

Project No: 23820

North Hertfordshire District Council

Energy & Sustainability Statement

9no. New Build Terraced Houses at Firs Hotel, Bedford Road, Hitchin, SG5 2TY

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SAP Calculations – SBEM Calculations – Renewable Energy Statements – Energy Performance Certificates
Air Tightness Testing – Extract Fan Testing – Water Calculations – DEC Assessments – Room Integrity Testing



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Executive Summary

This report has been commissioned in response to the Sustainable and Low Carbon Planning Policy requirements of North Hertfordshire District Council in respect to the proposed construction of 9no. New Houses at the site of Firs Hotel, Bedford Road, Hitchin, SG5 2TY.

In accordance with the widely accepted Energy Hierarchy approach to energy conservation, this statement outlines an overall commitment to reducing energy consumption under occupancy through the adoption of enhanced insulation standards and improved HVAC & lighting efficiencies in comparison to the standard requirements of Approved Document L1 2021 of the Building Regulations.

Predictive SAP 10 calculations firmly demonstrates that the proposed development is predicted to emit at least **72.14%** less carbon dioxide than would ordinarily be permitted by the standard requirements of Approved Document L1 2021 of the Building Regulations.

This reduction is achieved through the adoption of enhanced insulation standards, improved heating and lighting efficiencies, together with the installation of MCS Approved Air Source Heat Pumps as a means of providing the dwellings with heating and hot water from a low carbon source. Additionally, solar PV arrays will be installed to the pitched roof spaces of the dwellings to provide renewably-sourced electricity for the Air Source Heat Pumps and domestic use. It is estimated that this will supply each dwelling with 1.60 kWp worth of solar PV equivalent to 4no. 400-W panels equating to around 8.00 m² of roof area per dwelling. In total, the arrays would consist of 36no. 400-W solar PV panels producing 14.40 kWp across the development, taking up approximately 72.00 m² worth of roof space.

Asides from targeting improved energy efficiency, the proposed development will also incorporate a number of water saving features to ensure that each dwelling achieves a maximum calculated water consumption of 110 litres per person per day.

In the circumstances, the proposed development is deemed to satisfy the requirements of Policies SP9 and D1 of North Hertfordshire District Council's Local Plan (November 2022).

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1.0 Introduction

- 1.1 EPS Group have been appointed to carry out an Energy Statement in respect to the proposed construction of 9no. terraced houses at the site of Firs Hotel, Bedford Road, Hitchin, SG5 2TY.
- 1.2 The proposed works are required to comply with the requirements of Approved Document L1 2021 of the Building Regulations.
- 1.3 The energy consumption of the proposed dwellings has therefore been assessed using the National Calculations Method (NCM) - SAP 10 (Standard Assessment Procedure), in order to determine the predicted annual carbon dioxide (CO₂) emissions of the development.
- 1.4 The following fuel emissions factors have been utilised within the supporting calculations as defined by the updated National Calculations Method:

Fuel	CO ₂ emission factor (kgCO ₂ /kWh)
Grid supplied electricity	0.136
Grid displaced electricity	0.136

- 1.5 The dimensions that are referenced within this report are based upon SAP measurement conventions which may result in slight differences with other dimensions quoted elsewhere.

2.0 Planning Policy Context

2.1 National

The National Planning Policy Framework (NPPF) outlines the Government's planning policies for England and how these are expected to be applied by local authorities. Section 14 of this document details how local policies should address climate change through the promotion of energy efficiency and the adoption of low carbon and renewable technologies. It states:

"14.0 Meeting the challenge of climate change, flooding and coastal change

161. *The planning system should support the transition to net zero by 2050 and take full account of all climate impacts including overheating, water scarcity, storm and flood risks and coastal change. It should help to: shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure.*

Planning for climate change

162. *Plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating and drought from rising temperatures⁶¹. Policies should support appropriate measures to ensure the future health and resilience of communities and infrastructure to climate change impacts, such as providing space for physical protection measures, or making provision for the possible future relocation of vulnerable development and infrastructure.*

163. *The need to mitigate and adapt to climate change should also be considered in preparing and assessing planning applications, taking into account the full range of potential climate change impacts.*

164. *New development should be planned for in ways that:*

a) avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through incorporating green infrastructure and sustainable drainage systems; and

b) help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings in plans should reflect the Government's policy for national technical standards.

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

a) provide a positive strategy for energy from these sources, that maximises the potential for suitable development, and their future re-powering and life extension, while ensuring that adverse impacts are addressed appropriately (including cumulative landscape and visual impacts);

b) consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and

- c) *identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers.*
166. *In determining planning applications, local planning authorities should expect new development to: a) comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and b) take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.*
167. *Local planning authorities should also give significant weight to the need to support energy efficiency and low carbon heating improvements to existing buildings, both domestic and non-domestic (including through installation of heat pumps and solar panels where these do not already benefit from permitted development rights). Where the proposals would affect conservation areas, listed buildings or other relevant designated heritage assets, local planning authorities should also apply the policies set out in chapter 16 of this Framework.*
168. *When determining planning applications for all forms of renewable and low carbon energy developments and their associated infrastructure, local planning authorities should:*
- a) *not require applicants to demonstrate the overall need for renewable or low carbon energy, and give significant weight to the benefits associated with renewable and low carbon energy generation and the proposal's contribution to a net zero future;*
 - b) *recognise that small-scale and community-led projects provide a valuable contribution to cutting greenhouse gas emissions;*
 - c) *in the case of applications for the repowering and life-extension of existing renewable sites, give significant weight to the benefits of utilising an established site.*
169. *Once suitable areas for renewable and low carbon energy have been identified in plans, local planning authorities should expect subsequent applications for commercial scale projects outside these areas to demonstrate that the proposed location meets the criteria used in identifying suitable areas."*

2.2 North Hertfordshire District Council

Policies SP9: Design and Sustainability and D1: Sustainable Design of North Hertfordshire Council's *Local Plan* (November 2022) encourages good design and sustainable development. Of particular relevance is that buildings are required to be designed in order reduce energy consumption and to have a positive influence on the environment. Developers are encouraged to seek to minimise carbon emissions and maximise opportunities for energy generation from renewable sources. Specifically, the policies state:

"Policy SP9: Design and Sustainability

The Council considers good design to be a key aspect of sustainable development. We will:

- a) *Support new development where it is well designed and located and responds positively to its local context;*
- b) *Require Strategic Masterplans to be produced for Strategic Housing Sites and other significant development. Significant development generally comprises residential development of 100 dwellings or more. Exceptionally, developments under 100*

dwelling will be considered significant if there are site specific complexities and sensitivities that require a masterplan-led approach. In some circumstances a Strategic Masterplan may also be required to consider the cumulative impact of more than one site to support a co-ordinated and integrated approach to place-making and design.

- c) *Require Strategic Masterplans and planning applications for Strategic Housing Sites and significant development to (as applicable):*
 - i. *create buildings, spaces and streets which positively reflect and respond to the local landscape, townscape and historic character*
 - ii. *create integrated, accessible and sustainable transport systems with walking, cycling and public transport designed to be the most attractive forms of transport and effectively linking into the surrounding areas;*
 - iii. *provide a clear structure and hierarchy of pedestrian friendly streets and well-connected footpaths and cycleways integrate with the wider built and natural environment and communities;*
 - iv. *plan for integrated and mixed-use communities with walkable locally accessible community, employment and retail facilities;*
 - v. *positively integrate with adjacent rural and urban communities and positively contribute to their character and the way the area functions, including addressing cumulative, cross boundary planning and infrastructure matters;*
 - vi. *create an accessible multi-functional green infrastructure network that provides:*
 - *a key structuring and functional place-making feature supporting healthy lifestyles, sport, play and recreation linking into the wider Green Infrastructure Network; and*
 - *a high-quality integrated network to support ecological connectivity, biodiversity net gain, climate adaptation and mitigation linking into the wider Ecological Network*
 - vii. *ensure the effective use of sustainable urban drainage and sustainable water management;*
 - viii. *ensure a hierarchy of linked, high quality and attractive public spaces and public realm that is safe, attractive and supports social interaction for all age groups; and*
 - ix. *design to last with a clear stewardship, management and maintenance strategy*
- d) *Ensure Strategic Masterplans are informed by a technical and design evidence base and include the following for Strategic Housing Sites and where applicable for other significant development:*
 - i. *site specific vision and place-making principles*
 - ii. *Masterplan setting out the quantum, scale, type, mix and distribution of land uses, housing and community facilities;*

