9341	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.8400	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2405.4111	1.1300	2718.1145	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2932.4492	1.1300	3313.6676	(278)
Space and water heating			6031.7821	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	228.5507	1.5338	350.5587	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-873.9985	1.4978	-1309.0563	
PV Unit electricity exported	-1335.9052	0.4622	-617.4781	
Total			-1926.5344	(283)
Total Primary energy kWh/year			4585.9072	(286)
Target Primary Energy Rate (TPER)			51.2900	(287)

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

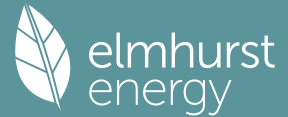
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling	89.4200	2.5000	223.5500	(1b) - (3b)
Ground floor				
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	89.4200			(4)
Dwelling volume				(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	Air changes per hour	
Pressure test	30.0000 / (5) =	0.1342 (8)
Pressure Test Method	Yes	
Measured/design AP50	Blower Door	
Infiltration rate	5.0000	(17)
Number of sides sheltered	0.3842	(18)
	1	(19)

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Shelter factor (20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3554 (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	0.4531	0.4442	0.4353	0.3909	0.3820	0.3376	0.3376	0.3287	0.3554	0.3820	0.3998	0.4176	(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	0.6027	0.5987	0.5948	0.5764	0.5730	0.5570	0.5570	0.5540	0.5631	0.5730	0.5799	0.5872	(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			9.6800	0.9615	9.3077			(27)
Heatloss Floor over void			4.1400	0.1200	0.4968	20.0000	82.8000	(28b)
External Wall 1	70.3250	9.6800	60.6450	0.1800	10.9161	110.0000	6670.9500	(29a)
Main Roof	89.4200		89.4200	0.1100	9.8362	9.0000	804.7800	(30)
Total net area of external elements Aum(A, m2)			163.8850					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	30.5568		(33)
Main dwelling								
Party Wall Between Corridor			39.7300	0.0000	0.0000	180.0000	7151.4000	(32)
Party Floor 1			85.2800			30.0000	2558.4000	(32d)
Internal Wall 1			127.5300			9.0000	1147.7700	(32c)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K (28)...(30) + (32) + (32a)...(32e) = 18416.1000 (34)
List of Thermal Bridges 205.9506 (35)

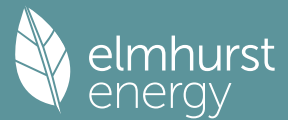
	Length	Psi-value	Total	
K1 Element				
E1 Steel lintel with perforated steel base plate	5.3000	0.3050	1.6165	
E3 Sill	3.1000	0.0240	0.0744	
E4 Jamb	14.0000	0.0240	0.3360	
E7 Party floor between dwellings (in blocks of flats)	28.1300	0.0330	0.9283	
E16 Corner (normal)	5.0000	0.0400	0.2000	
E18 Party wall between dwellings	7.5000	0.0300	0.2250	
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0860	-0.2150	
E10 Eaves (insulation at ceiling level)	13.0700	0.0820	1.0717	
E12 Gable (insulation at ceiling level)	14.7100	0.0460	0.6767	
E8 Balcony within a dwelling, wall insulation continuous	4.8800	0.1000	0.4880	
P7 Party Wall - Exposed floor (normal)	4.4300	0.4800	2.1264	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.1900	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	11.1900	0.0350	0.3916	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			7.9196	(36)
Point Thermal bridges			0.0000	(36a) =
Total fabric heat loss			38.4764	(33) + (36) + (36a) =

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	44.4588	44.1648	43.8765	42.5226	42.2693	41.0901	41.0901	40.8717	41.5443	42.2693	42.7818	43.3175	(38)
Heat transfer coeff	82.9353	82.6412	82.3529	80.9991	80.7457	79.5665	79.5665	79.3482	80.0208	80.7457	81.2582	81.7939	(39)
Average = Sum(39)m / 12 =												80.9978	
HLP	0.9275	0.9242	0.9210	0.9058	0.9030	0.8898	0.8898	0.8874	0.8949	0.9030	0.9087	0.9147	(40)
HLP (average)												0.9058	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6177	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	29.4127	28.9759	28.3608	27.2266	26.3773	25.4356	24.9269	25.5378	26.2028	27.2105	28.3681	29.3133	29.3133	(42b)
Hot water usage for other uses	41.4378	39.9310	38.4242	36.9174	35.4105	33.9037	33.9037	35.4105	36.9174	38.4242	39.9310	41.4378	41.4378	(42c)
Average daily hot water use (litres/day)													64.9410	(43)
Daily hot water use	70.8506	68.9069	66.7850	64.1439	61.7878	59.3393	58.8306	60.9483	63.1202	65.6347	68.2991	70.7511	70.7511	(44)
Energy conte	112.2100	98.1225	102.6460	87.8098	83.1783	72.9646	71.1505	75.4667	77.8335	89.0657	97.3046	110.7792	110.7792	(45)
Energy content (annual)										Total = Sum(45)m =			1078.5314	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:														
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	95.3785	83.4042	87.2491	74.6384	70.7015	62.0199	60.4780	64.1467	66.1585	75.7058	82.7089	94.1623	94.1623	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	95.3785	83.4042	87.2491	74.6384	70.7015	62.0199	60.4780	64.1467	66.1585	75.7058	82.7089	94.1623	94.1623	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =			916.7517	(64)
Electric shower(s)	54.5447	48.5998	53.0691	50.6432	51.5935	49.2152	50.8557	51.5935	50.6432	53.0691	52.0712	54.5447	54.5447	(64a)
Heat gains from water heating, kWh/month	37.4808	33.0010	35.0796	31.3204	30.5738	27.8088	27.8334	28.9351	29.2004	32.1937	33.6950	37.1768	37.1768	(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	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	136.2931	150.8960	136.2931	140.8362	136.2931	140.8362	136.2931	136.2931	140.8362	136.2931	140.8362	136.2931 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	238.0066	240.4764	234.2527	221.0031	204.2779	188.5585	178.0571	175.5873	181.8110	195.0606	211.7858	227.5052 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885 (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)	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079 (71)
Water heating gains (Table 5)	50.3774	49.1086	47.1499	43.5005	41.0938	38.6233	37.4105	38.8912	40.5561	43.2711	46.7986	49.9688 (72)
Total internal gains	486.6427	502.7464	479.9612	467.6053	443.9303	430.2835	414.0262	413.0371	425.4689	436.8903	461.6862	476.0325 (73)

6. Solar gains

[Jan]	Area m ²		Solar flux Table 6a W/m ²		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
East	3.5200		19.6403		0.6300		0.7000		0.7700		21.1282 (76)	
West	6.1600		19.6403		0.6300		0.7000		0.7700		36.9743 (80)	
Solar gains	58.1025	113.6607	187.1830	272.9953	334.5660	342.4878	326.0624	280.0828	217.7016	134.8680	72.4469	47.7806 (83)
Total gains	545.0451	616.4072	667.1442	740.6006	778.4962	772.7714	740.0885	693.1199	643.1705	571.7584	534.1331	523.8131 (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	61.6816	61.9011	62.1178	63.1561	63.3542	64.2931	64.2931	64.4701	63.9282	63.3542	62.9547	62.5423
alpha	5.1121	5.1267	5.1412	5.2104	5.2236	5.2862	5.2862	5.2980	5.2619	5.2236	5.1970	5.1695
util living area	0.9948	0.9895	0.9772	0.9312	0.8238	0.6322	0.4682	0.5181	0.7700	0.9528	0.9891	0.9958 (86)
MIT	19.7681	19.9460	20.2064	20.5734	20.8389	20.9696	20.9948	20.9913	20.9162	20.5665	20.1177	19.7503 (87)
Th 2	20.1442	20.1470	20.1497	20.1625	20.1650	20.1762	20.1762	20.1783	20.1718	20.1650	20.1601	20.1550 (88)
util rest of house	0.9935	0.9868	0.9710	0.9125	0.7802	0.5607	0.3830	0.4296	0.7044	0.9362	0.9858	0.9946 (89)
MIT 2	19.0150	19.1936	19.4525	19.8153	20.0531	20.1609	20.1745	20.1753	20.1235	19.8166	19.3753	19.0058 (90)
Living area fraction	19.3551	19.5334	19.7930	20.1576	20.4079	20.5261	20.5449	20.5438	20.4815	20.1552	19.7105	19.3420 (92)
MIT	19.3551	19.5334	19.7930	20.1576	20.4079	20.5261	20.5449	20.5438	20.4815	20.1552	19.7105	19.3420 (93)
Temperature adjustment												0.0000
adjusted MIT	19.3551	19.5334	19.7930	20.1576	20.4079	20.5261	20.5449	20.5438	20.4815	20.1552	19.7105	19.3420 (93)

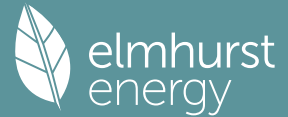
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9918	0.9843	0.9678	0.9124	0.7937	0.5919	0.4215	0.4695	0.7304	0.9360	0.9835	0.9932 (94)
Useful gains	540.5809	606.7042	645.6951	675.7233	617.9293	457.3875	311.9341	325.4467	469.7610	535.1436	525.3227	520.2603 (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	1248.5988	1209.3201	1094.7157	911.8573	703.1294	471.5164	313.8835	328.8018	510.6516	771.5441	1024.7081	1238.5252 (97)
Space heating kWh	526.7653	404.9579	334.0713	170.0165	63.3889	0.0000	0.0000	0.0000	0.0000	175.8819	359.5575	534.3891 (98a)
Space heating requirement - total per year (kWh/year)												2569.0283
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	526.7653	404.9579	334.0713	170.0165	63.3889	0.0000	0.0000	0.0000	0.0000	175.8819	359.5575	534.3891 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2569.0283
Space heating per m ²												28.7299 (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	747.9255	588.7924	603.0461	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8846	0.9396	0.9176	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	661.6246	553.2565	553.3820	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	837.9674	802.8425	750.7582	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	126.9668	185.6920	146.8478	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	31.7417	46.4230	36.7120	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												114.8767 (107)
Energy for space heating												28.7299 (99)
Energy for space cooling												1.2847 (108)
Total												30.0146 (109)
Fabric Energy Efficiency (DFEE)												30.0 (109)

Full SAP Calculation Printout



SAP 10 WORKSHEET FOR New Build (As Designed) (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	89.4200 (1b)	x 2.5000 (2b)	= 223.5500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 223.5500 (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) = 0.1342 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3842 (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) = 0.3554 (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	0.4531	0.4442	0.4353	0.3909	0.3820	0.3376	0.3376	0.3287	0.3554	0.3820	0.3998	0.4176 (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	0.6027	0.5987	0.5948	0.5764	0.5730	0.5570	0.5570	0.5540	0.5631	0.5730	0.5799	0.5872 (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 Opening Type			9.6800	1.1450	11.0840		(27)
Heatloss Floor over void			4.1400	0.1300	0.5382		(28b)
External Wall 1	70.3250	9.6800	60.6450	0.1800	10.9161		(29a)
Main Roof	89.4200		89.4200	0.1100	9.8362		(30)
Total net area of external elements Aum (A, m ²)			163.8850				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.3745		(33)
Main dwelling							
Party Wall Between Corridor			39.7300	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							205.9506 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate				5.3000	0.0500	0.2650	
E3 Sill				3.1000	0.0500	0.1550	
E4 Jamb				14.0000	0.0500	0.7000	
E7 Party floor between dwellings (in blocks of flats)				28.1300	0.0700	1.9691	
E16 Corner (normal)				5.0000	0.0900	0.4500	
E18 Party wall between dwellings				7.5000	0.0600	0.4500	
E17 Corner (inverted - internal area greater than external area)				2.5000	-0.0900	-0.2250	
E10 Eaves (insulation at ceiling level)				13.0700	0.0600	0.7842	
E12 Gable (insulation at ceiling level)				14.7100	0.0600	0.8826	
E8 Balcony within a dwelling, wall insulation continuous				4.8800	0.0000	0.0000	
P7 Party Wall - Exposed floor (normal)				4.4300	0.1600	0.7088	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				11.1900	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)				11.1900	0.1200	1.3428	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.4825 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	39.8570 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	44.4588	44.1648	43.8765	42.5226	42.2693	41.0901	41.0901	40.8717	41.5443	42.2693	42.7818	43.3175 (38)
Heat transfer coeff	84.3158	84.0217	83.7335	82.3796	82.1263	80.9471	80.9471	80.7287	81.4013	82.1263	82.6387	83.1745 (39)
Average = Sum(39)m / 12 =												82.3784
HLP	0.9429	0.9396	0.9364	0.9213	0.9184	0.9052	0.9052	0.9028	0.9103	0.9184	0.9242	0.9302 (40)
HLP (average)												0.9213
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

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

6. Solar gains

7. Mean internal temperature (heating season)

8. Space heating requirement

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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 (96)
Heat loss rate W	1266.4448	1226.6540	1110.4386	925.2688	713.7314	478.9020	318.7058	333.8765	518.4115	782.7896	1039.6036	1256.5085 (97)
Space heating kWh	540.0258	416.5261	345.4649	178.4481	68.2097	0.0000	0.0000	0.0000	0.0000	183.5780	370.1967	547.7589 (98a)
Space heating requirement - total per year (kWh/year)												2650.2081
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	540.0258	416.5261	345.4649	178.4481	68.2097	0.0000	0.0000	0.0000	0.0000	183.5780	370.1967	547.7589 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2650.2081
Space heating per m2												29.6378 (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	760.9025	599.0084	613.5382	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8766	0.9342	0.9110	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	667.0390	559.5828	558.9258	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	837.9674	802.8425	750.7582	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	123.0684	180.9853	142.7233	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	30.7671	45.2463	35.6808	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												111.6942 (107)
Energy for space heating												29.6378 (99)
Energy for space cooling												1.2491 (108)
Total												30.8869 (109)
Fabric Energy Efficiency (TFEE)												30.9 (109)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	89.4200 (1b)	x 2.5000 (2b)	= 223.5500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	223.5500 (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) = 0.1342 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3842 (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) = 0.3554 (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	0.4531	0.4442	0.4353	0.3909	0.3820	0.3376	0.3376	0.3287	0.3554	0.3820	0.3998	0.4176 (22b)
Effective ac	0.6027	0.5987	0.5948	0.5764	0.5730	0.5570	0.5570	0.5540	0.5631	0.5730	0.5799	0.5872 (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			9.6800	0.9615	9.3077		(27)
Heatloss Floor over void			4.1400	0.1200	0.4968	20.0000	82.8000 (28b)
External Wall 1	70.3250	9.6800	60.6450	0.1800	10.9161	110.0000	6670.9500 (29a)
Main Roof	89.4200		89.4200	0.1100	9.8362	9.0000	804.7800 (30)

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Total net area of external elements Aum(A, m2)	163.8850												(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...	(30)	+	(32)	=	30.5568							(33)
Main dwelling													
Party Wall Between Corridor	39.7300	0.0000		0.0000		180.0000	7151.4000						(32)
Party Floor 1	85.2800					30.0000	2558.4000						(32d)
Internal Wall 1	127.5300					9.0000	1147.7700						(32c)
Heat capacity Cm = Sum(A x k)						(28)...	(30)	+	(32)	+	(32a)...	(32e)	= 18416.1000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K													205.9506 (35)
List of Thermal Bridges													
K1 Element						Length	Psi-value		Total				
E1 Steel lintel with perforated steel base plate						5.3000	0.3050		1.6165				
E3 Sill						3.1000	0.0240		0.0744				
E4 Jamb						14.0000	0.0240		0.3360				
E7 Party floor between dwellings (in blocks of flats)						28.1300	0.0330		0.9283				
E16 Corner (normal)						5.0000	0.0400		0.2000				
E18 Party wall between dwellings						7.5000	0.0300		0.2250				
E17 Corner (inverted - internal area greater than external area)						2.5000	-0.0860		-0.2150				
E10 Eaves (insulation at ceiling level)						13.0700	0.0820		1.0717				
E12 Gable (insulation at ceiling level)						14.7100	0.0460		0.6767				
E8 Balcony within a dwelling, wall insulation continuous						4.8800	0.1000		0.4880				
P7 Party Wall - Exposed floor (normal)						4.4300	0.4800		2.1264				
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)						11.1900	0.0000		0.0000				
P4 Party wall - Roof (insulation at ceiling level)						11.1900	0.0350		0.3916				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												7.9196 (36)	
Point Thermal bridges												(36a) =	0.0000
Total fabric heat loss												(33) + (36) + (36a) =	38.4764 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	44.4588	44.1648	43.8765	42.5226	42.2693	41.0901	41.0901	40.8717	41.5443	42.2693	42.7818	43.3175	(38)
Average = Sum(39)m / 12 =	82.9353	82.6412	82.3529	80.9991	80.7457	79.5665	79.5665	79.3482	80.0208	80.7457	81.2582	81.7939	(39)
												80.9978	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9275	0.9242	0.9210	0.9058	0.9030	0.8898	0.8898	0.8874	0.8949	0.9030	0.9087	0.9147	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

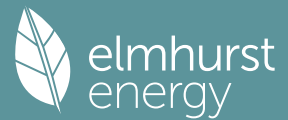
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6177 (42)
Hot water usage for mixer showers													
	93.6512	92.2438	90.1929	86.2690	83.3732	80.1439	78.3084	80.3437	82.5748	86.0421	90.0503	93.2924	(42a)
Hot water usage for baths													
	29.4127	28.9759	28.3608	27.2266	26.3773	25.4356	24.9269	25.5378	26.2028	27.2105	28.3681	29.3133	(42b)
Hot water usage for other uses													
	41.4378	39.9310	38.4242	36.9174	35.4105	33.9037	33.9037	35.4105	36.9174	38.4242	39.9310	41.4378	(42c)
Average daily hot water use (litres/day)													151.2843 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	164.5018	161.1507	156.9779	150.4129	145.1611	139.4832	137.1390	141.2920	145.6950	151.6768	158.3494	164.0435	(44)
Energy conte	260.5306	229.4765	241.2692	205.9078	195.4147	171.5109	165.8577	174.9490	179.6565	205.8240	225.5977	256.8525	(45)
Energy content (annual)										Total = Sum(45)m =		2512.8469	
Distribution loss (46)m = 0.15 x (45)m													
	39.0796	34.4215	36.1904	30.8862	29.3122	25.7266	24.8787	26.2423	26.9485	30.8736	33.8397	38.5279	(46)
Water storage loss:													
Store volume													200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													0.0090 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.0049 (55)
Total storage loss													
	0.1507	0.1361	0.1507	0.1458	0.1507	0.1458	0.1507	0.1507	0.1458	0.1507	0.1458	0.1507	(56)
If cylinder contains dedicated solar storage													
	0.1507	0.1361	0.1507	0.1458	0.1507	0.1458	0.1507	0.1507	0.1458	0.1507	0.1458	0.1507	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	283.9436	250.6237	264.6822	228.5656	218.8277	194.1687	189.2708	198.3620	202.3143	229.2370	248.2555	280.2655	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	283.9436	250.6237	264.6822	228.5656	218.8277	194.1687	189.2708	198.3620	202.3143	229.2370	248.2555	280.2655	(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													
	105.3569	93.2187	98.9524	86.5906	83.7058	75.1536	73.8781	76.9010	77.8620	87.1669	93.1375	104.1339	(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	
	157.0619	157.0619	157.0619	157.0619	157.0619	157.0619	157.0619	157.0619	157.0619	157.0619	157.0619	157.0619	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	34.8659	30.9676	25.1845	19.0663	14.2523	12.0324	13.0014	16.8997	22.6828	28.8010	33.6150	35.8349	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	355.2338	358.9200	349.6309	329.8554	304.8924	281.4307	265.7568	262.0706	271.3597	291.1352	316.0982	339.5599	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.3239	53.3239	53.3239	53.3239	53.3239	53.3239	53.3239	53.3239	53.3239	53.3239	53.3239	53.3239	(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)													
	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	(71)
Water heating gains (Table 5)													
	141.6087	138.7184	133.0006	120.2647	112.5078	104.3800	99.2986	103.3615	108.1417	117.1598	129.3576	139.9649	(72)
Total internal gains													
	637.3862	634.2838	613.4938	574.8642	537.3303	503.5209	483.7346	488.0097	507.8621	542.7739	584.7487	621.0376	(73)