- iii. *Green Infrastructure Framework identifying the scale, distribution, type and design of green spaces, biodiversity net gain, strategic drainage and on and off-site linkages;*
- iv. *Movement Framework setting out the key access points, strategic highways, street hierarchy and footways and cycleways (on and off site)*
- v. *Urban Design Framework and design principles identifying how the site responds to local character and context and key structuring elements and layout principles (including heights and densities)*
- vi. *Sustainability & Energy Framework identifying site-wide and building scale opportunities for low and zero carbon*
- vii. *Illustrative Masterplan Layout*
- vii. *Infrastructure Delivery, Phasing & Management Strategy*
- e) *Encourage the submission of Strategic Masterplans for the Council's consideration and agreement before the submission of a planning application. We will also confirm the scope and contents of individual Strategic Masterplans with applicants in pre-application discussions. Planning applications must be accompanied by a Strategic Masterplan. Where applications have already been submitted to the Council a Strategic Masterplan should be agreed with the Council prior to or as part of the grant of planning permission. Adherence to the Strategic Masterplan will be secured through planning conditions and/or legal agreement.*
- f) *Assess proposals against detailed policy requirements set out in this Plan and have regard to the Design SPD; and*
- g) *Adopt the Government's additional technical standards for the size of new homes, water efficiency and, in specified circumstances, accessibility.*

Policy D1: Sustainable design:

Planning permission will be granted provided that development proposals:

- a) *Respond positively to the site's local context;*
- b) *Take all reasonable opportunities, consistent with the nature and scale of the scheme, to:*
 - i. *create or enhance public realm;*
 - ii. *optimise the potential of the site by incorporating Sustainable Drainage Systems (SuDS);*
 - iii. *reduce energy consumption and waste;*
 - iv. *retain existing vegetation and propose appropriate new planting;*
 - v. *maximise accessibility, legibility and physical and social connectivity both internally and with neighbouring areas;*
 - vi. *future proof for changes in technology and lifestyle;*
 - vii. *design-out opportunities for crime and anti-social behaviour; and*
 - viii. *minimise the visual impact of street furniture and parking provision;*
- c) *Have regard to the Design SPD, and any other relevant guidance;*

- d) *Within Letchworth Garden City have regard to the Letchworth Garden City Design Principles contained in Appendix 5; and*
- e) *For residential schemes, meet or exceed the nationally described space standards and optional water efficiency standards."*

Of further relevance is supporting Paragraph 9.12 which states:

"Development proposals should be in line with current regulations and guidelines and any future changes in Legislation or to the Building Regulations that will affect the sustainability of a building. North Hertfordshire lies in an area of serious water stress. Both the Environment Agency and Anglian Water support the introduction of the optional water efficiency standard within the district therefore, the lower figure of 110 litres per person per day for water consumption is sought. The introduction of the lower standard will have a marginal impact on scheme viability in the area."

2.3 Conclusions

On review of the above planning policies in accordance with North Hertfordshire District Council's Pre-application guidance, it is evident that there is a requirement for development to consider the use of increased energy efficiency standards and low carbon/renewable technology as part of an overall energy strategy.

The proposed development will therefore minimise regulated carbon dioxide (CO₂) emissions in comparison to those allowable under the current edition of Approved Document L1 2021 by following the widely accepted energy hierarchy approach to energy conservation in new and existing dwellings.

It is also recognised that there is an ongoing requirement to reduce internal water consumption to achieve a minimum water efficiency of 110 litres per person per day.

3.0 Proposed Energy Strategy and Performance

- 3.1 The proposed development benefits from a range of passive design features including internal layouts that facilitate natural cross ventilation which should act to reduce overheating risks during the summer months and reduce the likelihood of any future occupants installing mechanical cooling.
- 3.2 In accordance with the 'Lean' principles of the Energy Hierarchy, the following minimum fabric, heating and lighting standards will be adopted within the development as a means of reducing its overall energy demand by conventional (lean) means:

Table 1: Proposed Fabric and Lighting Standards		
Element/Feature	Current Approved Document L1 2021 Minimal Acceptable Standard	Proposed Development Target
External Wall U-value	0.26 W/m ² K	0.18 W/m²K
Ground Floor U-value	0.18 W/m ² K	0.11-0.12 W/m²K
Insulated Roof Joist U-value	0.16 W/m ² k	0.10 W/m²K
Insulated Exposed Floor Joist U-value	0.25 W/m ² k	0.18 W/m²k
Glazing U-value	1.60 W/m ² K	1.40 W/m²K
Entrance Door U-value	1.60 W/m ² K	1.20 W/m²K
Air Permeability	8.00 m ³ /m ² .h	4.00 m³/m².h
Thermal Bridging	-	Recognised Construction Details
Lighting	All fixed lighting to have efficacies of 75 lm/W	All fixed lighting to be LEDs with efficacies of 120 lm/W
Primary Heating & Hot Water	-	MCS Approved Air Source Heat Pump to Radiators and Underfloor Heating with a design flow temperature of 55°C
Hot Water Storage	-	210 litre Hot Water Storage Cylinder with 2.30 kWh/day Standby Loss
Ventilation	-	Mechanical Ventilation with Heat Recovery – Nuaire MRXBOX ECO3

- 3.3 The above build standards will ensure that the proposed development has a reduced energy demand in comparison to the minimum requirements of Approved Document L1 2021 of the Building Regulations. This will help to reduce the overall energy consumption and the associated CO₂ emissions arising from occupancy.
- 3.4 It is noted that the development has been designed to maximise the amount of natural daylight available, which in conjunction with the highly efficient LED lighting proposed will significantly reduce the amount of energy consumed through artificial lighting.

4.0 Review of Low Carbon and Renewable Technologies:

4.1 In response to the 'Green' requirement of the Energy Hierarchy a number of different renewable technologies were reviewed in terms of their overall suitability for inclusion within the proposed development.

4.2 Wind Turbine (Column or Roof Mounted)

Benefits	When installed in optimum positions, wind turbines can generate a large amount of renewable electricity, the surplus of which can be exported at financial gain to the national grid via the Smart Export Guarantee scheme.
Site Limitations/ Restrictions	- Not aesthetically pleasing nor in keeping with the local area. - The site is sheltered by trees on the northern boundary which would result in unreliable and insufficient outputs. - Requires ongoing maintenance which future occupants may neglect. - Can produce unacceptable levels of noise to occupants and neighbours.
Conclusion	The technology is not deemed as being suitable for use within the proposed development.

4.3 Solar Photovoltaic

Benefits	- When installed in optimum positions photovoltaic (PV) arrays can generate a large amount of renewable electricity which can be used locally or exported at financial gain to the national grid via the Smart Export Guarantee scheme. - Minimal ongoing costs & maintenance issues following installation. - Easy to integrate into a conventional build specification or retrofit applications. - The dwellings have large pitched roof spaces available for straightforward installation of panels
Site Limitations/ Restrictions	- PV panels are not aesthetically pleasing and may detract from the visual appearance of the dwellings. - As a result of the rapid decarbonisation of the national grid, the amount of CO₂ savings with this technology is limited as the CO₂ emission factor for grid displaced electricity is relatively low.
Conclusion	It is proposed to use this technology within the proposed dwellings (as detailed in Section 3).

4.4 Solar Thermal

Benefits	- Solar hot water systems can provide an efficient way of contributing to a dwelling's overall hot water requirements. - Minimal ongoing costs & maintenance issues following installation. - As with PV, a large surface area of available roof space is present in the development for straightforward installation.
Site Limitations/ Restrictions	- The amount of CO₂ savings with this technology is restricted as there is no benefit to producing more hot water than is used within a dwelling. - The installation of the solar PV arrays would not be in keeping with the style of the site surrounding the development - Solar collectors are not aesthetically pleasing and may detract from the visual appearance of the development.
Conclusion	It is not proposed to use this technology within the proposed development.

4.5 Ground Source Heat Pump

Benefits	• High operating efficiencies (CoPs). • Flexible installation options for new build developments, including trench and borehole installations. • Reliable and proven technology. • Generally low maintenance costs. • No visual impact on the property.
Site Limitations/ Restrictions	• Detailed ground surveys required. • High capital installation costs potentially rendering the technology financially unviable. • Trench installations require significant areas of land. • If sufficient capacity isn't available within the Distribution Network then local upgrades may be required which could render the technology financially unviable.
Conclusion	• It is not proposed to use this technology within the proposed development.