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6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
East				3.5200	19.6403	0.6300	0.7000	0.7700	21.1282 (76)			
West				6.1600	19.6403	0.6300	0.7000	0.7700	36.9743 (80)			
Solar gains	58.1025	113.6607	187.1830	272.9953	334.5660	342.4878	326.0624	280.0828	217.7016	134.8680	72.4469	47.7806 (83)
Total gains	695.4887	747.9445	800.6769	847.8595	871.8963	846.0087	809.7970	768.0925	725.5637	677.6419	657.1956	668.8182 (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	61.6816	61.9011	62.1178	63.1561	63.3542	64.2931	64.2931	64.4701	63.9282	63.3542	62.9547	62.5423
alpha	5.1121	5.1267	5.1412	5.2104	5.2236	5.2862	5.2862	5.2980	5.2619	5.2236	5.1970	5.1695
util living area	0.9851	0.9765	0.9538	0.8932	0.7708	0.5848	0.4294	0.4703	0.7082	0.9146	0.9740	0.9874 (86)
MIT	20.1721	20.2811	20.4672	20.6951	20.8537	20.9254	20.9387	20.9373	20.8988	20.6982	20.4017	20.1554 (87)
Th 2	20.1442	20.1470	20.1497	20.1625	20.1650	20.1762	20.1762	20.1783	20.1718	20.1650	20.1601	20.1550 (88)
util rest of house	0.9814	0.9708	0.9426	0.8680	0.7231	0.5161	0.3505	0.3887	0.6405	0.8888	0.9667	0.9844 (89)
MIT 2	19.1781	19.3178	19.5520	19.8371	20.0138	20.0909	20.0999	20.1014	20.0663	19.8484	19.4820	19.1659 (90)
Living area fraction									fLA = Living area / (4) =			0.4516 (91)
MIT	19.6270	19.7528	19.9653	20.2245	20.3931	20.4677	20.4787	20.4789	20.4422	20.2321	19.8973	19.6127 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6270	19.7528	19.9653	20.2245	20.3931	20.4677	20.4787	20.4789	20.4422	20.2321	19.8973	19.6127 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9787	0.9676	0.9397	0.8701	0.7368	0.5409	0.3797	0.4189	0.6636	0.8912	0.9640	0.9819 (94)
Useful gains	680.6842	723.7280	752.4342	737.7141	642.4066	457.6209	307.4464	321.7210	481.4779	603.8884	633.5422	656.7239 (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	1271.1492	1227.4548	1108.9062	917.2761	701.9275	466.8749	308.6141	323.6522	507.5096	777.7514	1039.8840	1260.6674 (97)
Space heating kWh	439.3059	338.5044	265.2152	129.2847	44.2835	0.0000	0.0000	0.0000	0.0000	129.3541	292.5661	449.3340 (98a)
Space heating requirement - total per year (kWh/year)												2087.8478
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	439.3059	338.5044	265.2152	129.2847	44.2835	0.0000	0.0000	0.0000	0.0000	129.3541	292.5661	449.3340 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2087.8478
Space heating per m2										(98c) / (4) =		23.3488 (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 %)												249.9000 (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	439.3059	338.5044	265.2152	129.2847	44.2835	0.0000	0.0000	0.0000	0.0000	129.3541	292.5661	449.3340 (98)
Space heating efficiency (main heating system 1)	249.9000	249.9000	249.9000	249.9000	249.9000	0.0000	0.0000	0.0000	0.0000	249.9000	249.9000	249.9000 (210)
Space heating fuel (main heating system)	175.7927	135.4559	106.1285	51.7346	17.7205	0.0000	0.0000	0.0000	0.0000	51.7623	117.0733	179.8055 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	283.9436	250.6237	264.6822	228.5656	218.8277	194.1687	189.2708	198.3620	202.3143	229.2370	248.2555	280.2655 (64)
Efficiency of water heater (217)m	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000 (216)
Fuel for water heating, kWh/month	162.1608	143.1318	151.1606	130.5343	124.9730	110.8902	108.0930	113.2850	115.5421	130.9178	141.7793	160.0603 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	30.5179	24.4826	22.0439	16.1503	12.4749	10.1921	11.3801	14.7922	19.2136	25.2093	28.4739	31.3661 (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)												

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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	0.0000	(235d)
Annual totals kWh/year														
Space heating fuel - main system 1													835.4733	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													175.1000	
Water heating fuel used													1592.5281	(219)
Space cooling fuel													0.0000	(221)
Electricity for pumps and fans:														
Total electricity for the above, kWh/year													0.0000	(231)
Electricity for lighting (calculated in Appendix L)													246.2970	(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													2674.2984	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	835.4733	14.0400	117.3005	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1592.5281	14.0400	223.5909	(247)
Energy for instantaneous electric shower(s)	0.0000	14.0400	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	246.2970	16.4900	40.6144	(250)
Additional standing charges			26.0000	(251)
Total energy cost			407.5058	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.0914	(257)
SAP value		82.3089	
SAP rating (Section 12)		82	(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	835.4733	0.1560	130.3280	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1592.5281	0.1413	225.0162	(264)
Space and water heating			355.3442	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	246.2970	0.1443	35.5483	(268)
Total CO2, kg/year			390.8925	(272)
CO2 emissions per m2			4.3700	(273)
EI value			96.1033	
EI rating			96	(274)
EI band			A	

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

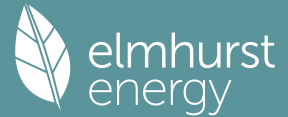
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling	89.4200	2.5000	223.5500	(1b) - (3b)
Ground floor				(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.4200			
Dwelling volume			223.5500	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Air changes per hour		

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Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 30.0000 / (5) = 0.1342 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 5.0000 (17)
Infiltration rate 0.3842 (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) = 0.3554 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	4.6000	4.5000	4.6000	4.1000	4.3000	3.7000	3.6000	3.7000	3.7000	4.2000	4.1000	4.3000	(22)
Wind factor	1.1500	1.1250	1.1500	1.0250	1.0750	0.9250	0.9000	0.9250	0.9250	1.0500	1.0250	1.0750	(22a)
Adj infiltr rate													
	0.4087	0.3998	0.4087	0.3643	0.3820	0.3287	0.3198	0.3287	0.3287	0.3732	0.3643	0.3820	(22b)
Effective ac	0.5835	0.5799	0.5835	0.5663	0.5730	0.5540	0.5512	0.5540	0.5540	0.5696	0.5663	0.5730	(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			9.6800	0.9615	9.3077			(27)
Heatloss Floor over void			4.1400	0.1200	0.4968	20.0000	82.8000	(28b)
External Wall 1	70.3250	9.6800	60.6450	0.1800	10.9161	110.0000	6670.9500	(29a)
Main Roof	89.4200		89.4200	0.1100	9.8362	9.0000	804.7800	(30)
Total net area of external elements Aum(A, m2)			163.8850					(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		30.5568			(33)
Main dwelling								
Party Wall Between Corridor			39.7300	0.0000	0.0000	180.0000	7151.4000	(32)
Party Floor 1			85.2800			30.0000	2558.4000	(32d)
Internal Wall 1			127.5300			9.0000	1147.7700	(32c)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K (28)...(30) + (32) + (32a)...(32e) = 18416.1000 (34)
List of Thermal Bridges 205.9506 (35)

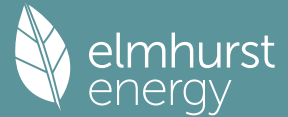
K1 Element	Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate	5.3000	0.3050	1.6165	
E3 Sill	3.1000	0.0240	0.0744	
E4 Jamb	14.0000	0.0240	0.3360	
E7 Party floor between dwellings (in blocks of flats)	28.1300	0.0330	0.9283	
E16 Corner (normal)	5.0000	0.0400	0.2000	
E18 Party wall between dwellings	7.5000	0.0300	0.2250	
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0860	-0.2150	
E10 Eaves (insulation at ceiling level)	13.0700	0.0820	1.0717	
E12 Gable (insulation at ceiling level)	14.7100	0.0460	0.6767	
E8 Balcony within a dwelling, wall insulation continuous	4.8800	0.1000	0.4880	
P7 Party Wall - Exposed floor (normal)	4.4300	0.4800	2.1264	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.1900	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	11.1900	0.0350	0.3916	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			7.9196	(36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	38.4764 (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	
	43.0467	42.7818	43.0467	41.7802	42.2693	40.8717	40.6592	40.8717	40.8717	42.0218	41.7802	42.2693	(38)
Heat transfer coeff	81.5231	81.2582	81.5231	80.2566	80.7457	79.3482	79.1356	79.3482	79.3482	80.4983	80.2566	80.7457	(39)
Average = Sum(39)m / 12 =												80.3323	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9117	0.9087	0.9117	0.8975	0.9030	0.8874	0.8850	0.8874	0.8874	0.9002	0.8975	0.9030	(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													2.6177 (42)
Hot water usage for mixer showers													
	93.6512	92.2438	90.1929	86.2690	83.3732	80.1439	78.3084	80.3437	82.5748	86.0421	90.0503	93.2924	(42a)
Hot water usage for baths													
	29.4127	28.9759	28.3608	27.2266	26.3773	25.4356	24.9269	25.5378	26.2028	27.2105	28.3681	29.3133	(42b)
Hot water usage for other uses													
	41.4378	39.9310	38.4242	36.9174	35.4105	33.9037	33.9037	35.4105	36.9174	38.4242	39.9310	41.4378	(42c)
Average daily hot water use (litres/day)												151.2843	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	164.5018	161.1507	156.9779	150.4129	145.1611	139.4832	137.1390	141.2920	145.6950	151.6768	158.3494	164.0435	(44)
Energy conte	260.5306	229.4765	241.2692	205.9078	195.4147	171.5109	165.8577	174.9490	179.6565	205.8240	225.5977	256.8525	(45)
Energy content (annual)										Total = Sum(45)m =		2512.8469	
Distribution loss (46)m = 0.15 x (45)m													
	39.0796	34.4215	36.1904	30.8862	29.3122	25.7266	24.8787	26.2423	26.9485	30.8736	33.8397	38.5279	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.0090	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.0049	(55)
Total storage loss													
	0.1507	0.1361	0.1507	0.1458	0.1507	0.1458	0.1507	0.1507	0.1458	0.1507	0.1458	0.1507	(56)
If cylinder contains dedicated solar storage													
	0.1507	0.1361	0.1507	0.1458	0.1507	0.1458	0.1507	0.1507	0.1458	0.1507	0.1458	0.1507	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	283.9436	250.6237	264.6822	228.5656	218.8277	194.1687	189.2708	198.3620	202.3143	229.2370	248.2555	280.2655	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	283.9436	250.6237	264.6822	228.5656	218.8277	194.1687	189.2708	198.3620	202.3143	229.2370	248.2555	280.2655	(64)
Total per year (kWh/year) = Sum(64)m =												2788.5168	(64)

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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	105.3569	93.2187	98.9524	86.5906	83.7058	75.1536	73.8781	76.9010	77.8620	87.1669	93.1375	104.1339 (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	157.0619	157.0619	157.0619	157.0619	157.0619	157.0619	157.0619	157.0619	157.0619	157.0619	157.0619	157.0619	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.8659	30.9676	25.1845	19.0663	14.2523	12.0324	13.0014	16.8997	22.6828	28.8010	33.6150	35.8349	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	355.2338	358.9200	349.6309	329.8554	304.8924	281.4307	265.7568	262.0706	271.3597	291.1352	316.0982	339.5599	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.3239	53.3239	53.3239	53.3239	53.3239	53.3239	53.3239	53.3239	53.3239	53.3239	53.3239	53.3239	(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)	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	(71)
Water heating gains (Table 5)	141.6087	138.7184	133.0006	120.2647	112.5078	104.3800	99.2986	103.3615	108.1417	117.1598	129.3576	139.9649	(72)
Total internal gains	637.3862	634.2838	613.4938	574.8642	537.3303	503.5209	483.7346	488.0097	507.8621	542.7739	584.7487	621.0376	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W	
East					3.5200	16.6187	0.6300	0.7000			0.7700	17.8777 (76)	
West					6.1600	16.6187	0.6300	0.7000			0.7700	31.2859 (80)	

Solar gains	49.1636	101.0318	175.4841	260.2555	311.9131	325.3634	303.6348	256.8912	206.3433	124.6508	63.6655	43.2301 (83)	
Total gains	686.5498	735.3156	788.9779	835.1197	849.2434	828.8843	787.3694	744.9009	714.2053	667.4247	648.4142	664.2677 (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	62.7501	62.9547	62.7501	63.7404	63.3542	64.4701	64.6432	64.4701	64.4701	63.5490	63.7404	63.3542	
alpha	5.1833	5.1970	5.1833	5.2494	5.2236	5.2980	5.3095	5.2980	5.2980	5.2366	5.2494	5.2236	
util living area	0.9835	0.9750	0.9519	0.8849	0.7506	0.5610	0.4293	0.4742	0.7127	0.9128	0.9717	0.9862	(86)
MIT	20.2302	20.3252	20.4929	20.7202	20.8690	20.9292	20.9391	20.9373	20.8989	20.7072	20.4406	20.2032	(87)
Th 2	20.1576	20.1601	20.1576	20.1696	20.1650	20.1783	20.1803	20.1783	20.1783	20.1673	20.1696	20.1650	(88)
util rest of house	0.9794	0.9689	0.9400	0.8577	0.6984	0.4896	0.3489	0.3901	0.6454	0.8862	0.9637	0.9828	(89)
MIT 2	19.2627	19.3842	19.5906	19.8729	20.0295	20.0959	20.1044	20.1014	20.0728	19.8613	19.5388	19.2346	(90)
Living area fraction	19.6996	19.8092	19.9980	20.2555	20.4086	20.4722	20.4813	20.4789	20.4459	20.2433	19.9460	19.6720	(91)
MIT	19.6996	19.8092	19.9980	20.2555	20.4086	20.4722	20.4813	20.4789	20.4459	20.2433	19.9460	19.6720	(92)
Temperature adjustment	19.6996	19.8092	19.9980	20.2555	20.4086	20.4722	20.4813	20.4789	20.4459	20.2433	19.9460	19.6720	(93)
adjusted MIT	19.6996	19.8092	19.9980	20.2555	20.4086	20.4722	20.4813	20.4789	20.4459	20.2433	19.9460	19.6720	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9767	0.9658	0.9374	0.8608	0.7144	0.5156	0.3787	0.4212	0.6683	0.8889	0.9611	0.9803	(94)
Useful gains	670.5712	710.1736	739.5731	718.8707	606.6747	427.3689	298.1458	313.7805	477.3205	593.3004	623.1739	651.2006	(95)
Ext temp.	4.8000	5.3000	6.8000	9.3000	12.3000	15.0000	16.7000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W	1214.6636	1178.9881	1075.9440	879.2518	654.7324	434.2124	299.2385	315.7156	503.5350	760.1661	998.8761	1216.9993	(97)
Space heating kWh	404.8048	315.0433	250.2600	115.4744	35.7550	0.0000	0.0000	0.0000	0.0000	124.1480	270.5056	420.9543	(98a)
Space heating requirement - total per year (kWh/year)												1936.9453	
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	404.8048	315.0433	250.2600	115.4744	35.7550	0.0000	0.0000	0.0000	0.0000	124.1480	270.5056	420.9543	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1936.9453	
Space heating per m ²										(98c) / (4) =		21.6612	(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 %)													249.9000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	404.8048	315.0433	250.2600	115.4744	35.7550	0.0000	0.0000	0.0000	0.0000	124.1480	270.5056	420.9543	(98)
Space heating efficiency (main heating system 1)	249.9000	249.9000	249.9000	249.9000	249.9000	0.0000	0.0000	0.0000	0.0000	249.9000	249.9000	249.9000	(210)
Space heating fuel (main heating system)	161.9867	126.0678	100.1440	46.2082	14.3077	0.0000	0.0000	0.0000	0.0000	49.6791	108.2455	168.4491	(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	283.9436	250.6237	264.6822	228.5656	218.8277	194.1687	189.2708	198.3620	202.3143	229.2370	248.2555	280.2655	(64)
Efficiency of water heater	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	(216)
Fuel for water heating, kWh/month	162.1608	143.1318	151.1606	130.5343	124.9730	110.8902	108.0930	113.2850	115.5421	130.9178	141.7793	160.0603	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	30.5179	24.4826	22.0439	16.1503	12.4749	10.1921	11.3801	14.7922	19.2136	25.2093	28.4739	31.3661	(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												775.0882	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												175.1000	
Water heating fuel used												1592.5281	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												246.2970	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
FV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												2613.9133	(238)

10a. Fuel costs - using BEDF prices (572)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	775.0882	23.6600	183.3859 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1592.5281	23.6600	376.7922 (247)
Energy for instantaneous electric shower(s)	0.0000	23.6600	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	246.2970	26.0600	64.1850 (250)
Additional standing charges			114.0000 (251)
Total energy cost			738.3630 (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	775.0882	0.1560	120.9517 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1592.5281	0.1413	225.0162 (264)
Space and water heating			345.9680 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	246.2970	0.1443	35.5483 (268)
Total CO2, kg/year			381.5162 (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	775.0882	1.5777	1222.8849 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1592.5281	1.5225	2424.5880 (278)
Space and water heating			3647.4729 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	246.2970	1.5338	377.7786 (282)
Total Primary energy kWh/year			4025.2514 (286)

SAP 10 EPC IMPROVEMENTS

As Designed

Current energy efficiency rating: B 82
Current environmental impact rating: A 96

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

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

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

Potential energy efficiency rating: B 82
Potential environmental impact rating: A 96

Fuel prices for cost data on this page from database revision number 572 TEST (30 May 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, North West England):

	Current £738	Potential £738	£0
Electricity			
Space heating	£297	£297	£0
Water heating	£377	£377	£0
Lighting	£64	£64	£0
Total cost of fuels	£738	£738	£0
Total cost of uses	£738	£738	£0
Delivered energy	29 kWh/m ²	29 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.4 tonnes	0.4 tonnes	0.0 tonnes
CO2 emissions per m ²	4 kg/m ²	4 kg/m ²	0 kg/m ²
Primary energy	45 kWh/m ²	45 kWh/m ²	0 kWh/m ²

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	89.4200 (1b)	x 2.5000 (2b)	= 223.5500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 223.5500 (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	Air changes per hour	30.0000 / (5) =	0.1342 (8)
Pressure test			Yes		
Pressure Test Method			Blower Door		
Measured/design AP50			5.0000		(17)
Infiltration rate			0.3842		(18)
Number of sides sheltered			1		(19)

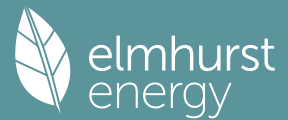
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3554	(21)

	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	0.4531	0.4442	0.4353	0.3909	0.3820	0.3376	0.3376	0.3287	0.3554	0.3820	0.3998	0.4176 (22b)
Effective ac	0.6027	0.5987	0.5948	0.5764	0.5730	0.5570	0.5570	0.5540	0.5631	0.5730	0.5799	0.5872 (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			9.6800	0.9615	9.3077		(27)
Heatloss Floor over void			4.1400	0.1200	0.4968	20.0000	82.8000 (28b)
External Wall 1	70.3250	9.6800	60.6450	0.1800	10.9161	110.0000	6670.9500 (29a)
Main Roof	89.4200		89.4200	0.1100	9.8362	9.0000	804.7800 (30)
Total net area of external elements Aum(A, m ²)			163.8850				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.5568		(33)