4.6 Air Source Heat Pump

Benefits	• High operating efficiencies (CoPs). • Reduced visual impact on the property. • Reliable and proven technology. • Generally low maintenance costs.
Site Limitations/ Restrictions	• Often require a supplementary immersion heating system for the generation of hot water. • The external units can result in some noise related problems although this can be limited through the careful selection of particular models with low operating acoustic levels and the potential use of acoustic housing units. • If sufficient capacity isn't available within the Distribution Network then local upgrades may be required which could render the technology financially unviable.
Conclusion	• It is proposed to use this technology within the proposed dwellings (as detailed in Section 3).

4.7 Biomass Boilers

Benefits	• Reliable and proven technology.
Site Limitations/ Restrictions	• Require large storage facilities for the fuel. • On-going cleaning, maintenance and management requirements. • Require regular fuel deliveries. • Would contribute to poor urban air quality.
Conclusion	• The technology is not deemed as being suitable for use within the proposed development.

4.8 On review of the above technologies, the installation of MCS Approved Air Source Heat Pumps (ASHP) is recommended as a means of providing the dwellings with a decentralised source of low carbon heating and hot water. Further to this, these ASHPs will be supplemented with renewably-sourced electricity from solar PV arrays installed to the dwellings' pitched roof spaces. This will supply each dwelling with 1.60 kWp worth of solar PV equivalent to 4no. 400-W panels equating to 8.00 m² of roof area per dwelling. These factors will provide an affordable and significant reduction in the development's energy consumption and associated carbon dioxide emissions.

4.9 The heat pumps, hot water systems and solar PV arrays will be designed, tested and commissioned to current approved standards.

5.0 Calculated Energy Performance (Illustrative)

- 5.1 Having identified the use of Air Source Heat Pumps and solar PV arrays as being the most suitable low carbon technologies for use within the development, predictive SAP 10 calculations have been prepared for the development. These have been based upon the 'Lean' specifications outlined within Section 3 of this report, including the Air Source Heat Pump as the primary source of heating and hot water whose energy sources are supplemented by the solar PV arrays.
- 5.2 The results of the illustrative SAP Calculations are summarised within Table 2 below with the full calculations provided within the Appendix 1 of this report for detailed review.

Table 2: Annual Regulated CO ₂ Emissions						
Plot Name	Floor Area (m ²)	Target Emission Rate (TER)	Dwelling Emission Rate (DER)	Annual Regulated 'Baseline' CO ₂ Emissions (kg/Year)	Annual Regulated Proposed CO ₂ Emissions (kg/Year)	Annual Percentage Reduction in CO ₂ Emissions
B-ES	131.33	10.23	2.92	1,343.50	384.07	71.41%
B-MS	131.33	9.29	2.66	1,220.32	349.95	71.32%
B-M	131.33	9.14	2.60	1,200.97	340.99	71.61%
B-MN	131.33	9.25	2.65	1,214.15	348.17	71.32%
B-EN	131.33	10.44	3.04	1,370.96	398.96	70.90%
C-ES	120.33	10.86	2.95	1,307.14	354.87	72.85%
C-MS	120.33	9.48	2.50	1,140.79	300.62	73.65%
C-MN	120.33	9.48	2.50	1,140.79	300.62	73.65%
C-EN	120.33	10.86	2.95	1,307.14	354.87	72.85%
Total Annual CO₂ Emissions (kg/Year, %)				11,245.76	3,133.11	72.14%

- 5.3 On review of the above, it is evident that the proposed dwellings will achieve a total minimum reduction in regulated CO₂ emissions of **72.14%** in comparison to Approved Document L1 2021 of the Building Regulations.

6.0 Flood Risk and Water Management

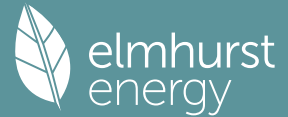
- 6.1 The development will be designed to be water efficient and to avoid excessive potable water consumption through the specification of water saving appliances such as a reduced volume/dual flush cistern and through restricting the flow rates of the water outlets. This will provide each dwelling with an overall reduced water consumption of less than or equal to 110 litres per person per day in line with the lower national technical standard set out in Part G of the Building Regulations.
- 6.2 Whilst the precise specification for achieving the above water consumption target is still to be confirmed, an example specification is detailed below, which will be used as a baseline for the development:
- Toilet = 4l (Full) and 2.6l (Part)
 - Basin mixer tap = 5l/min
 - Shower = 8/min
 - Bath = 170 litres capacity to overflow
 - Kitchen mixer tap = 6l/min
- 6.3 In addition to the above, the following measures will also be incorporated into the dwellings as means of encouraging future occupants to reduce their water consumption by raising awareness:
- Water meters installed in a readily visible location
 - Information on how to use water efficiently will be provided as part of any handover to future occupants
- 6.4 It is also noted that upon referencing the Environment Agency's Flood Risk Map, the proposed development is located in Flood Risk Zone 1, which is an area that is not at risk of flooding.
- 6.5 In the circumstances, the proposed development is deemed to satisfy the requirements of Policies SP9 and D1 of North Hertfordshire District Council's Local Plan (November 2022).



Appendix 1:

Baseline TER and Renewable DER Calculations (SAP Derived)

Full SAP Calculation Printout



Plot Reference	23820-B-EN			Issued on Date	07/01/2026
Assessment Reference	Renewable	Plot Type Ref	EST		
Plot Address	B-EN, Bedford Road, Hitchin, SG5 2TY			SAP Version	10.2
SAP Rating	85 B	DER	3.04	TER	10.44
Environmental	97 A	% DER < TER			70.88
CO ₂ Emissions (t/year)	0.34	DFEE	36.24	TFEE	37.69
Compliance Check	See BREL	% DFEE < TFEE			3.85
% DPER < TPER	37.06	DPER	34.38	TPER	54.63
Assessor Details	Mr. Samuel Marks			Assessor ID	BP82-0001
Client	23820, Jordon Foux				

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					
Ground floor	42.5900 (1b)	x	2.4500 (2b)	=	104.3455 (1b) - (3b)
First floor	44.3700 (1c)	x	2.7100 (2c)	=	120.2427 (1c) - (3c)
Second floor	44.3700 (1d)	x	2.7100 (2d)	=	120.2427 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	131.3300				(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	344.8309 (5)

2. Ventilation rate

		m ³ per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	4.0000	(17)
Infiltration rate	0.2000	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1700 (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	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												79.2000 (23c)
Effective ac	0.3207	0.3165	0.3123	0.2910	0.2867	0.2655	0.2655	0.2612	0.2740	0.2867	0.2953	0.3037 (25)

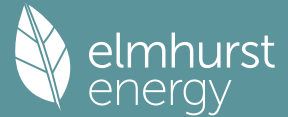
3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			22.0200	1.3258	29.1932		(27)
Solid Door			2.1000	1.2000	2.5200		(26)
Floor			42.5900	0.1200	5.1108	75.0000	3194.2500 (28a)
Exposed Floor			1.7800	0.1800	0.3204	0.0000	0.0000 (28b)
External Wall	150.7900	24.1200	126.6700	0.1800	22.8006	60.0000	7600.1996 (29a)
Plane	44.3700		44.3700	0.1000	4.4370	9.0000	399.3300 (30)
Total net area of external elements Aum (A, m ²)			239.5300				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	64.3820	(33)
Main dwelling							
Party Wall			66.5100	0.0000	0.0000	45.0000	2992.9501 (32)
B			68.8800			75.0000	5165.9998 (32c)
T			167.5500			9.0000	1507.9500 (32c)
Internal Floor			86.9600			18.0000	1565.2800 (32d)

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	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	156.0997	172.8247	156.0997	161.3030	156.0997	161.3030	156.0997	156.0997	161.3030	156.0997	161.3030	156.0997	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	299.3165	302.4224	294.5955	277.9329	256.8993	237.1307	223.9241	220.8181	228.6450	245.3077	266.3412	286.1098	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	(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)	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	(71)
Water heating gains (Table 5)	190.8931	187.8029	181.6899	168.0739	159.7809	151.0914	145.6589	150.0027	155.1133	164.7547	177.7954	189.1358	(72)
Total internal gains	715.7847	732.5254	701.8604	676.7851	642.2553	616.0005	592.1580	593.3959	611.5367	635.6374	674.9150	700.8207	(73)