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Main dwelling					
Party Wall Between Corridor	39.7300	0.0000	0.0000	180.0000	7151.4000 (32)
Party Floor 1	85.2800			30.0000	2558.4000 (32d)
Internal Wall 1	127.5300			9.0000	1147.7700 (32c)

Heat capacity $C_m = \text{Sum}(A \times k)$ (28)...(30) + (32) + (32a)...(32e) = 18416.1000 (34)
Thermal mass parameter (TMP = C_m / TFA) in kJ/m²K 205.9506 (35)

List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	5.3000	0.3050	1.6165
E3 Sill	3.1000	0.0240	0.0744
E4 Jamb	14.0000	0.0240	0.3360
E7 Party floor between dwellings (in blocks of flats)	28.1300	0.0330	0.9283
E16 Corner (normal)	5.0000	0.0400	0.2000
E18 Party wall between dwellings	7.5000	0.0300	0.2250
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0860	-0.2150
E10 Eaves (insulation at ceiling level)	13.0700	0.0820	1.0717
E12 Gable (insulation at ceiling level)	14.7100	0.0460	0.6767
E8 Balcony within a dwelling, wall insulation continuous	4.8800	0.1000	0.4880
P7 Party Wall - Exposed floor (normal)	4.4300	0.4800	2.1264
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.1900	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	11.1900	0.0350	0.3916

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.9196 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 38.4764 (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 44.4588 44.1648 43.8765 42.5226 42.2693 41.0901 41.0901 40.8717 41.5443 42.2693 42.7818 43.3175 (38)
82.9353 82.6412 82.3529 80.9991 80.7457 79.5665 79.5665 79.3482 80.0208 80.7457 81.2582 81.7939 (39)
Average = Sum(39)m / 12 = 80.9978

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9275	0.9242	0.9210	0.9058	0.9030	0.8898	0.8898	0.8874	0.8949	0.9030	0.9087	0.9147 (40)
HLP (average)												0.9058
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6177 (42)
Hot water usage for mixer showers												
93.6512 92.2438 90.1929 86.2690 83.3732 80.1439 78.3084 80.3437 82.5748 86.0421 90.0503 93.2924 (42a)												
Hot water usage for baths												
29.4127 28.9759 28.3608 27.2266 26.3773 25.4356 24.9269 25.5378 26.2028 27.2105 28.3681 29.3133 (42b)												
Hot water usage for other uses												
41.4378 39.9310 38.4242 36.9174 35.4105 33.9037 33.9037 35.4105 36.9174 38.4242 39.9310 41.4378 (42c)												
Average daily hot water use (litres/day)												151.2843 (43)

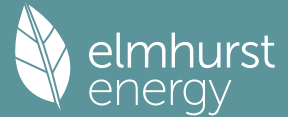
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	164.5018	161.1507	156.9779	150.4129	145.1611	139.4832	137.1390	141.2920	145.6950	151.6768	158.3494	164.0435 (44)
Energy content	260.5306	229.4765	241.2692	205.9078	195.4147	171.5109	165.8577	174.9490	179.6565	205.8240	225.5977	256.8525 (45)
Energy content (annual)										Total = Sum(45)m =		2512.8469
Distribution loss (46)m = $0.15 \times (45)\text{m}$												
39.0796 34.4215 36.1904 30.8862 29.3122 25.7266 24.8787 26.2423 26.9485 30.8736 33.8397 38.5279 (46)												
Water storage loss:												
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.0090 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.0049 (55)
Total storage loss												
0.1507 0.1361 0.1507 0.1458 0.1507 0.1458 0.1507 0.1507 0.1458 0.1507 0.1458 0.1507 (56)												
If cylinder contains dedicated solar storage												
0.1507 0.1361 0.1507 0.1458 0.1507 0.1458 0.1507 0.1507 0.1458 0.1507 0.1458 0.1507 (57)												
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
283.9436 250.6237 264.6822 228.5656 218.8277 194.1687 189.2708 198.3620 202.3143 229.2370 248.2555 280.2655 (62)												
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	283.9436	250.6237	264.6822	228.5656	218.8277	194.1687	189.2708	198.3620	202.3143	229.2370	248.2555	280.2655 (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												
105.3569 93.2187 98.9524 86.5906 83.7058 75.1536 73.8781 76.9010 77.8620 87.1669 93.1375 104.1339 (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												
157.0619 157.0619 157.0619 157.0619 157.0619 157.0619 157.0619 157.0619 157.0619 157.0619 157.0619 157.0619 (66)												
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
34.8659 30.9676 25.1845 19.0663 14.2523 12.0324 13.0014 16.8997 22.6828 28.8010 33.6150 35.8349 (67)												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
355.2338 358.9200 349.6309 329.8554 304.8924 281.4307 265.7568 262.0706 271.3597 291.1352 316.0982 339.5599 (68)												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
53.3239 53.3239 53.3239 53.3239 53.3239 53.3239 53.3239 53.3239 53.3239 53.3239 53.3239 53.3239 (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)												
-104.7079 -104.7079 -104.7079 -104.7079 -104.7079 -104.7079 -104.7079 -104.7079 -104.7079 -104.7079 -104.7079 -104.7079 (71)												
Water heating gains (Table 5)												
141.6087 138.7184 133.0006 120.2647 112.5078 104.3800 99.2986 103.3615 108.1417 117.1598 129.3576 139.9649 (72)												
Total internal gains	637.3862	634.2838	613.4938	574.8642	537.3303	503.5209	483.7346	488.0097	507.8621	542.7739	584.7487	621.0376 (73)

6. Solar gains

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[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
East				3.5200	19.6403	0.6300		0.7000		0.7700		21.1282 (76)
West				6.1600	19.6403	0.6300		0.7000		0.7700		36.9743 (80)

Solar gains	58.1025	113.6607	187.1830	272.9953	334.5660	342.4878	326.0624	280.0828	217.7016	134.8680	72.4469	47.7806 (83)
Total gains	695.4887	747.9445	800.6769	847.8595	871.8963	846.0087	809.7970	768.0925	725.5637	677.6419	657.1956	668.8182 (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	61.6816	61.9011	62.1178	63.1561	63.3542	64.2931	64.2931	64.4701	63.9282	63.3542	62.9547	62.5423
alpha	5.1121	5.1267	5.1412	5.2104	5.2236	5.2862	5.2862	5.2980	5.2619	5.2236	5.1970	5.1695
util living area	0.9851	0.9765	0.9538	0.8932	0.7708	0.5848	0.4294	0.4703	0.7082	0.9146	0.9740	0.9874 (86)
MIT	20.1721	20.2811	20.4672	20.6951	20.8537	20.9254	20.9387	20.9373	20.8988	20.6982	20.4017	20.1554 (87)
Th 2	20.1442	20.1470	20.1497	20.1625	20.1650	20.1762	20.1762	20.1783	20.1718	20.1650	20.1601	20.1550 (88)
util rest of house	0.9814	0.9708	0.9426	0.8680	0.7231	0.5161	0.3505	0.3887	0.6405	0.8888	0.9667	0.9844 (89)
MIT 2	19.1781	19.3178	19.5520	19.8371	20.0138	20.0909	20.0999	20.1014	20.0663	19.8484	19.4820	19.1659 (90)
Living area fraction	19.6270	19.7528	19.9653	20.2245	20.3931	20.4677	20.4787	20.4789	fLA = Living area / (4) =	20.4422	20.2321	19.8973 (91)
MIT	19.6270	19.7528	19.9653	20.2245	20.3931	20.4677	20.4787	20.4789	20.4422	20.2321	19.8973	19.6127 (92)
Temperature adjustment	19.6270	19.7528	19.9653	20.2245	20.3931	20.4677	20.4787	20.4789	20.4422	20.2321	19.8973	0.0000
adjusted MIT	19.6270	19.7528	19.9653	20.2245	20.3931	20.4677	20.4787	20.4789	20.4422	20.2321	19.8973	19.6127 (93)

8. Space heating requirement												

Utilisation	0.9787	0.9676	0.9397	0.8701	0.7368	0.5409	0.3797	0.4189	0.6636	0.8912	0.9640	0.9819 (94)
Useful gains	680.6842	723.7280	752.4342	737.7141	642.4066	457.6209	307.4464	321.7210	481.4779	603.8884	633.5422	656.7239 (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	1271.1492	1227.4548	1108.9062	917.2761	701.9275	466.8749	308.6141	323.6522	507.5096	777.7514	1039.8840	1260.6674 (97)
Space heating kWh	439.3059	338.5044	265.2152	129.2847	44.2835	0.0000	0.0000	0.0000	0.0000	129.3541	292.5661	449.3340 (98a)
Space heating requirement - total per year (kWh/year)												2087.8478
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	439.3059	338.5044	265.2152	129.2847	44.2835	0.0000	0.0000	0.0000	0.0000	129.3541	292.5661	449.3340 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2087.8478
Space heating per m2										(98c) / (4) =		23.3488 (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 %)												249.9000 (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	439.3059	338.5044	265.2152	129.2847	44.2835	0.0000	0.0000	0.0000	0.0000	129.3541	292.5661	449.3340 (98)
Space heating efficiency (main heating system 1)	249.9000	249.9000	249.9000	249.9000	249.9000	0.0000	0.0000	0.0000	0.0000	249.9000	249.9000	249.9000 (210)
Space heating fuel (main heating system)	175.7927	135.4559	106.1285	51.7346	17.7205	0.0000	0.0000	0.0000	0.0000	51.7623	117.0733	179.8055 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	283.9436	250.6237	264.6822	228.5656	218.8277	194.1687	189.2708	198.3620	202.3143	229.2370	248.2555	280.2655 (64)
Efficiency of water heater (217)m	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000 (216)
Fuel for water heating, kWh/month	162.1608	143.1318	151.1606	130.5343	124.9730	110.8902	108.0930	113.2850	115.5421	130.9178	141.7793	160.0603 (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 (231)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting (232)m	30.5179	24.4826	22.0439	16.1503	12.4749	10.1921	11.3801	14.7922	19.2136	25.2093	28.4739	31.3661 (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												

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Space heating fuel - main system 1	835.4733	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	175.1000	
Water heating fuel used	1592.5281	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	0.0000	(231)
Electricity for lighting (calculated in Appendix L)	246.2970	(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	2674.2984	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	835.4733	14.0400	117.3005 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1592.5281	14.0400	223.5909 (247)
Energy for instantaneous electric shower(s)	0.0000	14.0400	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	246.2970	16.4900	40.6144 (250)
Additional standing charges			26.0000 (251)
Total energy cost			407.5058 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] = 1.0914 (257)
SAP value	82.3089
SAP rating (Section 12)	82 (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	835.4733	0.1560	130.3280 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1592.5281	0.1413	225.0162 (264)
Space and water heating			355.3442 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	246.2970	0.1443	35.5483 (268)
Total CO2, kg/year			390.8925 (272)
CO2 emissions per m2			4.3700 (273)
EI value			96.1033
EI rating			96 (274)
EI band			A

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

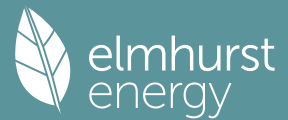
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	89.4200 (1b)	x 2.5000 (2b)	= 223.5500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	223.5500 (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)+(7a)+(7b)+(7c) = 30.0000 / (5) = 0.1342 (8)
Pressure test	Yes

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

Blower Door
5.0000 (17)
0.3842 (18)
1 (19)

Shelter factor

$$(20) = 1 - [0.075 \times (19)] = 0.9250 (20)$$
$$(21) = (18) \times (20) = 0.3554 (21)$$

Infiltration rate adjusted to include shelter factor

Wind speed	Jan 4.6000	Feb 4.5000	Mar 4.6000	Apr 4.1000	May 4.3000	Jun 3.7000	Jul 3.6000	Aug 3.7000	Sep 3.7000	Oct 4.2000	Nov 4.1000	Dec 4.3000 (22)
Wind factor	1.1500	1.1250	1.1500	1.0250	1.0750	0.9250	0.9000	0.9250	0.9250	1.0500	1.0250	1.0750 (22a)
Adj infiltr rate	0.4087	0.3998	0.4087	0.3643	0.3820	0.3287	0.3198	0.3287	0.3287	0.3732	0.3643	0.3820 (22b)
Effective ac	0.5835	0.5799	0.5835	0.5663	0.5730	0.5540	0.5512	0.5540	0.5540	0.5696	0.5663	0.5730 (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			9.6800	0.9615	9.3077			(27)
Heatloss Floor over void			4.1400	0.1200	0.4968	20.0000	82.8000	(28b)
External Wall 1	70.3250	9.6800	60.6450	0.1800	10.9161	110.0000	6670.9500	(29a)
Main Roof	89.4200		89.4200	0.1100	9.8362	9.0000	804.7800	(30)
Total net area of external elements Aum(A, m2)			163.8850					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...	(30) + (32) =	30.5568		(33)
Main dwelling								
Party Wall Between Corridor			39.7300	0.0000	0.0000	180.0000	7151.4000	(32)
Party Floor 1			85.2800			30.0000	2558.4000	(32a)
Internal Wall 1			127.5300			9.0000	1147.7700	(32c)

Heat capacity Cm = Sum(A x k)

$$(28) \dots (30) + (32) + (32a) \dots (32e) = 18416.1000 (34)$$

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

$$205.9506 (35)$$

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	5.3000	0.3050	1.6165
E3 Sill	3.1000	0.0240	0.0744
E4 Jamb	14.0000	0.0240	0.3360
E7 Party floor between dwellings (in blocks of flats)	28.1300	0.0330	0.9283
E16 Corner (normal)	5.0000	0.0400	0.2000
E18 Party wall between dwellings	7.5000	0.0300	0.2250
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0860	-0.2150
E10 Eaves (insulation at ceiling level)	13.0700	0.0820	1.0717
E12 Gable (insulation at ceiling level)	14.7100	0.0460	0.6767
E8 Balcony within a dwelling, wall insulation continuous	4.8800	0.1000	0.4880
P7 Party Wall - Exposed floor (normal)	4.4300	0.4800	2.1264
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.1900	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	11.1900	0.0350	0.3916

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

$$7.9196 (36)$$

Point Thermal bridges

$$(36a) = 0.0000$$

Total fabric heat loss

$$(33) + (36) + (36a) = 38.4764 (37)$$

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

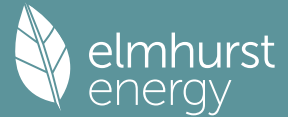
(38)m	Jan 43.0467	Feb 42.7818	Mar 43.0467	Apr 41.7802	May 42.2693	Jun 40.8717	Jul 40.6592	Aug 40.8717	Sep 40.8717	Oct 42.0218	Nov 41.7802	Dec 42.2693 (38)
Heat transfer coeff	81.5231	81.2582	81.5231	80.2566	80.7457	79.3482	79.1356	79.3482	79.3482	80.4983	80.2566	80.7457 (39)
Average = Sum(39)m / 12 =												80.3323

HLP	Jan 0.9117	Feb 0.9087	Mar 0.9117	Apr 0.8975	May 0.9030	Jun 0.8874	Jul 0.8850	Aug 0.8874	Sep 0.8874	Oct 0.9002	Nov 0.8975	Dec 0.9030 (40)
HLP (average)												0.8984
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6177 (42)
Hot water usage for mixer showers													
93.6512	92.2438	90.1929	86.2690	83.3732	80.1439	78.3084	80.3437	82.5748	86.0421	90.0503	93.2924	93.2924 (42a)	
Hot water usage for baths													
29.4127	28.9759	28.3608	27.2266	26.3773	25.4356	24.9269	25.5378	26.2028	27.2105	28.3681	29.3133	29.3133 (42b)	
Hot water usage for other uses													
41.4378	39.9310	38.4242	36.9174	35.4105	33.9037	33.9037	35.4105	36.9174	38.4242	39.9310	41.4378	41.4378 (42c)	
Average daily hot water use (litres/day)												151.2843 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
164.5018	161.1507	156.9779	150.4129	145.1611	139.4832	137.1390	141.2920	145.6950	151.6768	158.3494	164.0435	164.0435 (44)	
Energy content (annual)	260.5306	229.4765	241.2692	205.9078	195.4147	171.5109	165.8577	174.9490	179.6565	205.8240	225.5977	256.8525	256.8525 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2512.8469	
39.0796	34.4215	36.1904	30.8862	29.3122	25.7266	24.8787	26.2423	26.9485	30.8736	33.8397	38.5279	38.5279 (46)	
Water storage loss:													
Store volume													200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													0.0090 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.0049 (55)
Total storage loss													
0.1507	0.1361	0.1507	0.1458	0.1507	0.1458	0.1507	0.1507	0.1458	0.1507	0.1458	0.1507	0.1507 (56)	
If cylinder contains dedicated solar storage													
0.1507	0.1361	0.1507	0.1458	0.1507	0.1458	0.1507	0.1507	0.1458	0.1507	0.1458	0.1507	0.1507 (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	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month													
283.9436	250.6237	264.6822	228.5656	218.8277	194.1687	189.2708	198.3620	202.3143	229.2370	248.2555	280.2655	280.2655 (62)	
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h													
283.9436	250.6237	264.6822	228.5656	218.8277	194.1687	189.2708	198.3620	202.3143	229.2370	248.2555	280.2655	280.2655 (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	0.0000 (64a)
Total per year (kWh/year) = Sum(64)m =													2788.5168 (64)

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Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	105.3569	93.2187	98.9524	86.5906	83.7058	75.1536	73.8781	76.9010	77.8620	87.1669	93.1375	104.1339 (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	157.0619	157.0619	157.0619	157.0619	157.0619	157.0619	157.0619	157.0619	157.0619	157.0619	157.0619	157.0619 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.8659	30.9676	25.1845	19.0663	14.2523	12.0324	13.0014	16.8997	22.6828	28.8010	33.6150	35.8349 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	355.2338	358.9200	349.6309	329.8554	304.8924	281.4307	265.7568	262.0706	271.3597	291.1352	316.0982	339.5599 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.3239	53.3239	53.3239	53.3239	53.3239	53.3239	53.3239	53.3239	53.3239	53.3239	53.3239	53.3239 (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)	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079 (71)
Water heating gains (Table 5)	141.6087	138.7184	133.0006	120.2647	112.5078	104.3800	99.2986	103.3615	108.1417	117.1598	129.3576	139.9649 (72)
Total internal gains	637.3862	634.2838	613.4938	574.8642	537.3303	503.5209	483.7346	488.0097	507.8621	542.7739	584.7487	621.0376 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W		
East					3.5200	16.6187	0.6300	0.7000	0.7700	17.8777 (76)		
West					6.1600	16.6187	0.6300	0.7000	0.7700	31.2859 (80)		

Solar gains	49.1636	101.0318	175.4841	260.2555	311.9131	325.3634	303.6348	256.8912	206.3433	124.6508	63.6655	43.2301 (83)
Total gains	686.5498	735.3156	788.9779	835.1197	849.2434	828.8843	787.3694	744.9009	714.2053	667.4247	648.4142	664.2677 (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
tau	62.7501	62.9547	62.7501	63.7404	63.3542	64.4701	64.6432	64.4701	64.4701	63.5490	63.7404	63.3542
alpha	5.1833	5.1970	5.1833	5.2494	5.2236	5.2980	5.3095	5.2980	5.2980	5.2366	5.2494	5.2236
util living area	0.9835	0.9750	0.9519	0.8849	0.7506	0.5610	0.4293	0.4742	0.7127	0.9128	0.9717	0.9862 (86)
MIT	20.2302	20.3252	20.4929	20.7202	20.8690	20.9292	20.9391	20.9373	20.8989	20.7072	20.4406	20.2032 (87)
Th 2	20.1576	20.1601	20.1576	20.1696	20.1650	20.1783	20.1803	20.1783	20.1783	20.1673	20.1696	20.1650 (88)
util rest of house	0.9794	0.9689	0.9400	0.8577	0.6984	0.4896	0.3489	0.3901	0.6454	0.8862	0.9637	0.9828 (89)
MIT 2	19.2627	19.3842	19.5906	19.8729	20.0295	20.0959	20.1044	20.1014	20.0728	19.8613	19.5388	19.2346 (90)
Living area fraction	19.6996	19.8092	19.9980	20.2555	20.4086	20.4722	20.4813	20.4789	20.4459	20.2433	19.9460	19.6720 (92)
Temperature adjustment	19.6996	19.8092	19.9980	20.2555	20.4086	20.4722	20.4813	20.4789	20.4459	20.2433	19.9460	19.6720 (93)
adjusted MIT	19.6996	19.8092	19.9980	20.2555	20.4086	20.4722	20.4813	20.4789	20.4459	20.2433	19.9460	19.6720 (93)