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6. Solar gains

[Jan]	Area m2				Solar flux Table 6a W/m2	g Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
East	7.5000				19.6403	0.6300	0.7000	0.7000	0.7700	45.0174 (76)
West	14.5200				19.6403	0.6300	0.7000	0.7000	0.7700	87.1537 (80)

Solar gains	132.1711	258.5547	425.8027	621.0079	761.0685	779.0890	741.7245	637.1304	495.2262	306.7969	164.8018	108.6911 (83)
Total gains	847.9557	991.0801	1127.6632	1297.7930	1403.3238	1395.0895	1333.8825	1230.5263	1106.7629	942.4343	839.7168	809.5117 (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	59.2494	59.5139	59.7808	61.1520	61.4338	62.8829	62.8829	63.1809	62.2951	61.4338	60.8728	60.3218
alpha	4.9500	4.9676	4.9854	5.0768	5.0956	5.1922	5.1922	5.2121	5.1530	5.0956	5.0582	5.0215
util living area	0.9876	0.9730	0.9364	0.8282	0.6581	0.4653	0.3374	0.3799	0.6195	0.8907	0.9740	0.9899 (86)
MIT	20.0924	20.2645	20.4990	20.7646	20.8936	20.9342	20.9394	20.9389	20.9151	20.7202	20.3712	20.0775 (87)
Th 2	20.2287	20.2319	20.2350	20.2510	20.2542	20.2701	20.2701	20.2733	20.2637	20.2542	20.2478	20.2414 (88)
util rest of house	0.9849	0.9675	0.9238	0.7998	0.6144	0.4141	0.2818	0.3206	0.5616	0.8646	0.9678	0.9877 (89)
MIT 2	19.1545	19.3742	19.6680	19.9958	20.1365	20.1895	20.1931	20.1962	20.1683	19.9550	19.5238	19.1458 (90)
Living area fraction	19.2674	19.4813	19.7680	20.0884	20.2277	20.2792	20.2830	20.2856	20.2582	20.0471	19.6258	0.1204 (91)
MIT	19.2674	19.4813	19.7680	20.0884	20.2277	20.2792	20.2830	20.2856	20.2582	20.0471	19.6258	19.2580 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2674	19.4813	19.7680	20.0884	20.2277	20.2792	20.2830	20.2856	20.2582	20.0471	19.6258	19.2580 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9807	0.9608	0.9149	0.7931	0.6127	0.4147	0.2828	0.3216	0.5611	0.8564	0.9613	0.9840 (94)
Useful gains	831.5481	952.2169	1031.6824	1029.2829	859.8817	578.5868	377.1963	395.7469	621.0300	807.0592	807.1813	796.5377 (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	1628.5789	1579.5205	1430.8418	1179.5130	894.8875	582.2343	377.5825	396.4815	637.3031	991.3776	1326.5662	1609.3028 (97)
Space heating kWh	592.9909	421.5480	296.9746	108.1657	26.0443	0.0000	0.0000	0.0000	0.0000	137.1329	373.9571	604.6972 (98a)
Space heating requirement - total per year (kWh/year)												2561.5107
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	592.9909	421.5480	296.9746	108.1657	26.0443	0.0000	0.0000	0.0000	0.0000	137.1329	373.9571	604.6972 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2561.5107
Space heating per m2										(98c) / (4) =		19.5044 (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 %)												219.3000 (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	592.9909	421.5480	296.9746	108.1657	26.0443	0.0000	0.0000	0.0000	0.0000	137.1329	373.9571	604.6972 (98)
Space heating efficiency (main heating system 1)	219.3000	219.3000	219.3000	219.3000	219.3000	0.0000	0.0000	0.0000	0.0000	219.3000	219.3000	219.3000 (210)
Space heating fuel (main heating system)	270.4017	192.2244	135.4193	49.3232	11.8761	0.0000	0.0000	0.0000	0.0000	62.5321	170.5231	275.7397 (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	340.2996	301.1219	319.7065	279.9091	270.6832	243.1350	239.0838	248.8035	251.8441	281.8124	300.9603	336.3674 (64)
Efficiency of water heater (217)m	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000 (216)
Fuel for water heating, kWh/month	178.7288	158.1523	167.9131	147.0111	142.1655	127.6970	125.5692	130.6741	132.2711	148.0107	158.0674	176.6636 (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	39.7498	35.9030	39.7498	38.4675	39.7498	38.4675	39.7498	39.7498	38.4675	39.7498	38.4675	39.7498 (231)
Lighting	39.4715	31.6655	28.5113	20.8886	16.1350	13.1824	14.7188	19.1321	24.8507	32.6055	36.8278	40.5686 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-21.4266	-36.0542	-62.2124	-80.9041	-95.6500	-92.2630	-90.5378	-80.2399	-63.2141	-44.5226	-25.0875	-17.7369 (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	-3.9120	-10.2157	-26.3021	-50.3693	-76.4474	-80.7424	-78.5919	-61.1141	-38.4716	-17.3518	-5.7752	-2.9106 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

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Annual totals kWh/year	
Space heating fuel - main system 1	1168.0395 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	190.4000
Water heating fuel used	1792.9238 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.1125)	
mechanical ventilation fans (SFP = 1.1125)	468.0217 (230a)
Total electricity for the above, kWh/year	468.0217 (231)
Electricity for lighting (calculated in Appendix L)	318.5578 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1162.0534 (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	2585.4895 (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	1168.0395	0.1570	183.3703 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1792.9238	0.1410	252.7445 (264)
Space and water heating			436.1148 (265)
Pumps, fans and electric keep-hot	468.0217	0.1387	64.9204 (267)
Energy for lighting	318.5578	0.1443	45.9777 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-709.8492	0.1318	-93.5295
PV Unit electricity exported	-452.2042	0.1206	-54.5274
Total			-148.0569 (269)
Total CO2, kg/year			398.9561 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.0400 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1168.0395	1.5812	1846.8684 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1792.9238	1.5213	2727.4877 (278)
Space and water heating			4574.3560 (279)
Pumps, fans and electric keep-hot	468.0217	1.5128	708.0233 (281)
Energy for lighting	318.5578	1.5338	488.6147 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-709.8492	1.4868	-1055.4076
PV Unit electricity exported	-452.2042	0.4423	-200.0322
Total			-1255.4399 (283)
Total Primary energy kWh/year			4515.5541 (286)
Dwelling Primary energy Rate (DPER)			34.3800 (287)

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

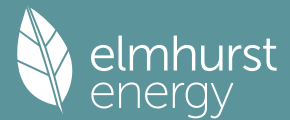
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	42.5900 (1b)	x 2.4500 (2b)	= 104.3455 (1b) - (3b)
First floor	44.3700 (1c)	x 2.7100 (2c)	= 120.2427 (1c) - (3c)
Second floor	44.3700 (1d)	x 2.7100 (2d)	= 120.2427 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	131.3300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	344.8309 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1160 (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)
0.3660 (18)
2 (19)

Shelter factor

Infiltration rate adjusted to include shelter factor

$$(20) = 1 - [0.075 \times (19)] = 0.8500 (20)$$

$$(21) = (18) \times (20) = 0.3111 (21)$$

	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	0.3967	0.3889	0.3811	0.3422	0.3344	0.2955	0.2955	0.2878	0.3111	0.3344	0.3500	0.3655	(22b)
Effective ac	0.5787	0.5756	0.5726	0.5586	0.5559	0.5437	0.5437	0.5414	0.5484	0.5559	0.5612	0.5668	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1000	1.0000	2.1000			(26)
TER Opening Type			22.0200	1.1450	25.2137			(27)
Floor			42.5900	0.1300	5.5367			(28a)
Exposed Floor			1.7800	0.1300	0.2314			(28b)
External Wall	150.7900	24.1200	126.6700	0.1800	22.8006			(29a)
Plane	44.3700		44.3700	0.1100	4.8807			(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	60.7631		(33)
Main dwelling								
Party Wall			66.5100	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							176.7197	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	13.5500	0.0500	0.6775	
E3 Sill	12.5500	0.0500	0.6275	
E4 Jamb	36.0000	0.0500	1.8000	
E5 Ground floor (normal)	19.7100	0.1600	3.1536	
E6 Intermediate floor within a dwelling	18.9200	0.0000	0.0000	
E16 Corner (normal)	18.2000	0.0900	1.6380	
E17 Corner (inverted - internal area greater than external area)	2.4500	-0.0900	-0.2205	
E10 Eaves (insulation at ceiling level)	10.2000	0.0600	0.6120	
E12 Gable (insulation at ceiling level)	8.7000	0.0600	0.5220	
E18 Party wall between dwellings	15.7500	0.0600	0.9450	
P1 Party wall - Ground floor	7.8900	0.0800	0.6312	
P2 Party wall - Intermediate floor within a dwelling	16.5900	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	8.7000	0.1200	1.0440	
P8 Party Wall - Exposed floor (inverted)	0.8100	0.2400	0.1944	
E20 Exposed floor (normal)	2.2000	0.3200	0.7040	
E21 Exposed floor (inverted)	3.0100	0.3200	0.9632	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			13.2919	(36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	74.0550 (37)

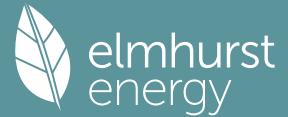
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	65.8488	65.5012	65.1605	63.5601	63.2607	61.8669	61.8669	61.6087	62.4037	63.2607	63.8665	64.4997	(38)
Heat transfer coeff	139.9039	139.5563	139.2156	137.6152	137.3158	135.9219	135.9219	135.6638	136.4588	137.3158	137.9215	138.5548	(39)
Average = Sum(39)m / 12 =												137.6138	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0653	1.0626	1.0600	1.0479	1.0456	1.0350	1.0350	1.0330	1.0391	1.0456	1.0502	1.0550	(40)
HLP (average)												1.0478	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8984 (42)
Hot water usage for mixer showers													
72.8157	71.7215	70.1269	67.0759	64.8244	62.3136	60.8864	62.4689	64.2036	66.8995	70.0160	72.5368	(42a)	
Hot water usage for baths													
31.4364	30.9695	30.3120	29.0998	28.1921	27.1856	26.6419	27.2948	28.0056	29.0826	30.3198	31.3301	(42b)	
Hot water usage for other uses													
44.3121	42.7007	41.0894	39.4780	37.8667	36.2553	36.2553	37.8667	39.4780	41.0894	42.7007	44.3121	(42c)	
Average daily hot water use (litres/day)												136.5638	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	148.5642	145.3917	141.5283	135.6538	130.8832	125.7545	123.7837	127.6304	131.6873	137.0715	143.0366	148.1789	(44)
Energy content	235.2894	207.0358	217.5237	185.7032	176.1940	154.6298	149.7056	158.0331	162.3836	186.0048	203.7818	232.0124	(45)
Energy content (annual)										Total = Sum(45)m =		2268.2972	
Distribution loss (46)m = 0.15 x (45)m													
35.2934	31.0554	32.6286	27.8555	26.4291	23.1945	22.4558	23.7050	24.3575	27.9007	30.5673	34.8019	(46)	
Water storage loss (or HIU loss):													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7016	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9188	(55)
Total storage loss													
28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)
If cylinder contains dedicated solar storage													
28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(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													
287.0359	253.7747	269.2703	235.7806	227.9406	204.7072	201.4522	209.7796	212.4609	237.7514	253.8591	283.7590	(62)	
WWHRS	-33.2883	-29.4405	-30.8284	-25.5271	-23.7903	-20.3576	-19.0820	-20.2918	-21.0627	-24.8306	-28.1301	-32.6719	(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													
253.7476	224.3342	238.4420	210.2535	204.1502	184.3496	182.3702	189.4879	191.3982	212.9208	225.7291	251.0871	(64)	
									Total per year (kWh/year) = Sum(64)m =		2568.2704	(64)	

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12Total per year (kWh/year)												2568 (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												
119.6310	106.2305	113.7239	101.8082	99.9818	91.4763	91.1744	93.9433	94.0544	103.2439	107.8193	118.5414	(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	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	156.0997	172.8247	156.0997	161.3030	156.0997	161.3030	156.0997	156.0997	161.3030	156.0997	161.3030	156.0997 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	299.3165	302.4224	294.5955	277.9329	256.8993	237.1307	223.9241	220.8181	228.6450	245.3077	266.3412	286.1098 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918 (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)	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343 (71)
Water heating gains (Table 5)	160.7943	158.0811	152.8547	141.4003	134.3841	127.0504	122.5462	126.2678	130.6311	138.7686	149.7491	159.3298 (72)
Total internal gains	685.6859	702.8036	673.0253	650.1115	616.8584	591.9595	569.0453	569.6610	587.0546	609.6514	646.8687	671.0147 (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					7.5000	19.6403	0.6300	0.7000			0.7700			45.0174 (76)
West					14.5200	19.6403	0.6300	0.7000			0.7700			87.1537 (80)
Solar gains	132.1711	258.5547	425.8027	621.0079	761.0685	779.0890	741.7245	637.1304	495.2262	306.7969	164.8018	108.6911 (83)		
Total gains	817.8569	961.3582	1098.8280	1271.1194	1377.9269	1371.0485	1310.7699	1206.7914	1082.2808	916.4483	811.6705	779.7058 (84)		

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	46.0804	46.1952	46.3083	46.8468	46.9490	47.4304	47.4304	47.5207	47.2438	46.9490	46.7428	46.5291
alpha	4.0720	4.0797	4.0872	4.1231	4.1299	4.1620	4.1620	4.1680	4.1496	4.1299	4.1162	4.1019
util living area	0.9909	0.9818	0.9603	0.8963	0.7733	0.5959	0.4466	0.5006	0.7460	0.9361	0.9830	0.9925 (86)
MIT	19.3455	19.5864	19.9541	20.4274	20.7696	20.9422	20.9862	20.9782	20.8536	20.3788	19.7821	19.3111 (87)
Th 2	20.0293	20.0315	20.0336	20.0436	20.0455	20.0543	20.0543	20.0559	20.0509	20.0455	20.0417	20.0377 (88)
util rest of house	0.9888	0.9776	0.9508	0.8722	0.7247	0.5207	0.3550	0.4050	0.6767	0.9159	0.9783	0.9907 (89)
MIT 2	18.0928	18.4001	18.8645	19.4501	19.8396	20.0158	20.0484	20.0458	19.9393	19.4058	18.6582	18.0546 (90)
Living area fraction	18.2436	18.5429	18.9956	19.5677	19.9515	20.1273	20.1613	20.1580	20.0494	19.5230	18.7935	18.2058 (91)
MIT	18.2436	18.5429	18.9956	19.5677	19.9515	20.1273	20.1613	20.1580	20.0494	19.5230	18.7935	18.2058 (92)
Temperature adjustment												0.0000
adjusted MIT	18.2436	18.5429	18.9956	19.5677	19.9515	20.1273	20.1613	20.1580	20.0494	19.5230	18.7935	18.2058 (93)

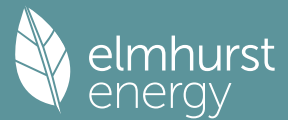
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9829	0.9685	0.9376	0.8581	0.7195	0.5268	0.3656	0.4157	0.6765	0.9019	0.9697	0.9857 (94)
Useful gains	803.9035	931.1214	1030.3052	1090.7084	991.3895	722.2020	479.1958	501.6152	732.1996	826.5727	787.0547	768.5222 (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	1950.7633	1903.9522	1739.5866	1468.0428	1133.0645	751.2793	484.0559	509.8256	811.8433	1225.2631	1612.7791	1940.5735 (97)
Space heating kWh	853.2637	653.7423	527.7054	271.6808	105.4063	0.0000	0.0000	0.0000	0.0000	296.6257	594.5215	872.0061 (98a)
Space heating requirement - total per year (kWh/year)												4174.9518
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	853.2637	653.7423	527.7054	271.6808	105.4063	0.0000	0.0000	0.0000	0.0000	296.6257	594.5215	872.0061 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4174.9518
Space heating per m2										(98c) / (4) =		31.7898 (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	853.2637	653.7423	527.7054	271.6808	105.4063	0.0000	0.0000	0.0000	0.0000	296.6257	594.5215	872.0061 (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)	924.4460	708.2798	571.7285	294.3454	114.1996	0.0000	0.0000	0.0000	0.0000	321.3713	644.1187	944.7520 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)