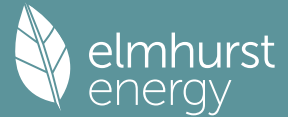
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9767	0.9658	0.9374	0.8608	0.7144	0.5156	0.3787	0.4212	0.6683	0.8889	0.9611	0.9803 (94)
Useful gains	670.5712	710.1736	739.5731	718.8707	606.6747	427.3689	298.1458	313.7805	477.3205	593.3004	623.1739	651.2006 (95)
Ext temp.	4.8000	5.3000	6.8000	9.3000	12.3000	15.0000	16.7000	16.5000	14.1000	10.8000	7.5000	4.6000 (96)
Heat loss rate W	1214.6636	1178.9881	1075.9440	879.2518	654.7324	434.2124	299.2385	315.7156	503.5350	760.1661	998.8761	1216.9993 (97)
Space heating kWh	404.8048	315.0433	250.2600	115.4744	35.7550	0.0000	0.0000	0.0000	0.0000	124.1480	270.5056	420.9543 (98a)
Space heating requirement - total per year (kWh/year)												1936.9453
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	404.8048	315.0433	250.2600	115.4744	35.7550	0.0000	0.0000	0.0000	0.0000	124.1480	270.5056	420.9543 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1936.9453
Space heating per m ²										(98c) / (4) =		21.6612 (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 %)												249.9000 (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	404.8048	315.0433	250.2600	115.4744	35.7550	0.0000	0.0000	0.0000	0.0000	124.1480	270.5056	420.9543 (98)
Space heating efficiency (main heating system 1)	249.9000	249.9000	249.9000	249.9000	249.9000	0.0000	0.0000	0.0000	0.0000	249.9000	249.9000	249.9000 (210)
Space heating fuel (main heating system)	161.9867	126.0678	100.1440	46.2082	14.3077	0.0000	0.0000	0.0000	0.0000	49.6791	108.2455	168.4491 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)												

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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	283.9436	250.6237	264.6822	228.5656	218.8277	194.1687	189.2708	198.3620	202.3143	229.2370	248.2555	280.2655	(64)
Efficiency of water heater												175.1000	(216)
(217)m	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	(217)
Fuel for water heating, kWh/month	162.1608	143.1318	151.1606	130.5343	124.9730	110.8902	108.0930	113.2850	115.5421	130.9178	141.7793	160.0603	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	30.5179	24.4826	22.0439	16.1503	12.4749	10.1921	11.3801	14.7922	19.2136	25.2093	28.4739	31.3661	(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												775.0882	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												175.1000	
Water heating fuel used												1592.5281	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												246.2970	(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												2613.9133	(238)

10a. Fuel costs - using BEDF prices (572)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	775.0882	23.6600	183.3859	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1592.5281	23.6600	376.7922	(247)
Energy for instantaneous electric shower(s)	0.0000	23.6600	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	246.2970	26.0600	64.1850	(250)
Additional standing charges			114.0000	(251)
Total energy cost			738.3630	(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	775.0882	0.1560	120.9517	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1592.5281	0.1413	225.0162	(264)
Space and water heating			345.9680	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	246.2970	0.1443	35.5483	(268)
Total CO2, kg/year			381.5162	(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	775.0882	1.5777	1222.8849	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1592.5281	1.5225	2424.5880	(278)
Space and water heating			3647.4729	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	246.2970	1.5338	377.7786	(282)
Total Primary energy kWh/year			4025.2514	(286)

Thermal Bridging

Property Reference	Flat 4	Issued on Date	30/06/2025
Assessment Reference	As Designed	Prop Type Ref	Semi-Detached Flat
Property	Flat 4, Bury Old Road, Prestwich, Manchester, M25 3DE		

SAP Rating	82 B	DER	4.49	TER	9.84
Environmental	96 A	% DER < TER			54.37
CO ₂ Emissions (t/year)	0.38	DFEE	30.01	TFEE	30.89
Compliance Check	See BREL	% DFEE < TFEE			2.82
% DPER < TPER	7.90	DPER	47.24	TPER	51.29

Assessor Details	Mr. Nathaniel Kempson	Assessor ID	R421-0001
Client	Encon Associates, Glenn Miles		

	Junction details	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E1 Steel lintel with perforated steel base plate	Non Gov Approved Schemes	0.305	5.30	1.62	Knauf
External wall	E3 Sill	Non Gov Approved Schemes	0.024	3.10	0.07	Knauf
External wall	E4 Jamb	Non Gov Approved Schemes	0.024	14.00	0.34	Knauf
External wall	E7 Party floor between dwellings (in blocks of flats)	Non Gov Approved Schemes	0.033	28.13	0.93	Knauf
External wall	E16 Corner (normal)	Non Gov Approved Schemes	0.040	5.00	0.20	Knauf
External wall	E18 Party wall between dwellings	Non Gov Approved Schemes	0.030	7.50	0.22	Knauf
External wall	E17 Corner (inverted – internal area greater than external area)	Non Gov Approved Schemes	-0.086	2.50	-0.21	Knauf
External wall	E10 Eaves (insulation at ceiling level)	Non Gov Approved Schemes	0.082	13.07	1.07	Knauf
External wall	E12 Gable (insulation at ceiling level)	Non Gov Approved Schemes	0.046	14.71	0.68	Knauf
External wall	E8 Balcony within a dwelling, wall insulation continuous	Table K1 - Default	0.100	4.88	0.49	
Party wall	P7 Party Wall - Exposed floor (normal)	Table K1 - Default	0.480	4.43	2.13	
Party wall	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	0.000	11.19	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Non Gov Approved Schemes	0.035	11.19	0.39	Knauf

Total: 125.00 W/mK:
Y-Value: 0.05 W/m²K:

Building Regulations England Part L (BREL) Compliance Report

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

Date: Mon 30 Jun 2025 11:02:49

Project Information			
Assessed By	Nathaniel Kempson	Building Type	Flat, Semi-detached
OCDEA Registration	EES/020528	Assessment Date	2025-06-30

Dwelling Details			
Assessment Type	As designed	Total Floor Area	89 m ²
Site Reference	Flat 5	Plot Reference	As Designed
Address	Flat 5 Bury Old Road, Prestwich, M25 3DE		

Client Details	
Name	Glenn Miles
Company	Encon Associates Ltd
Address	10 Chapel Lane, Nottingham, NG5 7DR

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	10.55 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	4.74 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	55.09 kWh _{PE} /m ²		
Dwelling primary energy	49.82 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	34.1 kWh/m ²		
Dwelling fabric energy efficiency	34.0 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	0.18	Walls (1) (0.18)	OK
Party walls	0.2	0	Party Wall (1) (0)	N/A
Curtain walls	1.6	0	N/A	N/A
Floors	0.18	0.12	Heatloss Floor over void (0.12)	OK
Roofs	0.16	0.11	Roof (1) (0.11)	OK
Windows, doors, and roof windows	1.6	1	East Windows (1)	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)	60.64	0.18
Party wall: Party Wall (1)	39.73	0 (!)
Party floor: Heatloss Floor over void, Heatloss Floor over void	42.26	0.12
Exposed roof: Roof (1)	89.42	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]
East Windows, Windows	1.76	East	0.7	1 (!)
East Windows, Windows	1.76	East	0.7	1 (!)
West Windows, Windows	1.76	West	0.7	1 (!)
West Windows, Windows	4.4	West	0.7	1 (!)

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	E1: Steel lintel with perforated steel base plate	Not government-approved scheme	0.305	Knauf

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E3: Sill	Not government-approved scheme	0.024 (!)	Knauf
External wall	E4: Jamb	Not government-approved scheme	0.024 (!)	Knauf
External wall	E7: Party floor between dwellings (in blocks of flats)	Not government-approved scheme	0.033 (!)	Knauf
External wall	E16: Corner (normal)	Not government-approved scheme	0.04	Knauf
External wall	E18: Party wall between dwellings	Not government-approved scheme	0.03 (!)	Knauf
External wall	E17: Corner (inverted - internal area greater than external area)	Not government-approved scheme	-0.086	Knauf
External wall	E10: Eaves (insulation at ceiling level)	Not government-approved scheme	0.082	Knauf
External wall	E12: Gable (insulation at ceiling level)	Not government-approved scheme	0.046	Knauf
External wall	E8: Balcony within a dwelling - wall insulation continuous	SAP table default	0.1	
Party wall	P7: Exposed floor (normal)	SAP table default	0.48	
Party wall	P3: Intermediate floor between dwellings (in blocks of flats)	SAP table default	0 (!)	
Party wall	P4: Roof (insulation at ceiling level)	Not government-approved scheme	0.035 (!)	Knauf

3 Air permeability (better than typically expected values are flagged with a subsequent (!))			
Maximum permitted air permeability at 50Pa	8 m ³ /hm ²		
Dwelling air permeability at 50Pa	5 m ³ /hm ² , Design value		OK
Air permeability test certificate reference			

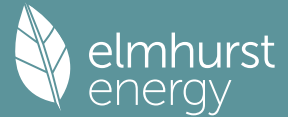
4 Space heating	
Main heating system 1: Heat pump with radiators or underfloor heating - Electricity	
Efficiency	249.9%
Emitter type	Underfloor
Flow temperature	35°C
System type	Air source heat pump
Manufacturer	TBC
Model	TBC
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water	
Cylinder/store - type: Cylinder	
Capacity	200 litres
Declared heat loss	0.009 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	95 lm/W	OK
External lights control	N/A	
8 Mechanical ventilation		
System type: N/A		
Maximum permitted specific fan power	N/A	
Specific fan power	N/A	N/A
Minimum permitted heat recovery efficiency	N/A	
Heat recovery efficiency	N/A	N/A
Manufacturer/Model		
Commissioning		
9 Local generation		
N/A		
10 Heat networks		
N/A		
11 Supporting documentary evidence		
N/A		
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 information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.		
Signed:	Assessor ID:	
Name:	Date:	
b. Client Declaration		
N/A		

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Property Reference	Flat 5				Issued on Date	30/06/2025	
Assessment Reference	As Designed			Prop Type Ref			
Property	Flat 5, Bury Old Road, Prestwich, Manchester, M25 3DE						
SAP Rating	81 B	DER	4.74	TER	10.55		
Environmental	96 A	% DER < TER				55.07	
CO ₂ Emissions (t/year)	0.4	DFEE	33.97	TFEE	34.11		
Compliance Check	See BREL	% DFEE < TFEE				0.40	
% DPER < TPER	9.57	DPER	49.82	TPER	55.09		
Assessor Details	Mr. Nathaniel Kempson				Assessor ID	R421-0001	
Client	Encon Associates, Glenn Miles						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	89.4200 (1b)	2.5000 (2b)	223.5500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.4200		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	223.5500 (5)

2. Ventilation rate

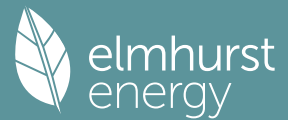
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1342 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3842 (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) = 0.3554 (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	0.4531	0.4442	0.4353	0.3909	0.3820	0.3376	0.3376	0.3287	0.3554	0.3820	0.3998	0.4176 (22b)
Effective ac	0.6027	0.5987	0.5948	0.5764	0.5730	0.5570	0.5570	0.5540	0.5631	0.5730	0.5799	0.5872 (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			9.6800	0.9615	9.3077		(27)
Heatloss Floor over void			42.2600	0.1200	5.0712	20.0000	845.2000 (28b)
External Wall 1	70.3250	9.6800	60.6450	0.1800	10.9161	110.0000	6670.9500 (29a)
Main Roof	89.4200		89.4200	0.1100	9.8362	9.0000	804.7800 (30)
Total net area of external elements Aum(A, m ²)			202.0050				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.1312		(33)
Main dwelling							
Party Wall Between Corridor			39.7300	0.0000	0.0000	180.0000	7151.4000 (32)
Party Floor 1			46.1400			30.0000	1384.2000 (32d)
Internal Wall 1			127.5300			9.0000	1147.7700 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	18004.3000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							201.3453 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate				5.3000	0.3050	1.6165	
E3 Sill				3.1000	0.0240	0.0744	
E4 Jamb				14.0000	0.0240	0.3360	
E7 Party floor between dwellings (in blocks of flats)				28.1300	0.0330	0.9283	
E16 Corner (normal)				5.0000	0.0400	0.2000	

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E18 Party wall between dwellings	7.5000	0.0300	0.2250
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0860	-0.2150
E10 Eaves (insulation at ceiling level)	13.0700	0.0820	1.0717
E12 Gable (insulation at ceiling level)	14.7100	0.0460	0.6767
E8 Balcony within a dwelling, wall insulation continuous	4.8800	0.1000	0.4880
P7 Party Wall - Exposed floor (normal)	8.2500	0.4800	3.9600
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.3800	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	7.3800	0.0350	0.2583
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			9.6199 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	44.7511 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 44.4588	Feb 44.1648	Mar 43.8765	Apr 42.5226	May 42.2693	Jun 41.0901	Jul 41.0901	Aug 40.8717	Sep 41.5443	Oct 42.2693	Nov 42.7818	Dec 43.3175 (38)
Heat transfer coeff	89.2099	88.9158	88.6276	87.2737	87.0204	85.8412	85.8412	85.6228	86.2954	87.0204	87.5328	88.0686 (39)
Average = Sum(39)m / 12 =												87.2725
HLP	Jan 0.9977	Feb 0.9944	Mar 0.9911	Apr 0.9760	May 0.9732	Jun 0.9600	Jul 0.9600	Aug 0.9575	Sep 0.9651	Oct 0.9732	Nov 0.9789	Dec 0.9849 (40)
HLP (average)												0.9760
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

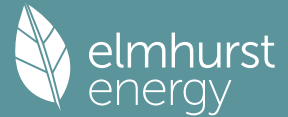
4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.6177 (42)
Hot water usage for mixer showers												
93.6512	92.2438	90.1929	86.2690	83.3732	80.1439	78.3084	80.3437	82.5748	86.0421	90.0503	93.2924 (42a)	
Hot water usage for baths												
29.4127	28.9759	28.3608	27.2266	26.3773	25.4356	24.9269	25.5378	26.2028	27.2105	28.3681	29.3133 (42b)	
Hot water usage for other uses												
41.4378	39.9310	38.4242	36.9174	35.4105	33.9037	33.9037	35.4105	36.9174	38.4242	39.9310	41.4378 (42c)	
Average daily hot water use (litres/day)												151.2843 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
164.5018	161.1507	156.9779	150.4129	145.1611	139.4832	137.1390	141.2920	145.6950	151.6768	158.3494	164.0435 (44)	
Energy content	260.5306	229.4765	241.2692	205.9078	195.4147	171.5109	165.8577	174.9490	179.6565	205.8240	225.5977	256.8525 (45)
Energy content (annual)	Total = Sum(45)m =											2512.8469
Distribution loss (46)m = 0.15 x (45)m												
39.0796	34.4215	36.1904	30.8862	29.3122	25.7266	24.8787	26.2423	26.9485	30.8736	33.8397	38.5279 (46)	
Water storage loss:												
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.0090 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.0049 (55)
Total storage loss												
0.1507	0.1361	0.1507	0.1458	0.1507	0.1458	0.1507	0.1507	0.1458	0.1507	0.1458	0.1507 (56)	
If cylinder contains dedicated solar storage												
0.1507	0.1361	0.1507	0.1458	0.1507	0.1458	0.1507	0.1507	0.1458	0.1507	0.1458	0.1507 (57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)	
Total heat required for water heating calculated for each month												
283.9436	250.6237	264.6822	228.5656	218.8277	194.1687	189.2708	198.3620	202.3143	229.2370	248.2555	280.2655 (62)	
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)	
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)	
Output from w/h	283.9436	250.6237	264.6822	228.5656	218.8277	194.1687	189.2708	198.3620	202.3143	229.2370	248.2555 (64)	
Total per year (kWh/year)												2788.5168 (64)
Electric shower(s)												2789 (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												
105.3569	93.2187	98.9524	86.5906	83.7058	75.1536	73.8781	76.9010	77.8620	87.1669	93.1375	104.1339 (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	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	136.2931	150.8960	136.2931	140.8362	136.2931	140.8362	136.2931	136.2931	140.8362	136.2931	140.8362	136.2931 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	238.0066	240.4764	234.2527	221.0031	204.2779	188.5585	178.0571	175.5873	181.8110	195.0606	211.7858	227.5052 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885 (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)	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079 (71)
Water heating gains (Table 5)	141.6087	138.7184	133.0006	120.2647	112.5078	104.3800	99.2986	103.3615	108.1417	117.1598	129.3576	139.9649 (72)
Total internal gains	578.1739	592.3562	565.8119	544.3695	515.3443	496.0403	475.9142	477.5074	493.0544	510.7790	544.2451	566.0287 (73)

6. Solar gains												
[Jan]												
	Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	
East	3.5200		19.6403		0.6300		0.7000		0.7700		21.1282 (76)	
West	6.1600		19.6403		0.6300		0.7000		0.7700		36.9743 (80)	
Solar gains	58.1025	113.6607	187.1830	272.9953	334.5660	342.4878	326.0624	280.0828	217.7016	134.8680	72.4469	47.7806 (83)
Total gains	636.2764	706.0169	752.9949	817.3648	849.9103	838.5281	801.9766	757.5902	710.7560	645.6471	616.6921	613.8093 (84)