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Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	253.7476	224.3342	238.4420	210.2535	204.1502	184.3496	182.3702	189.4879	191.3982	212.9208	225.7291	251.0871	(64)
Efficiency of water heater	86.5622	86.3130	85.7888	84.6356	82.6524	79.8000	79.8000	79.8000	79.8000	84.8034	86.1269	86.6160	(216)
Fuel for water heating, kWh/month	293.1390	259.9079	277.9407	248.4219	246.9985	231.0145	228.5341	237.4535	239.8474	251.0756	262.0890	289.8853	(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	7.0685	7.3041	7.0685	7.3041	7.0685	(231)
Lighting	32.4344	26.0201	23.4282	17.1645	13.2584	10.8322	12.0947	15.7212	20.4203	26.7925	30.2621	33.3359	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-41.7111	-59.7935	-87.3515	-99.8287	-108.9584	-102.0965	-100.7677	-94.4533	-83.5777	-69.0345	-46.1803	-35.9412	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-20.6491	-43.7447	-87.5397	-132.3733	-175.9408	-177.1803	-175.1682	-147.9596	-107.9318	-62.9382	-27.6859	-16.3116	(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												4523.2414	(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												3066.3075	(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)												261.7645	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2105.1175	(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												5832.1959	(238)

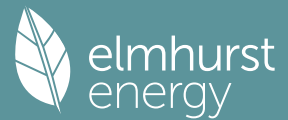
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4523.2414	0.2100	949.8807	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3066.3075	0.2100	643.9246	(264)
Space and water heating			1593.8053	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	261.7645	0.1443	37.7807	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-929.6943	0.1343	-124.8210	
PV Unit electricity exported	-1175.4232	0.1257	-147.7347	
Total			-272.5558	(269)
Total CO2, kg/year			1370.9595	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.4400	(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	4523.2414	1.1300	5111.2627	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3066.3075	1.1300	3464.9274	(278)
Space and water heating			8576.1902	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	261.7645	1.5338	401.5031	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-929.6943	1.4962	-1390.9949	
PV Unit electricity exported	-1175.4232	0.4613	-542.2754	
Total			-1933.2703	(283)
Total Primary energy kWh/year			7174.5238	(286)
Target Primary Energy Rate (TPER)			54.6300	(287)

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Plot Reference	23820-B-ES				Issued on Date	07/01/2026	
Assessment Reference	Renewable			Plot Type Ref	EST		
Plot Address	B-ES, Bedford Road, Hitchin, SG5 2TY				SAP Version	10.2	
SAP Rating	85 B	DER	2.92	TER	10.23		
Environmental	97 A	% DER < TER				71.46	
CO ₂ Emissions (t/year)	0.33	DFEE	35.51	TFEE	36.72		
Compliance Check	See BREL	% DFEE < TFEE				3.28	
% DPER < TPER	37.87	DPER	33.24	TPER	53.50		
Assessor Details	Mr. Samuel Marks				Assessor ID	BP82-0001	
Client	23820, Jordon Foux						

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					
Ground floor	42.5900 (1b)	x	2.4500 (2b)	=	104.3455 (1b) - (3b)
First floor	44.3700 (1c)	x	2.7100 (2c)	=	120.2427 (1c) - (3c)
Second floor	44.3700 (1d)	x	2.7100 (2d)	=	120.2427 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	131.3300				(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	344.8309 (5)

2. Ventilation rate

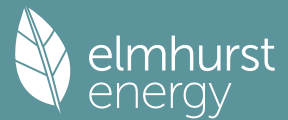
		m ³ per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	4.0000	(17)
Infiltration rate	0.2000	(18)
Number of sides sheltered	4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1400 (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	0.1785	0.1750	0.1715	0.1540	0.1505	0.1330	0.1330	0.1295	0.1400	0.1505	0.1575	0.1645 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												79.2000 (23c)
Effective ac	0.2825	0.2790	0.2755	0.2580	0.2545	0.2370	0.2370	0.2335	0.2440	0.2545	0.2615	0.2685 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			22.0200	1.3258	29.1932		(27)
Solid Door			2.1000	1.2000	2.5200		(26)
Floor			42.5900	0.1200	5.1108	75.0000	3194.2500 (28a)
Exposed Floor			1.7800	0.1800	0.3204	0.0000	0.0000 (28b)
External Wall	150.7900	24.1200	126.6700	0.1800	22.8006	60.0000	7600.1996 (29a)
Plane	44.3700		44.3700	0.1000	4.4370	9.0000	399.3300 (30)
Total net area of external elements Aum (A, m ²)			239.5300				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	64.3820	(33)
Main dwelling							
Party Wall			66.5100	0.0000	0.0000	45.0000	2992.9501 (32)
B			68.8800			75.0000	5165.9998 (32c)
T			167.5500			9.0000	1507.9500 (32c)
Internal Floor			86.9600			18.0000	1565.2800 (32d)

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Internal Ceiling	86.9600										9.0000		782.6400 (32e)	
Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...										(32e) =		23208.5995 (34)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K													176.7197 (35)	
List of Thermal Bridges														
K1 Element									Length	Psi-value		Total		
E2 Other lintels (including other steel lintels)									13.5500	0.0240		0.3252		
E3 Sill									12.5500	0.0220		0.2761		
E4 Jamb									36.0000	0.0170		0.6120		
E5 Ground floor (normal)									19.7100	0.0740		1.4585		
E6 Intermediate floor within a dwelling									18.9200	0.0010		0.0189		
E16 Corner (normal)									18.2000	0.0460		0.8372		
E17 Corner (inverted - internal area greater than external area)									2.4500	-0.0880		-0.2156		
E10 Eaves (insulation at ceiling level)									10.2000	0.0600		0.6120		
E12 Gable (insulation at ceiling level)									8.7000	0.0560		0.4872		
E18 Party wall between dwellings									15.7500	0.0330		0.5198		
P1 Party wall - Ground floor									7.8900	0.1080		0.8521		
P2 Party wall - Intermediate floor within a dwelling									16.5900	0.0000		0.0000		
P4 Party wall - Roof (insulation at ceiling level)									8.7000	0.1010		0.8787		
P8 Party Wall - Exposed floor (inverted)									0.8100	0.1850		0.1499		
E20 Exposed floor (normal)									2.2000	0.0690		0.1518		
E21 Exposed floor (inverted)									3.0100	0.3200		0.9632		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)													7.9270 (36)	
Point Thermal bridges												(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =		72.3090 (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	32.1469	31.7486	31.3503	29.3589	28.9606	26.9692	26.9692	26.5709	27.7658	28.9606	29.7572	30.5537	(38)	
Average = Sum(39)m / 12 =	104.4558	104.0575	103.6593	101.6679	101.2696	99.2782	99.2782	98.8799	100.0747	101.2696	102.0661	102.8627	(39)	
												101.5683		
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
HLP (average)	0.7954	0.7923	0.7893	0.7741	0.7711	0.7559	0.7559	0.7529	0.7620	0.7711	0.7772	0.7832	(40)	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31		
												31		

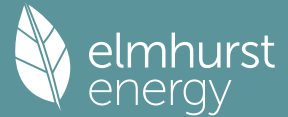
4. Water heating energy requirements (kWh/year)														