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7. Mean internal temperature (heating season)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	56.0610	56.2464	56.4293	57.3047	57.4715	58.2610	58.2610	58.4096	57.9544	57.4715	57.1351	56.7875	21.0000 (85)
alpha	4.7374	4.7498	4.7620	4.8203	4.8314	4.8841	4.8841	4.8940	4.8636	4.8314	4.8090	4.7858	
util living area	0.9897	0.9820	0.9660	0.9152	0.8076	0.6239	0.4646	0.5095	0.7488	0.9348	0.9808	0.9913	(86)
MIT	19.9898	20.1232	20.3214	20.5958	20.8002	20.9076	20.9309	20.9280	20.8664	20.6029	20.2606	19.9756	(87)
Th 2	20.0853	20.0880	20.0907	20.1034	20.1058	20.1168	20.1168	20.1189	20.1126	20.1058	20.1010	20.0959	(88)
util rest of house	0.9871	0.9775	0.9571	0.8932	0.7611	0.5491	0.3744	0.4168	0.6793	0.9133	0.9752	0.9891	(89)
MIT 2	18.9017	19.0729	19.3243	19.6701	19.9035	20.0168	20.0332	20.0339	19.9797	19.6868	19.2587	18.8921	(90)
Living area fraction													
MIT	19.3931	19.5472	19.7745	20.0881	20.3084	20.4191	20.4386	20.4376	20.3801	20.1005	19.7112	19.3814	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3931	19.5472	19.7745	20.0881	20.3084	20.4191	20.4386	20.4376	20.3801	20.1005	19.7112	19.3814	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9847	0.9743	0.9534	0.8928	0.7724	0.5756	0.4077	0.4509	0.7017	0.9131	0.9722	0.9868	(94)
Useful gains	626.5149	687.8377	717.9407	729.7238	656.4594	482.6269	326.9756	341.6326	498.7020	589.5474	599.5578	605.7201	(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	1346.4512	1302.3681	1176.4904	976.4276	749.1096	499.5158	329.5091	345.7146	541.9448	826.7383	1103.8914	1337.0002	(97)
Space heating kWh	535.6326	412.9644	341.1610	177.6267	68.9318	0.0000	0.0000	0.0000	0.0000	176.4700	363.1202	544.0724	(98a)
Space heating requirement - total per year (kWh/year)												2619.9791	
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	535.6326	412.9644	341.1610	177.6267	68.9318	0.0000	0.0000	0.0000	0.0000	176.4700	363.1202	544.0724	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2619.9791	
Space heating per m2										(98c) / (4) =		29.2997	(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 %)													249.9000 (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	535.6326	412.9644	341.1610	177.6267	68.9318	0.0000	0.0000	0.0000	0.0000	176.4700	363.1202	544.0724	(98)
Space heating efficiency (main heating system 1)	249.9000	249.9000	249.9000	249.9000	249.9000	0.0000	0.0000	0.0000	0.0000	249.9000	249.9000	249.9000	(210)
Space heating fuel (main heating system)	214.3388	165.2519	136.5190	71.0791	27.5837	0.0000	0.0000	0.0000	0.0000	70.6162	145.3062	217.7160	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	283.9436	250.6237	264.6822	228.5656	218.8277	194.1687	189.2708	198.3620	202.3143	229.2370	248.2555	280.2655	(64)
Efficiency of water heater (217)m	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	(216)
Fuel for water heating, kWh/month	162.1608	143.1318	151.1606	130.5343	124.9730	110.8902	108.0930	113.2850	115.5421	130.9178	141.7793	160.0603	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	30.5179	24.4826	22.0439	16.1503	12.4749	10.1921	11.3801	14.7922	19.2136	25.2093	28.4739	31.3661	(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												1048.4110	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												175.1000	
Water heating fuel used												1592.5281	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												246.2970	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(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	2887.2361 (238)

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

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Space heating - main system 1	1048.4110	0.1556	163.1031 (261)
Total CO ₂ associated with community systems			0.0000 (373)
Water heating (other fuel)	1592.5281	0.1413	225.0162 (264)
Space and water heating			388.1193 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	246.2970	0.1443	35.5483 (268)
Total CO ₂ , kg/year			423.6676 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.7400 (273)

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	1048.4110	1.5760	1652.2572 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	1592.5281	1.5225	2424.5880 (278)
Space and water heating			4076.8452 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	246.2970	1.5338	377.7786 (282)
Total Primary energy kWh/year			4454.6237 (286)
Dwelling Primary energy Rate (DPER)			49.8200 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	89.4200 (1b)	x 2.5000 (2b)	= 223.5500 (1b) - (3b)
Ground floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.4200		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 223.5500 (5)
Dwelling volume			

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) = 0.1342 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3842 (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) = 0.3554 (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	0.4531	0.4442	0.4353	0.3909	0.3820	0.3376	0.3376	0.3287	0.3554	0.3820	0.3998	0.4176 (22b)
Effective ac	0.6027	0.5987	0.5948	0.5764	0.5730	0.5570	0.5570	0.5540	0.5631	0.5730	0.5799	0.5872 (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 Opening Type			9.6800	1.1450	11.0840		(27)
Heatloss Floor over void			42.2600	0.1300	5.4938		(28b)
External Wall 1	70.3250	9.6800	60.6450	0.1800	10.9161		(29a)
Main Roof	89.4200		89.4200	0.1100	9.8362		(30)

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Total net area of external elements Aum(A, m2)	202.0050			(31)
Fabric heat loss, W/K = Sum (A x U)	(26) ... (30) + (32) =	37.3301		(33)
Main dwelling				
Party Wall Between Corridor	39.7300	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 201.3453 (35)

List of Thermal Bridges				
K1 Element	Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate	5.3000	0.0500	0.2650	
E3 Sill	3.1000	0.0500	0.1550	
E4 Jamb	14.0000	0.0500	0.7000	
E7 Party floor between dwellings (in blocks of flats)	28.1300	0.0700	1.9691	
E16 Corner (normal)	5.0000	0.0900	0.4500	
E18 Party wall between dwellings	7.5000	0.0600	0.4500	
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250	
E10 Eaves (insulation at ceiling level)	13.0700	0.0600	0.7842	
E12 Gable (insulation at ceiling level)	14.7100	0.0600	0.8826	
E8 Balcony within a dwelling, wall insulation continuous	4.8800	0.0000	0.0000	
P7 Party Wall - Exposed floor (normal)	8.2500	0.1600	1.3200	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.3800	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	7.3800	0.1200	0.8856	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.6365 (36)
Point Thermal bridges 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.9666 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	44.4588	44.1648	43.8765	42.5226	42.2693	41.0901	41.0901	40.8717	41.5443	42.2693	42.7818	43.3175	(38)
Average = Sum(39)m / 12 =	89.4254	89.1313	88.8431	87.4892	87.2359	86.0567	86.0567	85.8383	86.5109	87.2359	87.7483	88.2841	(39)
												87.4880	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0001	0.9968	0.9935	0.9784	0.9756	0.9624	0.9624	0.9599	0.9675	0.9756	0.9813	0.9873	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

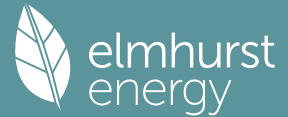
Assumed occupancy													2.6177 (42)
Hot water usage for mixer showers													
68.1099	67.0864	65.5949	62.7411	60.6351	58.2865	56.9515	58.4318	60.0544	62.5761	65.4911	67.8490	67.8490	(42a)
Hot water usage for baths													
29.4127	28.9759	28.3608	27.2266	26.3773	25.4356	24.9269	25.5378	26.2028	27.2105	28.3681	29.3133	29.3133	(42b)
Hot water usage for other uses													
41.4378	39.9310	38.4242	36.9174	35.4105	33.9037	33.9037	35.4105	36.9174	38.4242	39.9310	41.4378	41.4378	(42c)
Average daily hot water use (litres/day)													127.7361 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	138.9605	135.9933	132.3798	126.8850	122.4229	117.6258	115.7822	119.3801	123.1746	128.2108	133.7902	138.6001	(44)
Energy conte	220.0795	193.6527	203.4628	173.6992	164.8048	144.6346	140.0285	147.8174	151.8866	173.9808	190.6087	217.0143	(45)
Energy content (annual)													Total = Sum(45)m = 2121.6699
Distribution loss (46)m = 0.15 x (45)m													
33.0119	29.0479	30.5194	26.0549	24.7207	21.6952	21.0043	22.1726	22.7830	26.0971	28.5913	32.5521	32.5521	(46)
Water storage 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	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	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													
271.0056	239.6504	254.3889	222.9825	215.7308	193.9179	190.9546	198.7435	201.1699	224.9069	239.8920	267.9404	267.9404	(62)
WWHRS	-31.1370	-27.5378	-28.8360	-23.8774	-22.2529	-19.0419	-17.8488	-18.9804	-19.7015	-23.2259	-26.3121	-30.5604	(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													
239.8685	212.1126	225.5529	199.1052	193.4780	174.8760	173.1058	179.7631	181.4684	201.6810	213.5798	237.3800	237.3800	(64)
12Total per year (kWh/year)													Total per year (kWh/year) = Sum(64)m = 2431.9711 (64)
Electric shower(s)													2432 (64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)
Heat gains from water heating, kWh/month													
113.9173	101.1877	108.3923	97.1816	95.5384	87.5176	87.3003	89.8902	89.9289	98.5895	102.8040	112.8981	112.8981	(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	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	136.2931	150.8960	136.2931	140.8362	136.2931	140.8362	136.2931	136.2931	140.8362	136.2931	140.8362	136.2931	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	238.0066	240.4764	234.2527	221.0031	204.2779	188.5585	178.0571	175.5873	181.8110	195.0606	211.7858	227.5052	(68)
Pumps, fans	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885	(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	3.0000	3.0000	3.0000	(70)
Water heating gains (Table 5)	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	(71)
Total internal gains	153.1146	150.5769	145.6885	134.9745	128.4119	121.5523	117.3391	120.8201	124.9013	132.5127	142.7834	151.7448	(72)
	592.6799	607.2148	581.4998	562.0793	534.2484	513.2125	493.9548	494.9660	509.8140	529.1319	560.6709	580.8085	(73)

6. Solar gains

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[Jan]													
				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
East				3.5200	19.6403		0.6300		0.7000		0.7700		21.1282 (76)
West				6.1600	19.6403		0.6300		0.7000		0.7700		36.9743 (80)

Solar gains	58.1025	113.6607	187.1830	272.9953	334.5660	342.4878	326.0624	280.0828	217.7016	134.8680	72.4469	47.7806 (83)	
Total gains	650.7823	720.8755	768.6828	835.0746	868.8144	855.7004	820.0172	775.0488	727.5156	664.0000	633.1178	628.5892 (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	55.9259	56.1104	56.2924	57.1636	57.3296	58.1151	58.1151	58.2630	57.8100	57.3296	56.9948	56.6489	
alpha	4.7284	4.7407	4.7528	4.8109	4.8220	4.8743	4.8743	4.8842	4.8540	4.8220	4.7997	4.7766	
util living area	0.9888	0.9806	0.9635	0.9098	0.7987	0.6147	0.4559	0.5000	0.7383	0.9289	0.9789	0.9904 (86)	
MIT	19.7557	19.9332	20.1971	20.5603	20.8272	20.9634	20.9930	20.9892	20.9118	20.5725	20.1179	19.7364 (87)	
Th 2	20.0833	20.0860	20.0887	20.1014	20.1037	20.1148	20.1148	20.1168	20.1105	20.1037	20.0989	20.0939 (88)	
util rest of house	0.9860	0.9758	0.9541	0.8869	0.7513	0.5402	0.3671	0.4085	0.6683	0.9059	0.9727	0.9880 (89)	
MIT 2	18.6372	18.8638	19.1972	19.6495	19.9519	20.0914	20.1120	20.1122	20.0466	19.6739	19.1089	18.6204 (90)	
Living area fraction	fLA = Living area / (4) =												
MIT	19.1423	19.3467	19.6487	20.0608	20.3472	20.4852	20.5098	20.5082	20.4373	20.0797	19.5646	19.1244 (92)	
Temperature adjustment	0.0000												
adjusted MIT	19.1423	19.3467	19.6487	20.0608	20.3472	20.4852	20.5098	20.5082	20.4373	20.0797	19.5646	19.1244 (93)	

8. Space heating requirement													

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9822	0.9708	0.9486	0.8857	0.7650	0.5722	0.4072	0.4496	0.6955	0.9052	0.9681	0.9845 (94)	
Useful gains	639.1794	699.8408	729.1604	739.6437	664.6510	489.6534	333.8711	348.4953	505.9576	601.0499	612.9365	618.8698 (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	1327.2760	1287.6534	1168.1724	976.4502	754.3423	506.4610	336.4658	352.6410	548.2466	826.9687	1093.7462	1317.5828 (97)	
Space heating kWh	511.9439	395.0101	326.6249	170.5007	66.7303	0.0000	0.0000	0.0000	0.0000	168.0836	346.1830	519.8425 (98a)	
Space heating requirement - total per year (kWh/year)	2504.9189												
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	511.9439	395.0101	326.6249	170.5007	66.7303	0.0000	0.0000	0.0000	0.0000	168.0836	346.1830	519.8425 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)	2504.9189												
Space heating per m2	(98c) / (4) = 28.0130 (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	511.9439	395.0101	326.6249	170.5007	66.7303	0.0000	0.0000	0.0000	0.0000	168.0836	346.1830	519.8425 (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)	554.6521	427.9632	353.8732	184.7244	72.2972	0.0000	0.0000	0.0000	0.0000	182.1057	375.0628	563.2096 (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	239.8685	212.1126	225.5529	199.1052	193.4780	174.8760	173.1058	179.7631	181.4684	201.6810	213.5798	237.3800 (64)	
Efficiency of water heater (217)m	85.7157	85.4337	84.8892	83.7139	81.9295	79.8000	79.8000	79.8000	79.8000	83.6540	85.1364	79.8000 (216)	
Fuel for water heating, kWh/month	279.8422	248.2775	265.7026	237.8399	236.1519	219.1428	216.9245	225.2671	227.4040	241.0893	250.8679	276.7711 (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	28.3190	22.7186	20.4556	14.9866	11.5761	9.4578	10.5601	13.7264	17.8293	23.3929	26.4223	29.1061 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-41.4041	-58.1363	-83.2068	-93.1125	-100.0029	-93.1739	-92.0222	-87.0897	-78.2943	-66.2940	-45.4377	-35.8240 (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	-24.0601	-50.5557	-100.3899	-150.6478	-199.0777	-200.0044	-197.6489	-167.3898	-122.7480	-72.2478	-32.1054	-19.0298 (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													

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Space heating fuel - main system 1	2713.8883	(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	2925.2808	(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)	228.5507	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2209.9038	(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	3743.8160	(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	2713.8883	0.2100	569.9165	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2925.2808	0.2100	614.3090	(264)
Space and water heating			1184.2255	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	228.5507	0.1443	32.9869	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-873.9985	0.1347	-117.7145	
PV Unit electricity exported	-1335.9052	0.1259	-168.2183	
Total			-285.9328	(269)
Total CO2, kg/year			943.2089	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.5500	(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	2713.8883	1.1300	3066.6937	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2925.2808	1.1300	3305.5673	(278)
Space and water heating			6372.2610	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	228.5507	1.5338	350.5587	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-873.9985	1.4978	-1309.0563	
PV Unit electricity exported	-1335.9052	0.4622	-617.4781	
Total			-1926.5344	(283)
Total Primary energy kWh/year			4926.3861	(286)
Target Primary Energy Rate (TPER)			55.0900	(287)

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

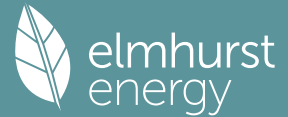
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling	89.4200	2.5000	223.5500	(1b) - (3b)
Ground floor				
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.4200			(4)
Dwelling volume				(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	Air changes per hour	
Pressure test	30.0000 / (5) =	0.1342 (8)
Pressure Test Method	Yes	
Measured/design AP50	Blower Door	
Infiltration rate	5.0000	(17)
Number of sides sheltered	0.3842	(18)
	1	(19)

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Shelter factor (20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3554 (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	0.4531	0.4442	0.4353	0.3909	0.3820	0.3376	0.3376	0.3287	0.3554	0.3820	0.3998	0.4176	(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	0.6027	0.5987	0.5948	0.5764	0.5730	0.5570	0.5570	0.5540	0.5631	0.5730	0.5799	0.5872	(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			9.6800	0.9615	9.3077			(27)
Heatloss Floor over void			42.2600	0.1200	5.0712	20.0000	845.2000	(28b)
External Wall 1	70.3250	9.6800	60.6450	0.1800	10.9161	110.0000	6670.9500	(29a)
Main Roof	89.4200		89.4200	0.1100	9.8362	9.0000	804.7800	(30)
Total net area of external elements Aum(A, m2)			202.0050					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	35.1312		(33)
Main dwelling								
Party Wall Between Corridor			39.7300	0.0000	0.0000	180.0000	7151.4000	(32)
Party Floor 1			46.1400			30.0000	1384.2000	(32d)
Internal Wall 1			127.5300			9.0000	1147.7700	(32c)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K (28)...(30) + (32) + (32a)...(32e) = 18004.3000 (34)
List of Thermal Bridges 201.3453 (35)

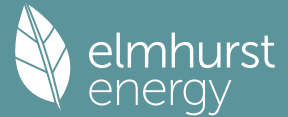
	Length	Psi-value	Total	
K1 Element				
E1 Steel lintel with perforated steel base plate	5.3000	0.3050	1.6165	
E3 Sill	3.1000	0.0240	0.0744	
E4 Jamb	14.0000	0.0240	0.3360	
E7 Party floor between dwellings (in blocks of flats)	28.1300	0.0330	0.9283	
E16 Corner (normal)	5.0000	0.0400	0.2000	
E18 Party wall between dwellings	7.5000	0.0300	0.2250	
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0860	-0.2150	
E10 Eaves (insulation at ceiling level)	13.0700	0.0820	1.0717	
E12 Gable (insulation at ceiling level)	14.7100	0.0460	0.6767	
E8 Balcony within a dwelling, wall insulation continuous	4.8800	0.1000	0.4880	
P7 Party Wall - Exposed floor (normal)	8.2500	0.4800	3.9600	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.3800	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	7.3800	0.0350	0.2583	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			9.6199	(36)
Point Thermal bridges			0.0000	(36a) =
Total fabric heat loss			44.7511	(33) + (36) + (36a) =

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	44.4588	44.1648	43.8765	42.5226	42.2693	41.0901	41.0901	40.8717	41.5443	42.2693	42.7818	43.3175	(38)
Average = Sum(39)m / 12 =	89.2099	88.9158	88.6276	87.2737	87.0204	85.8412	85.8412	85.6228	86.2954	87.0204	87.5328	88.0686	(39)
												87.2725	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9977	0.9944	0.9911	0.9760	0.9732	0.9600	0.9600	0.9575	0.9651	0.9732	0.9789	0.9849	(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													2.6177 (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	29.4127	28.9759	28.3608	27.2266	26.3773	25.4356	24.9269	25.5378	26.2028	27.2105	28.3681	29.3133	(42b)
Hot water usage for other uses	41.4378	39.9310	38.4242	36.9174	35.4105	33.9037	33.9037	35.4105	36.9174	38.4242	39.9310	41.4378	(42c)
Average daily hot water use (litres/day)													64.9410 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	70.8506	68.9069	66.7850	64.1439	61.7878	59.3393	58.8306	60.9483	63.1202	65.6347	68.2991	70.7511	(44)
Energy content (annual)	112.2100	98.1225	102.6460	87.8098	83.1783	72.9646	71.1505	75.4667	77.8335	89.0657	97.3046	110.7792	(45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	95.3785	83.4042	87.2491	74.6384	70.7015	62.0199	60.4780	64.1467	66.1585	75.7058	82.7089	94.1623	(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	95.3785	83.4042	87.2491	74.6384	70.7015	62.0199	60.4780	64.1467	66.1585	75.7058	82.7089	94.1623	(64)
12Total per year (kWh/year)													916.7517 (64)
Electric shower(s)	54.5447	48.5998	53.0691	50.6432	51.5935	49.2152	50.8557	51.5935	50.6432	53.0691	52.0712	54.5447	(64a)
Heat gains from water heating, kWh/month	37.4808	33.0010	35.0796	31.3204	30.5738	27.8088	27.8334	28.9351	29.2004	32.1937	33.6950	37.1768	(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	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	136.2931	150.8960	136.2931	140.8362	136.2931	140.8362	136.2931	136.2931	140.8362	136.2931	140.8362	136.2931 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	238.0066	240.4764	234.2527	221.0031	204.2779	188.5585	178.0571	175.5873	181.8110	195.0606	211.7858	227.5052 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885 (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)	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079 (71)
Water heating gains (Table 5)	50.3774	49.1086	47.1499	43.5005	41.0938	38.6233	37.4105	38.8912	40.5561	43.2711	46.7986	49.9688 (72)
Total internal gains	486.9427	502.7464	479.9612	467.6053	443.9303	430.2835	414.0262	413.0371	425.4689	436.8903	461.6862	476.0325 (73)

6. Solar gains

[Jan]	Area m ²		Solar flux Table 6a W/m ²		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
East	3.5200		19.6403		0.6300		0.7000		0.7700		21.1282 (76)	
West	6.1600		19.6403		0.6300		0.7000		0.7700		36.9743 (80)	
Solar gains	58.1025	113.6607	187.1830	272.9953	334.5660	342.4878	326.0624	280.0828	217.7016	134.8680	72.4469	47.7806 (83)
Total gains	545.0451	616.4072	667.1442	740.6006	778.4962	772.7714	740.0885	693.1199	643.1705	571.7584	534.1331	523.8131 (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	56.0610	56.2464	56.4293	57.3047	57.4715	58.2610	58.2610	58.4096	57.9544	57.4715	57.1351	56.7875
alpha	4.7374	4.7498	4.7620	4.8203	4.8314	4.8841	4.8841	4.8940	4.8636	4.8314	4.8090	4.7858
util living area	0.9946	0.9895	0.9783	0.9381	0.8442	0.6661	0.5008	0.5522	0.7960	0.9570	0.9892	0.9955 (86)
MIT	19.6118	19.7956	20.0723	20.4683	20.7760	20.9488	20.9896	20.9836	20.8768	20.4730	19.9875	19.5926 (87)
Th 2	20.0853	20.0880	20.0907	20.1034	20.1058	20.1168	20.1168	20.1189	20.1126	20.1058	20.1010	20.0959 (88)
util rest of house	0.9931	0.9867	0.9723	0.9207	0.8017	0.5898	0.4049	0.4538	0.7301	0.9413	0.9859	0.9943 (89)
MIT 2	18.8154	19.0000	19.2753	19.6678	19.9477	20.0906	20.1135	20.1132	20.0399	19.6801	19.2016	18.8046 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.1750	19.3593	19.6352	20.0293	20.3217	20.4781	20.5091	20.5062	20.4178	20.0382	19.5565	19.1604 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.1750	19.3593	19.6352	20.0293	20.3217	20.4781	20.5091	20.5062	20.4178	20.0382	19.5565	19.1604 (93)

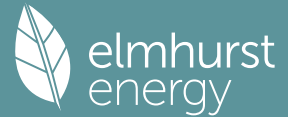
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9912	0.9839	0.9686	0.9190	0.8129	0.6222	0.4482	0.4981	0.7545	0.9399	0.9832	0.9927 (94)
Useful gains	540.2734	606.4916	646.1972	680.6281	632.8098	480.8124	331.6736	345.2183	485.2897	537.4098	525.1821	519.9758 (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	1327.0013	1285.6606	1164.1423	971.2969	750.2650	504.5854	335.5628	351.5871	545.1976	821.3125	1090.3500	1317.5415 (97)
Space heating kWh	585.3255	456.4015	385.3511	209.2815	87.3867	0.0000	0.0000	0.0000	0.0000	211.2236	406.9209	593.3888 (98a)
Space heating requirement - total per year (kWh/year)	2935.2797											
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	585.3255	456.4015	385.3511	209.2815	87.3867	0.0000	0.0000	0.0000	0.0000	211.2236	406.9209	593.3888 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2935.2797											
Space heating per m ²	(98c) / (4) = 32.8258 (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	806.9072	635.2248	650.7334	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8453	0.9111	0.8838	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	682.1055	578.7247	575.1132	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	837.9674	802.8425	750.7582	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	112.2205	166.7437	130.6798	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	28.0551	41.6859	32.6700	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement	102.4110 (107)											
Energy for space heating	32.8258 (99)											
Energy for space cooling	1.1453 (108)											
Total	33.9710 (109)											
Fabric Energy Efficiency (DFEE)	34.0 (109)											

Full SAP Calculation Printout



SAP 10 WORKSHEET FOR New Build (As Designed) (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	89.4200 (1b)	x 2.5000 (2b)	= 223.5500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 223.5500 (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) = 0.1342 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3842 (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) = 0.3554 (21)

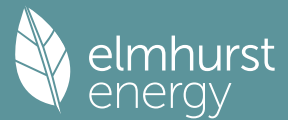
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4531	0.4442	0.4353	0.3909	0.3820	0.3376	0.3376	0.3287	0.3554	0.3820	0.3998	0.4176 (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	0.6027	0.5987	0.5948	0.5764	0.5730	0.5570	0.5570	0.5540	0.5631	0.5730	0.5799	0.5872 (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 Opening Type			9.6800	1.1450	11.0840		(27)
Heatloss Floor over void			42.2600	0.1300	5.4938		(28b)
External Wall 1	70.3250	9.6800	60.6450	0.1800	10.9161		(29a)
Main Roof	89.4200		89.4200	0.1100	9.8362		(30)
Total net area of external elements Aum (A, m ²)			202.0050				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		37.3301		(33)
Main dwelling							
Party Wall Between Corridor			39.7300	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							201.3453 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate				5.3000	0.0500	0.2650	
E3 Sill				3.1000	0.0500	0.1550	
E4 Jamb				14.0000	0.0500	0.7000	
E7 Party floor between dwellings (in blocks of flats)				28.1300	0.0700	1.9691	
E16 Corner (normal)				5.0000	0.0900	0.4500	
E18 Party wall between dwellings				7.5000	0.0600	0.4500	
E17 Corner (inverted - internal area greater than external area)				2.5000	-0.0900	-0.2250	
E10 Eaves (insulation at ceiling level)				13.0700	0.0600	0.7842	
E12 Gable (insulation at ceiling level)				14.7100	0.0600	0.8826	
E8 Balcony within a dwelling, wall insulation continuous				4.8800	0.0000	0.0000	
P7 Party Wall - Exposed floor (normal)				8.2500	0.1600	1.3200	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				7.3800	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)				7.3800	0.1200	0.8856	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.6365 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	44.9666 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	44.4588	44.1648	43.8765	42.5226	42.2693	41.0901	41.0901	40.8717	41.5443	42.2693	42.7818	43.3175 (38)
Heat transfer coeff	89.4254	89.1313	88.8431	87.4892	87.2359	86.0567	86.0567	85.8383	86.5109	87.2359	87.7483	88.2841 (39)
Average = Sum(39)m / 12 =												87.4880
HLP	1.0001	0.9968	0.9935	0.9784	0.9756	0.9624	0.9624	0.9599	0.9675	0.9756	0.9813	0.9873 (40)
HLP (average)												0.9784
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												2.6177 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
Hot water usage for other uses	29.4127	28.9759	28.3608	27.2266	26.3773	25.4356	24.9269	25.5378	26.2028	27.2105	28.3681	29.3133 (42c)
Average daily hot water use (litres/day)	41.4378	39.9310	38.4242	36.9174	35.4105	33.9037	33.9037	35.4105	36.9174	38.4242	39.9310	41.4378 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	70.8506	68.9069	66.7850	64.1439	61.7878	59.3393	58.8306	60.9483	63.1202	65.6347	68.2991	70.7511 (44)
Distribution loss (46)m = 0.15 x (45)m	112.2100	98.1225	102.6460	87.8098	83.1783	72.9646	71.1505	75.4667	77.8335	89.0657	97.3046	110.7792 (45)
Water storage loss:												Total = Sum(45)m = 1078.5314
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 (46)
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	95.3785	83.4042	87.2491	74.6384	70.7015	62.0199	60.4780	64.1467	66.1585	75.7058	82.7089	94.1623 (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	95.3785	83.4042	87.2491	74.6384	70.7015	62.0199	60.4780	64.1467	66.1585	75.7058	82.7089	94.1623 (64)
12Total per year (kWh/year)												916.7517 (64)
Electric shower(s)	54.5447	48.5998	53.0691	50.6432	51.5935	49.2152	50.8557	51.5935	50.6432	53.0691	52.0712	54.5447 (64a)
Heat gains from water heating, kWh/month	37.4808	33.0010	35.0796	31.3204	30.5738	27.8088	27.8334	28.9351	29.2004	32.1937	33.6950	37.1768 (65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 620.4429 (64a)												917 (64)

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	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849	130.8849 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	136.2931	150.8960	136.2931	140.8362	136.2931	140.8362	136.2931	136.2931	140.8362	136.2931	140.8362	136.2931 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	238.0066	240.4764	234.2527	221.0031	204.2779	188.5585	178.0571	175.5873	181.8110	195.0606	211.7858	227.5052 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885	36.0885 (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)	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079 (71)
Water heating gains (Table 5)	50.3774	49.1086	47.1499	43.5005	41.0938	38.6233	37.4105	38.8912	40.5561	43.2711	46.7986	49.9688 (72)
Total internal gains	486.9427	502.7464	479.9612	467.6053	443.9303	430.2835	414.0262	413.0371	425.4689	436.8903	461.6862	476.0325 (73)

6. Solar gains

[Jan]						Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East						3.5200	19.6403	0.6300	0.7000	0.7700	21.1282 (76)	
West						6.1600	19.6403	0.6300	0.7000	0.7700	36.9743 (80)	
Solar gains	58.1025	113.6607	187.1830	272.9953	334.5660	342.4878	326.0624	280.0828	217.7016	134.8680	72.4469	47.7806 (83)
Total gains	545.0451	616.4072	667.1442	740.6006	778.4962	772.7714	740.0885	693.1199	643.1705	571.7584	534.1331	523.8131 (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	55.9259	56.1104	56.2924	57.1636	57.3296	58.1151	58.1151	58.2630	57.8100	57.3296	56.9948	56.6489
alpha	4.7284	4.7407	4.7528	4.8109	4.8220	4.8743	4.8743	4.8842	4.8540	4.8220	4.7997	4.7766
util living area	0.9946	0.9895	0.9784	0.9384	0.8449	0.6672	0.5019	0.5534	0.7968	0.9572	0.9892	0.9955 (86)
MIT	19.6072	19.7912	20.0682	20.4651	20.7739	20.9481	20.9894	20.9833	20.8755	20.4701	19.9836	19.5880 (87)
Th 2	20.0833	20.0860	20.0887	20.1014	20.1037	20.1148	20.1148	20.1168	20.1105	20.1037	20.0989	20.0939 (88)
util rest of house	0.9931	0.9868	0.9724	0.9210	0.8024	0.5908	0.4056	0.4546	0.7310	0.9416	0.9859	0.9943 (89)
MIT 2	18.8094	18.9941	19.2698	19.6631	19.9442	20.0882	20.1114	20.1110	20.0370	19.6758	19.1962	18.7985 (90)
Living area fraction	19.1697	19.3540	19.6304	20.0252	20.3189	20.4765	20.5079	20.5049	20.4157	20.0345	19.5518	19.1550 (91)
MIT	19.1697	19.3540	19.6304	20.0252	20.3189	20.4765	20.5079	20.5049	20.4157	20.0345	19.5518	19.1550 (92)
Temperature adjustment	19.1697	19.3540	19.6304	20.0252	20.3189	20.4765	20.5079	20.5049	20.4157	20.0345	19.5518	19.1550 (93)
adjusted MIT	19.1697	19.3540	19.6304	20.0252	20.3189	20.4765	20.5079	20.5049	20.4157	20.0345	19.5518	19.1550 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9912	0.9839	0.9687	0.9193	0.8135	0.6232	0.4490	0.4990	0.7553	0.9401	0.9833	0.9927 (94)
	540.2748	606.5042	646.2440	680.8278	633.3189	481.5884	332.3355	345.8785	485.8084	537.5144	525.1947	519.9761 (95)

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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 (96)
Heat loss rate W	1329.7279	1288.3084	1166.5423	973.3391	751.8745	505.7102	336.2992	352.3609	546.3739	823.0244	1092.6237	1320.2890 (97)
Space heating kWh	587.3531	458.1724	387.1020	210.6081	88.2054	0.0000	0.0000	0.0000	0.0000	212.4195	408.5489	595.4328 (98a)
Space heating requirement - total per year (kWh/year)												2947.8421
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	587.3531	458.1724	387.1020	210.6081	88.2054	0.0000	0.0000	0.0000	0.0000	212.4195	408.5489	595.4328 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2947.8421
Space heating per m2												32.9663 (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	808.9328	636.8194	652.3711	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8441	0.9101	0.8827	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	682.7863	579.5660	575.8308	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	837.9674	802.8425	750.7582	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	111.7304	166.1178	130.1460	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	27.9326	41.5294	32.5365	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												101.9985 (107)
Energy for space heating												32.9663 (99)
Energy for space cooling												1.1407 (108)
Total												34.1069 (109)
Fabric Energy Efficiency (TFEE)												34.1 (109)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	89.4200	2.5000	223.5500
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.4200		
Dwelling volume			

2. Ventilation rate

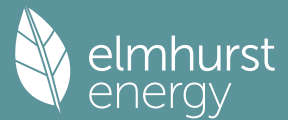
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) = 0.1342 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3842 (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) = 0.3554 (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	0.4531	0.4442	0.4353	0.3909	0.3820	0.3376	0.3376	0.3287	0.3554	0.3820	0.3998	0.4176 (22b)
Effective ac	0.6027	0.5987	0.5948	0.5764	0.5730	0.5570	0.5570	0.5540	0.5631	0.5730	0.5799	0.5872 (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			9.6800	0.9615	9.3077		(27)
Heatloss Floor over void			42.2600	0.1200	5.0712	20.0000	845.2000 (28b)
External Wall 1	70.3250	9.6800	60.6450	0.1800	10.9161	110.0000	6670.9500 (29a)
Main Roof	89.4200		89.4200	0.1100	9.8362	9.0000	804.7800 (30)

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Total net area of external elements Aum(A, m2)	202.0050												(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	35.1312											(33)
Main dwelling													
Party Wall Between Corridor	39.7300	0.0000	0.0000	180.0000	7151.4000								(32)
Party Floor 1	46.1400			30.0000	1384.2000								(32d)
Internal Wall 1	127.5300			9.0000	1147.7700								(32c)
Heat capacity Cm = Sum(A x k)													
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	(28)...(30) + (32) + (32a)...(32e) =	18004.3000											(34)
List of Thermal Bridges													(35)
K1 Element				Length	Psi-value	Total							
E1 Steel lintel with perforated steel base plate				5.3000	0.3050	1.6165							
E3 Sill				3.1000	0.0240	0.0744							
E4 Jamb				14.0000	0.0240	0.3360							
E7 Party floor between dwellings (in blocks of flats)				28.1300	0.0330	0.9283							
E16 Corner (normal)				5.0000	0.0400	0.2000							
E18 Party wall between dwellings				7.5000	0.0300	0.2250							
E17 Corner (inverted - internal area greater than external area)				2.5000	-0.0860	-0.2150							
E10 Eaves (insulation at ceiling level)				13.0700	0.0820	1.0717							
E12 Gable (insulation at ceiling level)				14.7100	0.0460	0.6767							
E8 Balcony within a dwelling, wall insulation continuous				4.8800	0.1000	0.4880							
P7 Party Wall - Exposed floor (normal)				8.2500	0.4800	3.9600							
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				7.3800	0.0000	0.0000							
P4 Party wall - Roof (insulation at ceiling level)				7.3800	0.0350	0.2583							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)						9.6199							(36)
Point Thermal bridges						(36a) =							
Total fabric heat loss						(33) + (36) + (36a) =							(37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	44.4588	44.1648	43.8765	42.5226	42.2693	41.0901	41.0901	40.8717	41.5443	42.2693	42.7818	43.3175	(38)
Average = Sum(39)m / 12 =	89.2099	88.9158	88.6276	87.2737	87.0204	85.8412	85.8412	85.6228	86.2954	87.0204	87.5328	88.0686	(39)
													87.2725
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9977	0.9944	0.9911	0.9760	0.9732	0.9600	0.9600	0.9575	0.9651	0.9732	0.9789	0.9849	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

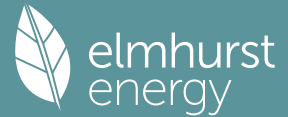
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6177 (42)
Hot water usage for mixer showers													
Hot water usage for baths	93.6512	92.2438	90.1929	86.2690	83.3732	80.1439	78.3084	80.3437	82.5748	86.0421	90.0503	93.2924	(42a)
Hot water usage for other uses	29.4127	28.9759	28.3608	27.2266	26.3773	25.4356	24.9269	25.5378	26.2028	27.2105	28.3681	29.3133	(42b)
Average daily hot water use (litres/day)	41.4378	39.9310	38.4242	36.9174	35.4105	33.9037	33.9037	35.4105	36.9174	38.4242	39.9310	41.4378	(42c)
													151.2843 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	164.5018	161.1507	156.9779	150.4129	145.1611	139.4832	137.1390	141.2920	145.6950	151.6768	158.3494	164.0435	(44)
Energy content (annual)	260.5306	229.4765	241.2692	205.9078	195.4147	171.5109	165.8577	174.9490	179.6565	205.8240	225.5977	256.8525	(45)
Distribution loss (46)m = 0.15 x (45)m													
Water storage loss:	39.0796	34.4215	36.1904	30.8862	29.3122	25.7266	24.8787	26.2423	26.9485	30.8736	33.8397	38.5279	(46)
Store volume													200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													0.0090 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.0049 (55)
Total storage loss	0.1507	0.1361	0.1507	0.1458	0.1507	0.1458	0.1507	0.1507	0.1458	0.1507	0.1458	0.1507	(56)
If cylinder contains dedicated solar storage													
Primary loss	0.1507	0.1361	0.1507	0.1458	0.1507	0.1458	0.1507	0.1507	0.1458	0.1507	0.1458	0.1507	(57)
Combi loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
WWHRS	283.9436	250.6237	264.6822	228.5656	218.8277	194.1687	189.2708	198.3620	202.3143	229.2370	248.2555	280.2655	(62)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Electric shower(s)	283.9436	250.6237	264.6822	228.5656	218.8277	194.1687	189.2708	198.3620	202.3143	229.2370	248.2555	280.2655	(64)
													2788.5168 (64)
Total per year (kWh/year) = Sum(64)m =													
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)

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	157.0619	157.0619	157.0619	157.0619	157.0619	157.0619	157.0619	157.0619	157.0619	157.0619	157.0619	157.0619	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	34.8659	30.9676	25.1845	19.0663	14.2523	12.0324	13.0014	16.8997	22.6828	28.8010	33.6150	35.8349	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	355.2338	358.9200	349.6309	329.8554	304.8924	281.4307	265.7568	262.0706	271.3597	291.1352	316.0982	339.5599	(68)
Pumps, fans	53.3239	53.3239	53.3239	53.3239	53.3239	53.3239	53.3239	53.3239	53.3239	53.3239	53.3239	53.3239	(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)	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	(71)
Total internal gains	141.6087	138.7184	133.0006	120.2647	112.5078	104.3800	99.2986	103.3615	108.1417	117.1598	129.3576	139.9649	(72)
	637.3862	634.2838	613.4938	574.8642	537.3303	503.5209	483.7346	488.0097	507.8621	542.7739	584.7487	621.0376	(73)