Assumed occupancy													2.8984 (42)	
Hot water usage for mixer showers	100.1216	98.6170	96.4245	92.2294	89.1336	85.6811	83.7188	85.8947	88.2800	91.9869	96.2720	99.7380	(42a)	
Hot water usage for baths	31.4364	30.9695	30.3120	29.0998	28.1921	27.1856	26.6419	27.2948	28.0056	29.0826	30.3198	31.3301	(42b)	
Hot water usage for other uses	44.3121	42.7007	41.0894	39.4780	37.8667	36.2553	36.2553	37.8667	39.4780	41.0894	42.7007	44.3121	(42c)	
Average daily hot water use (litres/day)													161.7390 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use	175.8701	172.2872	167.8259	160.8073	155.1924	149.1221	146.6160	151.0562	155.7636	162.1589	169.2926	175.3802	(44)	
Energy conte	278.5352	245.3347	257.9421	220.1371	208.9188	183.3630	177.3194	187.0391	192.0721	220.0480	241.1883	274.6030	(45)	
Energy content (annual)	Total = Sum(45)m =												2686.5010	
Distribution loss (46)m = 0.15 x (45)m	41.7803	36.8002	38.6913	33.0206	31.3378	27.5044	26.5979	28.0559	28.8108	33.0072	36.1782	41.1905	(46)	
Water storage loss (or HIU loss):														
Store volume													210.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):													2.3000 (48)	
Temperature factor from Table 2b													0.5400 (49)	
Enter (49) or (54) in (55)													1.2420 (55)	
Total storage loss	38.5020	34.7760	38.5020	37.2600	38.5020	37.2600	38.5020	38.5020	37.2600	38.5020	37.2600	38.5020	(56)	
If cylinder contains dedicated solar storage	38.5020	34.7760	38.5020	37.2600	38.5020	37.2600	38.5020	38.5020	37.2600	38.5020	37.2600	38.5020	(57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	(59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)	
Total heat required for water heating calculated for each month	340.2996	301.1219	319.7065	279.9091	270.6832	243.1350	239.0838	248.8035	251.8441	281.8124	300.9603	336.3674	(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	340.2996	301.1219	319.7065	279.9091	270.6832	243.1350	239.0838	248.8035	251.8441	281.8124	300.9603	336.3674	(64)	
	Total per year (kWh/year) = Sum(64)m =												3413.7270 (64)	
12Total per year (kWh/year)													3414 (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	142.0245	126.2036	135.1773	121.0132	118.8770	108.7858	108.3702	111.6020	111.6816	122.5775	128.0127	140.7170	(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	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	(66)	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	156.0997	172.8247	156.0997	161.3030	156.0997	161.3030	156.0997	156.0997	161.3030	156.0997	161.3030	156.0997	(67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	299.3165	302.4224	294.5955	277.9329	256.8993	237.1307	223.9241	220.8181	228.6450	245.3077	266.3412	286.1098	(68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	(69)	
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	(71)	
Water heating gains (Table 5)	190.8931	187.8029	181.6899	168.0739	159.7809	151.0914	145.6589	150.0027	155.1133	164.7547	177.7954	189.1358	(72)	
Total internal gains	715.7847	732.5254	701.8604	676.7851	642.2553	616.0005	592.1580	593.3959	611.5367	635.6374	674.9150	700.8207	(73)	

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6. Solar gains

[Jan]	Area m2				Solar flux Table 6a W/m2	g Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W	
East	7.5000				19.6403	0.6300	0.7000	0.7000	0.7700	45.0174 (76)	
West	14.5200				19.6403	0.6300	0.7000	0.7000	0.7700	87.1537 (80)	

Solar gains	132.1711	258.5547	425.8027	621.0079	761.0685	779.0890	741.7245	637.1304	495.2262	306.7969	164.8018	108.6911 (83)
Total gains	847.9557	991.0801	1127.6632	1297.7930	1403.3238	1395.0895	1333.8825	1230.5263	1106.7629	942.4343	839.7168	809.5117 (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	61.7183	61.9545	62.1925	63.4107	63.6601	64.9371	64.9371	65.1986	64.4202	63.6601	63.1633	62.6742
alpha	5.1146	5.1303	5.1462	5.2274	5.2440	5.3291	5.3291	5.3466	5.2947	5.2440	5.2109	5.1783
util living area	0.9870	0.9712	0.9313	0.8161	0.6414	0.4517	0.3269	0.3685	0.6036	0.8826	0.9724	0.9894 (86)
MIT	20.1499	20.3190	20.5452	20.7911	20.9044	20.9372	20.9412	20.9408	20.9217	20.7471	20.4142	20.1310 (87)
Th 2	20.2573	20.2600	20.2626	20.2758	20.2784	20.2917	20.2917	20.2943	20.2864	20.2784	20.2732	20.2679 (88)
util rest of house	0.9843	0.9654	0.9183	0.7875	0.5990	0.4031	0.2746	0.3125	0.5477	0.8558	0.9659	0.9872 (89)
MIT 2	19.2506	19.4658	19.7480	20.0486	20.1709	20.2140	20.2167	20.2193	20.1967	20.0076	19.5985	19.2351 (90)
Living area fraction	19.3588	19.5685	19.8440	20.1380	20.2592	20.3010	20.3039	20.3062	fLA = Living area / (4) =	20.0967	19.6967	0.1204 (91)
MIT	19.3588	19.5685	19.8440	20.1380	20.2592	20.3010	20.3039	20.3062	20.2840	20.0967	19.6967	19.3430 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3588	19.5685	19.8440	20.1380	20.2592	20.3010	20.3039	20.3062	20.2840	20.0967	19.6967	19.3430 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9800	0.9588	0.9097	0.7816	0.5978	0.4037	0.2755	0.3134	0.5475	0.8482	0.9594	0.9835 (94)
Useful gains	830.9907	950.2712	1025.8271	1014.3392	838.9251	563.2304	367.4421	385.7014	605.9627	799.4015	805.6580	796.1608 (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	1572.9830	1526.3681	1383.2285	1142.5454	866.7906	565.9866	367.7197	386.2421	618.8599	961.7222	1285.6941	1557.6484 (97)
Space heating kWh	552.0423	387.1371	265.9066	92.3085	20.7319	0.0000	0.0000	0.0000	0.0000	120.7666	345.6260	566.5467 (98a)
Space heating requirement - total per year (kWh/year)												2351.0657
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	552.0423	387.1371	265.9066	92.3085	20.7319	0.0000	0.0000	0.0000	0.0000	120.7666	345.6260	566.5467 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2351.0657
Space heating per m2										(98c) / (4) =		17.9020 (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 %)												219.3000 (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	552.0423	387.1371	265.9066	92.3085	20.7319	0.0000	0.0000	0.0000	0.0000	120.7666	345.6260	566.5467 (98)
Space heating efficiency (main heating system 1)	219.3000	219.3000	219.3000	219.3000	219.3000	0.0000	0.0000	0.0000	0.0000	219.3000	219.3000	219.3000 (210)
Space heating fuel (main heating system)	251.7293	176.5331	121.2525	42.0923	9.4537	0.0000	0.0000	0.0000	0.0000	55.0691	157.6042	258.3432 (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	340.2996	301.1219	319.7065	279.9091	270.6832	243.1350	239.0838	248.8035	251.8441	281.8124	300.9603	336.3674 (64)
Efficiency of water heater (217)m	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000 (216)
Fuel for water heating, kWh/month	178.7288	158.1523	167.9131	147.0111	142.1655	127.6970	125.5692	130.6741	132.2711	148.0107	158.0674	176.6636 (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	39.7498	35.9030	39.7498	38.4675	39.7498	38.4675	39.7498	39.7498	38.4675	39.7498	38.4675	39.7498 (231)
Lighting	39.4715	31.6655	28.5113	20.8886	16.1350	13.1824	14.7188	19.1321	24.8507	32.6055	36.8278	40.5686 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-21.3871	-35.9550	-61.9881	-80.6493	-95.5143	-92.2630	-90.5378	-80.2399	-63.2141	-44.4244	-25.0385	-17.7090 (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	-3.9515	-10.3148	-26.5265	-50.6241	-76.5831	-80.7424	-78.5919	-61.1141	-38.4716	-17.4500	-5.8243	-2.9386 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

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Annual totals kWh/year	
Space heating fuel - main system 1	1072.0774 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	190.4000
Water heating fuel used	1792.9238 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.1125)	
mechanical ventilation fans (SFP = 1.1125)	468.0217 (230a)
Total electricity for the above, kWh/year	468.0217 (231)
Electricity for lighting (calculated in Appendix L)	318.5578 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1162.0534 (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	2489.5274 (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	1072.0774	0.1572	168.4935 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1792.9238	0.1410	252.7445 (264)
Space and water heating			421.2379 (265)
Pumps, fans and electric keep-hot	468.0217	0.1387	64.9204 (267)
Energy for lighting	318.5578	0.1443	45.9777 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-708.9203	0.1317	-93.3931
PV Unit electricity exported	-453.1331	0.1207	-54.6771
Total			-148.0703 (269)
Total CO2, kg/year			384.0658 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.9200 (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	1072.0774	1.5818	1695.8241 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1792.9238	1.5213	2727.4877 (278)
Space and water heating			4423.3118 (279)
Pumps, fans and electric keep-hot	468.0217	1.5128	708.0233 (281)
Energy for lighting	318.5578	1.5338	488.6147 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-708.9203	1.4867	-1053.9737
PV Unit electricity exported	-453.1331	0.4427	-200.5848
Total			-1254.5585 (283)
Total Primary energy kWh/year			4365.3913 (286)
Dwelling Primary energy Rate (DPER)			33.2400 (287)