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6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
East				3.5200	19.6403	0.6300	0.7000	0.7700	21.1282 (76)			
West				6.1600	19.6403	0.6300	0.7000	0.7700	36.9743 (80)			
Solar gains	58.1025	113.6607	187.1830	272.9953	334.5660	342.4878	326.0624	280.0828	217.7016	134.8680	72.4469	47.7806 (83)
Total gains	695.4887	747.9445	800.6769	847.8595	871.8963	846.0087	809.7970	768.0925	725.5637	677.6419	657.1956	668.8182 (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	56.0610	56.2464	56.4293	57.3047	57.4715	58.2610	58.2610	58.4096	57.9544	57.4715	57.1351	56.7875
alpha	4.7374	4.7498	4.7620	4.8203	4.8314	4.8841	4.8841	4.8940	4.8636	4.8314	4.8090	4.7858
util living area	0.9854	0.9776	0.9576	0.9052	0.7963	0.6194	0.4603	0.5031	0.7386	0.9238	0.9755	0.9876 (86)
MIT	20.0508	20.1648	20.3647	20.6172	20.8088	20.9085	20.9312	20.9285	20.8705	20.6277	20.3006	20.0330 (87)
Th 2	20.0853	20.0880	20.0907	20.1034	20.1058	20.1168	20.1168	20.1189	20.1126	20.1058	20.1010	20.0959 (88)
util rest of house	0.9818	0.9721	0.9470	0.8815	0.7487	0.5448	0.3709	0.4113	0.6687	0.8996	0.9686	0.9846 (89)
MIT 2	18.9789	19.1250	19.3773	19.6946	19.9120	20.0174	20.0333	20.0341	19.9831	19.7152	19.3084	18.9647 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.4629	19.5946	19.8232	20.1112	20.3170	20.4198	20.4387	20.4380	20.3838	20.1273	19.7565	19.4471 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.4629	19.5946	19.8232	20.1112	20.3170	20.4198	20.4387	20.4380	20.3838	20.1273	19.7565	19.4471 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9787	0.9685	0.9433	0.8817	0.7607	0.5712	0.4039	0.4451	0.6914	0.9003	0.9653	0.9818 (94)
Useful gains	680.7049	724.3890	755.3102	747.5600	663.2554	483.2286	327.0897	341.8840	501.6655	610.0920	634.3995	656.6554 (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	1352.6846	1306.5791	1180.8008	978.4456	749.8533	499.5796	329.5220	345.7425	542.2638	829.0651	1107.8583	1342.7924 (97)
Space heating kWh	499.9529	391.2317	316.5650	166.2376	64.4288	0.0000	0.0000	0.0000	0.0000	162.9160	340.8903	510.4859 (98a)
Space heating requirement - total per year (kWh/year)	2452.7082											
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	499.9529	391.2317	316.5650	166.2376	64.4288	0.0000	0.0000	0.0000	0.0000	162.9160	340.8903	510.4859 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2452.7082											
Space heating per m2	(98c) / (4) = 27.4291 (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 %)												249.9000 (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	499.9529	391.2317	316.5650	166.2376	64.4288	0.0000	0.0000	0.0000	0.0000	162.9160	340.8903	510.4859 (98)
Space heating efficiency (main heating system 1)	249.9000	249.9000	249.9000	249.9000	249.9000	0.0000	0.0000	0.0000	0.0000	249.9000	249.9000	249.9000 (210)
Space heating fuel (main heating system)	200.0612	156.5553	126.6767	66.5217	25.7818	0.0000	0.0000	0.0000	0.0000	65.1925	136.4107	204.2761 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	283.9436	250.6237	264.6822	228.5656	218.8277	194.1687	189.2708	198.3620	202.3143	229.2370	248.2555	280.2655 (64)
Efficiency of water heater (217)m	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000 (216)
Fuel for water heating, kWh/month	162.1608	143.1318	151.1606	130.5343	124.9730	110.8902	108.0930	113.2850	115.5421	130.9178	141.7793	160.0603 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	30.5179	24.4826	22.0439	16.1503	12.4749	10.1921	11.3801	14.7922	19.2136	25.2093	28.4739	31.3661 (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)												

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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	0.0000	(235d)
Annual totals kWh/year														
Space heating fuel - main system 1													981.4759	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													175.1000	
Water heating fuel used													1592.5281	(219)
Space cooling fuel													0.0000	(221)
Electricity for pumps and fans:														
Total electricity for the above, kWh/year													0.0000	(231)
Electricity for lighting (calculated in Appendix L)													246.2970	(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													2820.3010	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	981.4759	14.0400	137.7992	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1592.5281	14.0400	223.5909	(247)
Energy for instantaneous electric shower(s)	0.0000	14.0400	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	246.2970	16.4900	40.6144	(250)
Additional standing charges			26.0000	(251)
Total energy cost			428.0045	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1463	(257)
SAP value		81.4190	
SAP rating (Section 12)		81	(258)
SAP band		B	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	981.4759	0.1556	152.7173	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1592.5281	0.1413	225.0162	(264)
Space and water heating			377.7336	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	246.2970	0.1443	35.5483	(268)
Total CO2, kg/year			413.2818	(272)
CO2 emissions per m2			4.6200	(273)
EI value			95.8801	
EI rating			96	(274)
EI band			A	

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

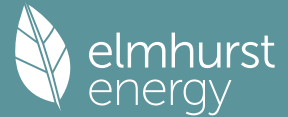
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling	89.4200	2.5000	223.5500	(1b) - (3b)
Ground floor				(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.4200			
Dwelling volume			223.5500	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Air changes per hour		

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Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 30.0000 / (5) = 0.1342 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 5.0000 (17)
Infiltration rate 0.3842 (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) = 0.3554 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	4.6000	4.5000	4.6000	4.1000	4.3000	3.7000	3.6000	3.7000	3.7000	4.2000	4.1000	4.3000	(22)
Wind factor	1.1500	1.1250	1.1500	1.0250	1.0750	0.9250	0.9000	0.9250	0.9250	1.0500	1.0250	1.0750	(22a)
Adj infiltr rate													
Effective ac	0.4087	0.3998	0.4087	0.3643	0.3820	0.3287	0.3198	0.3287	0.3287	0.3732	0.3643	0.3820	(22b)
	0.5835	0.5799	0.5835	0.5663	0.5730	0.5540	0.5512	0.5540	0.5540	0.5696	0.5663	0.5730	(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			9.6800	0.9615	9.3077			(27)
Heatloss Floor over void			42.2600	0.1200	5.0712	20.0000	845.2000	(28b)
External Wall 1	70.3250	9.6800	60.6450	0.1800	10.9161	110.0000	6670.9500	(29a)
Main Roof	89.4200		89.4200	0.1100	9.8362	9.0000	804.7800	(30)
Total net area of external elements Aum(A, m2)			202.0050					(31)
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	35.1312			(33)
Main dwelling								
Party Wall Between Corridor			39.7300	0.0000	0.0000	180.0000	7151.4000	(32)
Party Floor 1			46.1400			30.0000	1384.2000	(32d)
Internal Wall 1			127.5300			9.0000	1147.7700	(32c)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K (28)...(30) + (32) + (32a)...(32e) = 18004.3000 (34)
List of Thermal Bridges 201.3453 (35)

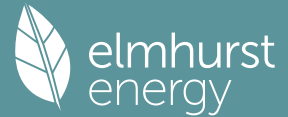
K1 Element	Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate	5.3000	0.3050	1.6165	
E3 Sill	3.1000	0.0240	0.0744	
E4 Jamb	14.0000	0.0240	0.3360	
E7 Party floor between dwellings (in blocks of flats)	28.1300	0.0330	0.9283	
E16 Corner (normal)	5.0000	0.0400	0.2000	
E18 Party wall between dwellings	7.5000	0.0300	0.2250	
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0860	-0.2150	
E10 Eaves (insulation at ceiling level)	13.0700	0.0820	1.0717	
E12 Gable (insulation at ceiling level)	14.7100	0.0460	0.6767	
E8 Balcony within a dwelling, wall insulation continuous	4.8800	0.1000	0.4880	
P7 Party Wall - Exposed floor (normal)	8.2500	0.4800	3.9600	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.3800	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	7.3800	0.0350	0.2583	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				9.6199 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	44.7511 (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	
	43.0467	42.7818	43.0467	41.7802	42.2693	40.8717	40.6592	40.8717	40.8717	42.0218	41.7802	42.2693	(38)
Heat transfer coeff	87.7978	87.5328	87.7978	86.5312	87.0204	85.6228	85.4103	85.6228	85.6228	86.7729	86.5312	87.0204	(39)
Average = Sum(39)m / 12 =												86.6069	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9819	0.9789	0.9819	0.9677	0.9732	0.9575	0.9552	0.9575	0.9575	0.9704	0.9677	0.9732	(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													2.6177 (42)
Hot water usage for mixer showers													
	93.6512	92.2438	90.1929	86.2690	83.3732	80.1439	78.3084	80.3437	82.5748	86.0421	90.0503	93.2924	(42a)
Hot water usage for baths													
	29.4127	28.9759	28.3608	27.2266	26.3773	25.4356	24.9269	25.5378	26.2028	27.2105	28.3681	29.3133	(42b)
Hot water usage for other uses													
	41.4378	39.9310	38.4242	36.9174	35.4105	33.9037	33.9037	35.4105	36.9174	38.4242	39.9310	41.4378	(42c)
Average daily hot water use (litres/day)												151.2843	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	164.5018	161.1507	156.9779	150.4129	145.1611	139.4832	137.1390	141.2920	145.6950	151.6768	158.3494	164.0435	(44)
Energy conte	260.5306	229.4765	241.2692	205.9078	195.4147	171.5109	165.8577	174.9490	179.6565	205.8240	225.5977	256.8525	(45)
Energy content (annual)										Total = Sum(45)m =		2512.8469	
Distribution loss (46)m = 0.15 x (45)m													
	39.0796	34.4215	36.1904	30.8862	29.3122	25.7266	24.8787	26.2423	26.9485	30.8736	33.8397	38.5279	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.0090	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.0049	(55)
Total storage loss													
	0.1507	0.1361	0.1507	0.1458	0.1507	0.1458	0.1507	0.1507	0.1458	0.1507	0.1458	0.1507	(56)
If cylinder contains dedicated solar storage													
	0.1507	0.1361	0.1507	0.1458	0.1507	0.1458	0.1507	0.1507	0.1458	0.1507	0.1458	0.1507	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	283.9436	250.6237	264.6822	228.5656	218.8277	194.1687	189.2708	198.3620	202.3143	229.2370	248.2555	280.2655	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	283.9436	250.6237	264.6822	228.5656	218.8277	194.1687	189.2708	198.3620	202.3143	229.2370	248.2555	280.2655	(64)
Total per year (kWh/year) = Sum(64)m =												2788.5168	(64)

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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	105.3569	93.2187	98.9524	86.5906	83.7058	75.1536	73.8781	76.9010	77.8620	87.1669	93.1375	104.1339 (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	157.0619	157.0619	157.0619	157.0619	157.0619	157.0619	157.0619	157.0619	157.0619	157.0619	157.0619	157.0619	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.8659	30.9676	25.1845	19.0663	14.2523	12.0324	13.0014	16.8997	22.6828	28.8010	33.6150	35.8349	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	355.2338	358.9200	349.6309	329.8554	304.8924	281.4307	265.7568	262.0706	271.3597	291.1352	316.0982	339.5599	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.3239	53.3239	53.3239	53.3239	53.3239	53.3239	53.3239	53.3239	53.3239	53.3239	53.3239	53.3239	(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)	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	(71)
Water heating gains (Table 5)	141.6087	138.7184	133.0006	120.2647	112.5078	104.3800	99.2986	103.3615	108.1417	117.1598	129.3576	139.9649	(72)
Total internal gains	637.3862	634.2838	613.4938	574.8642	537.3303	503.5209	483.7346	488.0097	507.8621	542.7739	584.7487	621.0376	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W	
East					3.5200	16.6187	0.6300	0.7000			0.7700	17.8777 (76)	
West					6.1600	16.6187	0.6300	0.7000			0.7700	31.2859 (80)	

Solar gains	49.1636	101.0318	175.4841	260.2555	311.9131	325.3634	303.6348	256.8912	206.3433	124.6508	63.6655	43.2301 (83)	
Total gains	686.5498	735.3156	788.9779	835.1197	849.2434	828.8843	787.3694	744.9009	714.2053	667.4247	648.4142	664.2677 (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	56.9626	57.1351	56.9626	57.7964	57.4715	58.4096	58.5550	58.4096	58.4096	57.6354	57.7964	57.4715	
alpha	4.7975	4.8090	4.7975	4.8531	4.8314	4.8940	4.9037	4.8940	4.8940	4.8424	4.8531	4.8314	
util living area	0.9841	0.9764	0.9560	0.8982	0.7777	0.5957	0.4605	0.5071	0.7433	0.9224	0.9736	0.9866	(86)
MIT	20.1122	20.2116	20.3925	20.6461	20.8292	20.9146	20.9316	20.9284	20.8703	20.6382	20.3424	20.0834	(87)
Th 2	20.0985	20.1010	20.0985	20.1103	20.1058	20.1189	20.1209	20.1189	20.1189	20.1081	20.1103	20.1058	(88)
util rest of house	0.9801	0.9705	0.9449	0.8725	0.7251	0.5175	0.3693	0.4126	0.6739	0.8974	0.9659	0.9832	(89)
MIT 2	19.0674	19.1946	19.4185	19.7351	19.9336	20.0244	20.0378	20.0341	19.9893	19.7299	19.3687	19.0367	(90)
Living area fraction	19.5392	19.6538	19.8584	20.1465	20.3380	20.4264	20.4414	20.4380	20.3871	20.1401	19.8084	19.5093	(91)
MIT	19.5392	19.6538	19.8584	20.1465	20.3380	20.4264	20.4414	20.4380	20.3871	20.1401	19.8084	19.5093	(92)
Temperature adjustment	19.5392	19.6538	19.8584	20.1465	20.3380	20.4264	20.4414	20.4380	20.3871	20.1401	19.8084	19.5093	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9770	0.9670	0.9414	0.8737	0.7397	0.5455	0.4029	0.4475	0.6964	0.8984	0.9628	0.9804	(94)
Ext temp.	670.7467	711.0407	742.7231	729.6485	628.1531	452.1966	317.2651	333.3279	497.3473	599.6193	624.2732	651.2377	(95)
Heat loss rate W	4.8000	5.3000	6.8000	9.3000	12.3000	15.0000	16.7000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Space heating kWh	1294.0695	1256.4301	1146.4958	938.5578	699.4709	464.6206	319.5567	337.1784	538.3206	810.4675	1065.0637	1297.4161	(97)
Space heating requirement - total per year (kWh/year)	463.7521	366.5017	300.4069	150.4147	53.0605	0.0000	0.0000	0.0000	0.0000	156.8710	317.3692	480.7567	(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)	463.7521	366.5017	300.4069	150.4147	53.0605	0.0000	0.0000	0.0000	0.0000	156.8710	317.3692	480.7567	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2289.1328	
Space heating per m ²												25.5998	(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 %)													249.9000 (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)	463.7521	366.5017	300.4069	150.4147	53.0605	0.0000	0.0000	0.0000	0.0000	156.8710	317.3692	480.7567	(98)
Space heating fuel (main heating system)	249.9000	249.9000	249.9000	249.9000	249.9000	0.0000	0.0000	0.0000	0.0000	249.9000	249.9000	249.9000	(210)
Space heating efficiency (main heating system 2)	185.5751	146.6593	120.2108	60.1900	21.2327	0.0000	0.0000	0.0000	0.0000	62.7735	126.9985	192.3796	(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)

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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	283.9436	250.6237	264.6822	228.5656	218.8277	194.1687	189.2708	198.3620	202.3143	229.2370	248.2555	280.2655	(64)
Efficiency of water heater													
(217)m	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	(216)
Fuel for water heating, kWh/month	162.1608	143.1318	151.1606	130.5343	124.9730	110.8902	108.0930	113.2850	115.5421	130.9178	141.7793	160.0603	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	30.5179	24.4826	22.0439	16.1503	12.4749	10.1921	11.3801	14.7922	19.2136	25.2093	28.4739	31.3661	(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												916.0195	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												175.1000	
Water heating fuel used												1592.5281	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												246.2970	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
FV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												2754.8447	(238)

10a. Fuel costs - using BEDF prices (572)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	916.0195	23.6600	216.7302	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1592.5281	23.6600	376.7922	(247)
Energy for instantaneous electric shower(s)	0.0000	23.6600	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	246.2970	26.0600	64.1850	(250)
Additional standing charges			114.0000	(251)
Total energy cost			771.7074	(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	916.0195	0.1557	142.5882	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1592.5281	0.1413	225.0162	(264)
Space and water heating			367.6044	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	246.2970	0.1443	35.5483	(268)
Total CO2, kg/year			403.1527	(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	916.0195	1.5763	1443.9258	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1592.5281	1.5225	2424.5880	(278)
Space and water heating			3868.5137	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	246.2970	1.5338	377.7786	(282)
Total Primary energy kWh/year			4246.2923	(286)

SAP 10 EPC IMPROVEMENTS

As Designed

Current energy efficiency rating:
Current environmental impact rating:

B 81
A 96

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

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

Recommended measures Typical annual savings Energy Environmental
 (none) efficiency impact
 Total Savings £0 0.00 kg/m²
 Potential energy efficiency rating: B 81
 Potential environmental impact rating: A 96

Fuel prices for cost data on this page from database revision number 572 TEST (30 May 2025)
 Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, North West England):

	Current £772	Potential £772	£0
Electricity			
Space heating	£331	£331	£0
Water heating	£377	£377	£0
Lighting	£64	£64	£0
Total cost of fuels	£772	£772	£0
Total cost of uses	£772	£772	£0
Delivered energy	31 kWh/m ²	31 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.4 tonnes	0.4 tonnes	0.0 tonnes
CO2 emissions per m ²	5 kg/m ²	5 kg/m ²	0 kg/m ²
Primary energy	47 kWh/m ²	47 kWh/m ²	0 kWh/m ²

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	89.4200 (1b)	x 2.5000 (2b)	= 223.5500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 223.5500 (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)

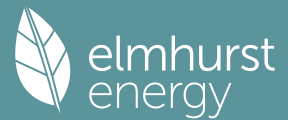
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1342 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3842 (18)
Number of sides sheltered		1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3554 (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	0.4531	0.4442	0.4353	0.3909	0.3820	0.3376	0.3376	0.3287	0.3554	0.3820	0.3998	0.4176 (22b)
Effective ac	0.6027	0.5987	0.5948	0.5764	0.5730	0.5570	0.5570	0.5540	0.5631	0.5730	0.5799	0.5872 (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			9.6800	0.9615	9.3077		(27)
Heatloss Floor over void			42.2600	0.1200	5.0712	20.0000	845.2000 (28b)
External Wall 1	70.3250	9.6800	60.6450	0.1800	10.9161	110.0000	6670.9500 (29a)
Main Roof	89.4200		89.4200	0.1100	9.8362	9.0000	804.7800 (30)
Total net area of external elements Aum(A, m ²)			202.0050				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		35.1312		(33)

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Main dwelling					
Party Wall Between Corridor	39.7300	0.0000	0.0000	180.0000	7151.4000 (32)
Party Floor 1	46.1400			30.0000	1384.2000 (32d)
Internal Wall 1	127.5300			9.0000	1147.7700 (32c)

Heat capacity $C_m = \text{Sum}(A \times k)$ (28)...(30) + (32) + (32a)...(32e) = 18004.3000 (34)
Thermal mass parameter (TMP = C_m / TFA) in $\text{kJ/m}^2\text{K}$ 201.3453 (35)

List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	5.3000	0.3050	1.6165
E3 Sill	3.1000	0.0240	0.0744
E4 Jamb	14.0000	0.0240	0.3360
E7 Party floor between dwellings (in blocks of flats)	28.1300	0.0330	0.9283
E16 Corner (normal)	5.0000	0.0400	0.2000
E18 Party wall between dwellings	7.5000	0.0300	0.2250
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0860	-0.2150
E10 Eaves (insulation at ceiling level)	13.0700	0.0820	1.0717
E12 Gable (insulation at ceiling level)	14.7100	0.0460	0.6767
E8 Balcony within a dwelling, wall insulation continuous	4.8800	0.1000	0.4880
P7 Party Wall - Exposed floor (normal)	8.2500	0.4800	3.9600
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.3800	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	7.3800	0.0350	0.2583

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.6199 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.7511 (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 44.4588 44.1648 43.8765 42.5226 42.2693 41.0901 41.0901 40.8717 41.5443 42.2693 42.7818 43.3175 (38)
89.2099 88.9158 88.6276 87.2737 87.0204 85.8412 85.8412 85.6228 86.2954 87.0204 87.5328 88.0686 (39)
Average = $\text{Sum}(39)\text{m} / 12 =$ 87.2725