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

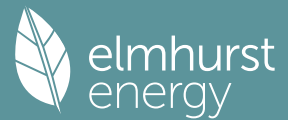
1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)
Main dwelling					
Ground floor	42.5900 (1b)	x	2.4500 (2b)	=	104.3455 (1b) - (3b)
First floor	44.3700 (1c)	x	2.7100 (2c)	=	120.2427 (1c) - (3c)
Second floor	44.3700 (1d)	x	2.7100 (2d)	=	120.2427 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	131.3300				(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	344.8309 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1160 (8)
Pressure test	Yes

Full SAP Calculation Printout



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

Blower Door
5.0000 (17)
0.3660 (18)
4 (19)

Shelter factor

Infiltration rate adjusted to include shelter factor

$$(20) = 1 - [0.075 \times (19)] = 0.7000 (20)$$
$$(21) = (18) \times (20) = 0.2562 (21)$$

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)
Effective ac	0.3267	0.3202	0.3138	0.2818	0.2754	0.2434	0.2434	0.2370	0.2562	0.2754	0.2882	0.3010	(22b)
	0.5534	0.5513	0.5492	0.5397	0.5379	0.5296	0.5296	0.5281	0.5328	0.5379	0.5415	0.5453	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1000	1.0000	2.1000			(26)
TER Opening Type			22.0200	1.1450	25.2137			(27)
Floor			42.5900	0.1300	5.5367			(28a)
Exposed Floor			1.7800	0.1300	0.2314			(28b)
External Wall	150.7900	24.1200	126.6700	0.1800	22.8006			(29a)
Plane	44.3700		44.3700	0.1100	4.8807			(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	60.7631		(33)
Main dwelling								
Party Wall			66.5100	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							176.7197	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	13.5500	0.0500	0.6775	
E3 Sill	12.5500	0.0500	0.6275	
E4 Jamb	36.0000	0.0500	1.8000	
E5 Ground floor (normal)	19.7100	0.1600	3.1536	
E6 Intermediate floor within a dwelling	18.9200	0.0000	0.0000	
E16 Corner (normal)	18.2000	0.0900	1.6380	
E17 Corner (inverted - internal area greater than external area)	2.4500	-0.0900	-0.2205	
E10 Eaves (insulation at ceiling level)	10.2000	0.0600	0.6120	
E12 Gable (insulation at ceiling level)	8.7000	0.0600	0.5220	
E18 Party wall between dwellings	15.7500	0.0600	0.9450	
P1 Party wall - Ground floor	7.8900	0.0800	0.6312	
P2 Party wall - Intermediate floor within a dwelling	16.5900	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	8.7000	0.1200	1.0440	
P8 Party Wall - Exposed floor (inverted)	0.8100	0.2400	0.1944	
E20 Exposed floor (normal)	2.2000	0.3200	0.7040	
E21 Exposed floor (inverted)	3.0100	0.3200	0.9632	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			13.2919	(36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	74.0550 (37)

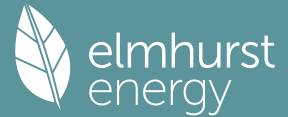
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	62.9682	62.7324	62.5014	61.4160	61.2129	60.2676	60.2676	60.0925	60.6317	61.2129	61.6237	62.0532	(38)
Average = Sum(39)m / 12 =	137.0232	136.7875	136.5564	135.4710	135.2680	134.3226	134.3226	134.1476	134.6868	135.2680	135.6788	136.1082	(39)
												135.4700	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0434	1.0416	1.0398	1.0315	1.0300	1.0228	1.0228	1.0215	1.0256	1.0300	1.0331	1.0364	(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													2.8984 (42)
Hot water usage for mixer showers													
Hot water usage for baths	72.8157	71.7215	70.1269	67.0759	64.8244	62.3136	60.8864	62.4689	64.2036	66.8995	70.0160	72.5368	(42a)
Hot water usage for a3436	31.4364	30.9695	30.3120	29.0998	28.1921	27.1856	26.6419	27.2948	28.0056	29.0826	30.3198	31.3301	(42b)
Hot water usage for other uses	44.3121	42.7007	41.0894	39.4780	37.8667	36.2553	36.2553	37.8667	39.4780	41.0894	42.7007	44.3121	(42c)
Average daily hot water use (litres/day)												136.5638	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	148.5642	145.3917	141.5283	135.6538	130.8832	125.7545	123.7837	127.6304	131.6873	137.0715	143.0366	148.1789	(44)
Energy content (annual)	235.2894	207.0358	217.5237	185.7032	176.1940	154.6298	149.7056	158.0331	162.3836	186.0048	203.7818	232.0124	(45)
Distribution loss (46)m = 0.15 x (45)m	35.2934	31.0554	32.6286	27.8555	26.4291	23.1945	22.4558	23.7050	24.3575	27.9007	30.5673	34.8019	(46)
Water storage loss (or HIU loss):													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7016	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9188	(55)
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(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	287.0359	253.7747	269.2703	235.7806	227.9406	204.7072	201.4522	209.7796	212.4609	237.7514	253.8591	283.7590	(62)
WWHRS	-33.2883	-29.4405	-30.8284	-25.5271	-23.7903	-20.3576	-19.0820	-20.2918	-21.0627	-24.8306	-28.1301	-32.6719	(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	253.7476	224.3342	238.4420	210.2535	204.1502	184.3496	182.3702	189.4879	191.3982	212.9208	225.7291	251.0871	(64)
Total per year (kWh/year) = Sum(64)m =												2568.2704	(64)

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12Total per year (kWh/year)											2568 (64)	
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)	
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											0.0000 (64a)	
Heat gains from water heating, kWh/month												
	119.6310	106.2305	113.7239	101.8082	99.9818	91.4763	91.1744	93.9433	94.0544	103.2439	107.8193	118.5414 (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	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	156.0997	172.8247	156.0997	161.3030	156.0997	161.3030	156.0997	156.0997	161.3030	156.0997	161.3030	156.0997	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	299.3165	302.4224	294.5955	277.9329	256.8993	237.1307	223.9241	220.8181	228.6450	245.3077	266.3412	286.1098	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	(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)	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	(71)
Water heating gains (Table 5)	160.7943	158.0811	152.8547	141.4003	134.3841	127.0504	122.5462	126.2678	130.6311	138.7686	149.7491	159.3298	(72)
Total internal gains	685.6859	702.8036	673.0253	650.1115	616.8584	591.9595	569.0453	569.6610	587.0546	609.6514	646.8687	671.0147	(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					7.5000	19.6403	0.6300	0.7000			0.7700			45.0174 (76)
West					14.5200	19.6403	0.6300	0.7000			0.7700			87.1537 (80)
Solar gains	132.1711	258.5547	425.8027	621.0079	761.0685	779.0890	741.7245	637.1304	495.2262	306.7969	164.8018	108.6911 (83)		
Total gains	817.8569	961.3582	1098.8280	1271.1194	1377.9269	1371.0485	1310.7699	1206.7914	1082.2808	916.4483	811.6705	779.7058 (84)		

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	47.0492	47.1303	47.2100	47.5883	47.6597	47.9951	47.9951	48.0578	47.8654	47.6597	47.5154	47.3655
alpha	4.1366	4.1420	4.1473	4.1726	4.1773	4.1997	4.1997	4.2039	4.1910	4.1773	4.1677	4.1577
util living area	0.9908	0.9816	0.9593	0.8938	0.7685	0.5909	0.4420	0.4960	0.7414	0.9347	0.9828	0.9925 (86)
MIT	19.3891	19.6275	19.9899	20.4501	20.7823	20.9458	20.9873	20.9797	20.8611	20.3984	19.8109	19.3483 (87)
Th 2	20.0474	20.0488	20.0503	20.0571	20.0584	20.0644	20.0644	20.0655	20.0621	20.0584	20.0558	20.0531 (88)
util rest of house	0.9887	0.9773	0.9498	0.8695	0.7200	0.5166	0.3520	0.4019	0.6724	0.9144	0.9781	0.9907 (89)
MIT 2	18.1604	18.4640	18.9210	19.4874	19.8640	20.0282	20.0589	20.0560	19.9563	19.4390	18.7042	18.1123 (90)
Living area fraction	18.3083	18.6040	19.0497	19.6033	19.9745	20