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9977	0.9944	0.9911	0.9760	0.9732	0.9600	0.9600	0.9575	0.9651	0.9732	0.9789	0.9849 (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												2.6177 (42)
Hot water usage for mixer showers												
93.6512 92.2438 90.1929 86.2690 83.3732 80.1439 78.3084 80.3437 82.5748 86.0421 90.0503 93.2924 (42a)												
Hot water usage for baths												
29.4127 28.9759 28.3608 27.2266 26.3773 25.4356 24.9269 25.5378 26.2028 27.2105 28.3681 29.3133 (42b)												
Hot water usage for other uses												
41.4378 39.9310 38.4242 36.9174 35.4105 33.9037 33.9037 35.4105 36.9174 38.4242 39.9310 41.4378 (42c)												
Average daily hot water use (litres/day)												151.2843 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
164.5018 161.1507 156.9779 150.4129 145.1611 139.4832 137.1390 141.2920 145.6950 151.6768 158.3494 164.0435 (44)												
Energy content (annual)	260.5306 229.4765 241.2692 205.9078 195.4147 171.5109 165.8577 174.9490 179.6565 205.8240 225.5977 256.8525 (45)											
Distribution loss (46)m = $0.15 \times (45)\text{m}$												
39.0796 34.4215 36.1904 30.8862 29.3122 25.7266 24.8787 26.2423 26.9485 30.8736 33.8397 38.5279 (46)												

Water storage loss:
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 0.0090 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.0049 (55)
Total storage loss

0.1507 0.1361 0.1507 0.1458 0.1507 0.1458 0.1507 0.1507 0.1458 0.1507 0.1458 0.1507 (56)												
If cylinder contains dedicated solar storage												
0.1507 0.1361 0.1507 0.1458 0.1507 0.1458 0.1507 0.1507 0.1458 0.1507 0.1458 0.1507 (57)												
Primary loss 23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 23.2624 23.2624 22.5120 23.2624 22.5120 23.2624 (59)												
Combi loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (61)												

Total heat required for water heating calculated for each month
283.9436 250.6237 264.6822 228.5656 218.8277 194.1687 189.2708 198.3620 202.3143 229.2370 248.2555 280.2655 (62)
WWHRS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63a)
PV diverter 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63b)
Solar input 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63c)
FGHRS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63d)

Output from w/h	283.9436	250.6237	264.6822	228.5656	218.8277	194.1687	189.2708	198.3620	202.3143	229.2370	248.2555	280.2655 (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
105.3569 93.2187 98.9524 86.5906 83.7058 75.1536 73.8781 76.9010 77.8620 87.1669 93.1375 104.1339 (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 157.0619 157.0619 157.0619 157.0619 157.0619 157.0619 157.0619 157.0619 157.0619 157.0619 157.0619 157.0619 (66)												
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
34.8659 30.9676 25.1845 19.0663 14.2523 12.0324 13.0014 16.8997 22.6828 28.8010 33.6150 35.8349 (67)												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
355.2338 358.9200 349.6309 329.8554 304.8924 281.4307 265.7568 262.0706 271.3597 291.1352 316.0982 339.5599 (68)												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
53.3239 53.3239 53.3239 53.3239 53.3239 53.3239 53.3239 53.3239 53.3239 53.3239 53.3239 53.3239 (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)												
-104.7079 -104.7079 -104.7079 -104.7079 -104.7079 -104.7079 -104.7079 -104.7079 -104.7079 -104.7079 -104.7079 -104.7079 (71)												
Water heating gains (Table 5)												
141.6087 138.7184 133.0006 120.2647 112.5078 104.3800 99.2986 103.3615 108.1417 117.1598 129.3576 139.9649 (72)												
Total internal gains	637.3862	634.2838	613.4938	574.8642	537.3303	503.5209	483.7346	488.0097	507.8621	542.7739	584.7487	621.0376 (73)

6. Solar gains

[illegible]

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Space heating fuel - main system 1	981.4759	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	175.1000	
Water heating fuel used	1592.5281	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	0.0000	(231)
Electricity for lighting (calculated in Appendix L)	246.2970	(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	2820.3010	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	981.4759	14.0400	137.7992 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1592.5281	14.0400	223.5909 (247)
Energy for instantaneous electric shower(s)	0.0000	14.0400	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	246.2970	16.4900	40.6144 (250)
Additional standing charges			26.0000 (251)
Total energy cost			428.0045 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] = 1.1463 (257)
SAP value	81.4190
SAP rating (Section 12)	81 (258)
SAP band	B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	981.4759	0.1556	152.7173 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1592.5281	0.1413	225.0162 (264)
Space and water heating			377.7336 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	246.2970	0.1443	35.5483 (268)
Total CO2, kg/year			413.2818 (272)
CO2 emissions per m2			4.6200 (273)
EI value			95.8801
EI rating			96 (274)
EI band			A

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

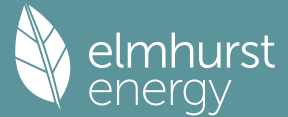
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	89.4200 (1b)	x 2.5000 (2b)	= 223.5500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	223.5500 (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) = 0.1342 (8)
Pressure test	Yes

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

Blower Door
5.0000 (17)
0.3842 (18)
1 (19)

Shelter factor

$$(20) = 1 - [0.075 \times (19)] = 0.9250 (20)$$
$$(21) = (18) \times (20) = 0.3554 (21)$$

Infiltration rate adjusted to include shelter factor

Wind speed	Jan 4.6000	Feb 4.5000	Mar 4.6000	Apr 4.1000	May 4.3000	Jun 3.7000	Jul 3.6000	Aug 3.7000	Sep 3.7000	Oct 4.2000	Nov 4.1000	Dec 4.3000 (22)
Wind factor	1.1500	1.1250	1.1500	1.0250	1.0750	0.9250	0.9000	0.9250	0.9250	1.0500	1.0250	1.0750 (22a)
Adj infilt rate	0.4087	0.3998	0.4087	0.3643	0.3820	0.3287	0.3198	0.3287	0.3287	0.3732	0.3643	0.3820 (22b)
Effective ac	0.5835	0.5799	0.5835	0.5663	0.5730	0.5540	0.5512	0.5540	0.5540	0.5696	0.5663	0.5730 (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			9.6800	0.9615	9.3077			(27)
Heatloss Floor over void			42.2600	0.1200	5.0712	20.0000	845.2000	(28b)
External Wall 1	70.3250	9.6800	60.6450	0.1800	10.9161	110.0000	6670.9500	(29a)
Main Roof	89.4200		89.4200	0.1100	9.8362	9.0000	804.7800	(30)
Total net area of external elements Aum(A, m2)			202.0050					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...	(30) + (32) =	35.1312		(33)
Main dwelling								
Party Wall Between Corridor			39.7300	0.0000	0.0000	180.0000	7151.4000	(32)
Party Floor 1			46.1400			30.0000	1384.2000	(32a)
Internal Wall 1			127.5300			9.0000	1147.7700	(32c)

Heat capacity Cm = Sum(A x k)

$$(28) \dots (30) + (32) + (32a) \dots (32e) = 18004.3000 (34)$$

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

$$201.3453 (35)$$

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	5.3000	0.3050	1.6165
E3 Sill	3.1000	0.0240	0.0744
E4 Jamb	14.0000	0.0240	0.3360
E7 Party floor between dwellings (in blocks of flats)	28.1300	0.0330	0.9283
E16 Corner (normal)	5.0000	0.0400	0.2000
E18 Party wall between dwellings	7.5000	0.0300	0.2250
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0860	-0.2150
E10 Eaves (insulation at ceiling level)	13.0700	0.0820	1.0717
E12 Gable (insulation at ceiling level)	14.7100	0.0460	0.6767
E8 Balcony within a dwelling, wall insulation continuous	4.8800	0.1000	0.4880
P7 Party Wall - Exposed floor (normal)	8.2500	0.4800	3.9600
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.3800	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	7.3800	0.0350	0.2583

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

$$9.6199 (36)$$

Point Thermal bridges

$$(36a) = 0.0000$$

Total fabric heat loss

$$(33) + (36) + (36a) = 44.7511 (37)$$

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

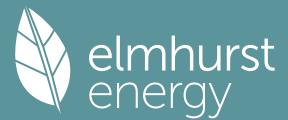
(38)m	Jan 43.0467	Feb 42.7818	Mar 43.0467	Apr 41.7802	May 42.2693	Jun 40.8717	Jul 40.6592	Aug 40.8717	Sep 40.8717	Oct 42.0218	Nov 41.7802	Dec 42.2693 (38)
Heat transfer coeff	87.7978	87.5328	87.7978	86.5312	87.0204	85.6228	85.4103	85.6228	85.6228	86.7729	86.5312	87.0204 (39)
Average = Sum(39)m / 12 =												86.6069

HLP	Jan 0.9819	Feb 0.9789	Mar 0.9819	Apr 0.9677	May 0.9732	Jun 0.9575	Jul 0.9552	Aug 0.9575	Sep 0.9575	Oct 0.9704	Nov 0.9677	Dec 0.9732 (40)
HLP (average)												0.9685
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6177 (42)
Hot water usage for mixer showers													
93.6512	92.2438	90.1929	86.2690	83.3732	80.1439	78.3084	80.3437	82.5748	86.0421	90.0503	93.2924	93.2924 (42a)	
Hot water usage for baths													
29.4127	28.9759	28.3608	27.2266	26.3773	25.4356	24.9269	25.5378	26.2028	27.2105	28.3681	29.3133	29.3133 (42b)	
Hot water usage for other uses													
41.4378	39.9310	38.4242	36.9174	35.4105	33.9037	33.9037	35.4105	36.9174	38.4242	39.9310	41.4378	41.4378 (42c)	
Average daily hot water use (litres/day)												151.2843 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
164.5018	161.1507	156.9779	150.4129	145.1611	139.4832	137.1390	141.2920	145.6950	151.6768	158.3494	164.0435	164.0435 (44)	
Energy content (annual)	260.5306	229.4765	241.2692	205.9078	195.4147	171.5109	165.8577	174.9490	179.6565	205.8240	225.5977	256.8525	256.8525 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2512.8469	
39.0796	34.4215	36.1904	30.8862	29.3122	25.7266	24.8787	26.2423	26.9485	30.8736	33.8397	38.5279	38.5279 (46)	
Water storage loss:													
Store volume													200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													0.0090 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.0049 (55)
Total storage loss													
0.1507	0.1361	0.1507	0.1458	0.1507	0.1458	0.1507	0.1507	0.1458	0.1507	0.1458	0.1507	0.1507	0.1507 (56)
If cylinder contains dedicated solar storage													
0.1507	0.1361	0.1507	0.1458	0.1507	0.1458	0.1507	0.1507	0.1458	0.1507	0.1458	0.1507	0.1507	0.1507 (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	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month													
283.9436	250.6237	264.6822	228.5656	218.8277	194.1687	189.2708	198.3620	202.3143	229.2370	248.2555	280.2655	280.2655 (62)	
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h													
283.9436	250.6237	264.6822	228.5656	218.8277	194.1687	189.2708	198.3620	202.3143	229.2370	248.2555	280.2655	280.2655 (64)	
										Total per year (kWh/year) = Sum(64)m =		2788.5168	2788.5168 (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	0.0000 (64a)

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Heat gains from water heating, kWh/month
105.3569 93.2187 98.9524 86.5906 83.7058 75.1536 73.8781 76.9010 77.8620 87.1669 93.1375 104.1339 (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	157.0619	157.0619	157.0619	157.0619	157.0619	157.0619	157.0619	157.0619	157.0619	157.0619	157.0619	157.0619 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.8659	30.9676	25.1845	19.0663	14.2523	12.0324	13.0014	16.8997	22.6828	28.8010	33.6150	35.8349 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	355.2338	358.9200	349.6309	329.8554	304.8924	281.4307	265.7568	262.0706	271.3597	291.1352	316.0982	339.5599 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.3239	53.3239	53.3239	53.3239	53.3239	53.3239	53.3239	53.3239	53.3239	53.3239	53.3239	53.3239 (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)	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079	-104.7079 (71)
Water heating gains (Table 5)	141.6087	138.7184	133.0006	120.2647	112.5078	104.3800	99.2986	103.3615	108.1417	117.1598	129.3576	139.9649 (72)
Total internal gains	637.3862	634.2838	613.4938	574.8642	537.3303	503.5209	483.7346	488.0097	507.8621	542.7739	584.7487	621.0376 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W		
East					3.5200	16.6187	0.6300	0.7000	0.7700	17.8777 (76)		
West					6.1600	16.6187	0.6300	0.7000	0.7700	31.2859 (80)		

Solar gains	49.1636	101.0318	175.4841	260.2555	311.9131	325.3634	303.6348	256.8912	206.3433	124.6508	63.6655	43.2301 (83)
Total gains	686.5498	735.3156	788.9779	835.1197	849.2434	828.8843	787.3694	744.9009	714.2053	667.4247	648.4142	664.2677 (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)												
tau	56.9626	57.1351	56.9626	57.7964	57.4715	58.4096	58.5550	58.4096	58.4096	57.6354	57.7964	57.4715
alpha	4.7975	4.8090	4.7975	4.8531	4.8314	4.8940	4.9037	4.8940	4.8940	4.8424	4.8531	4.8314
util living area	0.9841	0.9764	0.9560	0.8982	0.7777	0.5957	0.4605	0.5071	0.7433	0.9224	0.9736	0.9866 (86)
MIT	20.1122	20.2116	20.3925	20.6461	20.8292	20.9146	20.9316	20.9284	20.8703	20.6382	20.3424	20.0834 (87)
Th 2	20.0985	20.1010	20.0985	20.1103	20.1058	20.1189	20.1209	20.1189	20.1189	20.1081	20.1103	20.1058 (88)
util rest of house	0.9801	0.9705	0.9449	0.8725	0.7251	0.5175	0.3693	0.4126	0.6739	0.8974	0.9659	0.9832 (89)
MIT 2	19.0674	19.1946	19.4185	19.7351	19.9336	20.0244	20.0378	20.0341	19.9893	19.7299	19.3687	19.0367 (90)
Living area fraction									fLA = Living area / (4) =			0.4516 (91)
MIT	19.5392	19.6538	19.8584	20.1465	20.3380	20.4264	20.4414	20.4380	20.3871	20.1401	19.8084	19.5093 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5392	19.6538	19.8584	20.1465	20.3380	20.4264	20.4414	20.4380	20.3871	20.1401	19.8084	19.5093 (93)

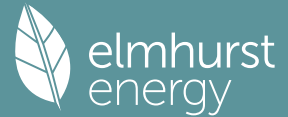
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9770	0.9670	0.9414	0.8737	0.7397	0.5455	0.4029	0.4475	0.6964	0.8984	0.9628	0.9804 (94)
Useful gains	670.7467	711.0407	742.7231	729.6485	628.1531	452.1966	317.2651	333.3279	497.3473	599.6193	624.2732	651.2377 (95)
Ext temp.	4.8000	5.3000	6.8000	9.3000	12.3000	15.0000	16.7000	16.5000	14.1000	10.8000	7.5000	4.6000 (96)
Heat loss rate W	1294.0695	1256.4301	1146.4958	938.5578	699.4709	464.6206	319.5567	337.1784	538.3206	810.4675	1065.0637	1297.4161 (97)
Space heating kWh	463.7521	366.5017	300.4069	150.4147	53.0605	0.0000	0.0000	0.0000	0.0000	156.8710	317.3692	480.7567 (98a)
Space heating requirement - total per year (kWh/year)												2289.1328
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	463.7521	366.5017	300.4069	150.4147	53.0605	0.0000	0.0000	0.0000	0.0000	156.8710	317.3692	480.7567 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2289.1328
Space heating per m ²										(98c) / (4) =		25.5998 (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 %)												249.9000 (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	463.7521	366.5017	300.4069	150.4147	53.0605	0.0000	0.0000	0.0000	0.0000	156.8710	317.3692	480.7567 (98)
Space heating efficiency (main heating system 1)	249.9000	249.9000	249.9000	249.9000	249.9000	0.0000	0.0000	0.0000	0.0000	249.9000	249.9000	249.9000 (210)
Space heating fuel (main heating system)	185.5751	146.6593	120.2108	60.1900	21.2327	0.0000	0.0000	0.0000	0.0000	62.7735	126.9985	192.3796 (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)												

Full SAP Calculation Printout



	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	283.9436	250.6237	264.6822	228.5656	218.8277	194.1687	189.2708	198.3620	202.3143	229.2370	248.2555	280.2655	(64)
Efficiency of water heater												175.1000	(216)
(217)m	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	(217)
Fuel for water heating, kWh/month	162.1608	143.1318	151.1606	130.5343	124.9730	110.8902	108.0930	113.2850	115.5421	130.9178	141.7793	160.0603	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	30.5179	24.4826	22.0439	16.1503	12.4749	10.1921	11.3801	14.7922	19.2136	25.2093	28.4739	31.3661	(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												916.0195	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												175.1000	
Water heating fuel used												1592.5281	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												246.2970	(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												2754.8447	(238)

10a. Fuel costs - using BEDF prices (572)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	916.0195	23.6600	216.7302	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1592.5281	23.6600	376.7922	(247)
Energy for instantaneous electric shower(s)	0.0000	23.6600	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	246.2970	26.0600	64.1850	(250)
Additional standing charges			114.0000	(251)
Total energy cost			771.7074	(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	916.0195	0.1557	142.5882	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1592.5281	0.1413	225.0162	(264)
Space and water heating			367.6044	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	246.2970	0.1443	35.5483	(268)
Total CO2, kg/year			403.1527	(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	916.0195	1.5763	1443.9258	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1592.5281	1.5225	2424.5880	(278)
Space and water heating			3868.5137	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	246.2970	1.5338	377.7786	(282)
Total Primary energy kWh/year			4246.2923	(286)

Thermal Bridging

Property Reference	Flat 5	Issued on Date	30/06/2025
Assessment Reference	As Designed	Prop Type Ref	Semi-Detached Flat
Property	Flat 5, Bury Old Road, Prestwich, Manchester, M25 3DE		

SAP Rating	81 B	DER	4.74	TER	10.55
Environmental	96 A	% DER < TER			55.07
CO ₂ Emissions (t/year)	0.4	DFEE	33.97	TFEE	34.11
Compliance Check	See BREL	% DFEE < TFEE			0.40
% DPER < TPER	9.57	DPER	49.82	TPER	55.09

Assessor Details	Mr. Nathaniel Kempson	Assessor ID	R421-0001
Client	Encon Associates, Glenn Miles		

	Junction details	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E1 Steel lintel with perforated steel base plate	Non Gov Approved Schemes	0.305	5.30	1.62	Knauf
External wall	E3 Sill	Non Gov Approved Schemes	0.024	3.10	0.07	Knauf
External wall	E4 Jamb	Non Gov Approved Schemes	0.024	14.00	0.34	Knauf
External wall	E7 Party floor between dwellings (in blocks of flats)	Non Gov Approved Schemes	0.033	28.13	0.93	Knauf
External wall	E16 Corner (normal)	Non Gov Approved Schemes	0.040	5.00	0.20	Knauf
External wall	E18 Party wall between dwellings	Non Gov Approved Schemes	0.030	7.50	0.22	Knauf
External wall	E17 Corner (inverted – internal area greater than external area)	Non Gov Approved Schemes	-0.086	2.50	-0.21	Knauf
External wall	E10 Eaves (insulation at ceiling level)	Non Gov Approved Schemes	0.082	13.07	1.07	Knauf
External wall	E12 Gable (insulation at ceiling level)	Non Gov Approved Schemes	0.046	14.71	0.68	Knauf
External wall	E8 Balcony within a dwelling, wall insulation continuous	Table K1 - Default	0.100	4.88	0.49	
Party wall	P7 Party Wall - Exposed floor (normal)	Table K1 - Default	0.480	8.25	3.96	
Party wall	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	0.000	7.38	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Non Gov Approved Schemes	0.035	7.38	0.26	Knauf

Total: 121.20 W/mK:
Y-Value: 0.05 W/m²K: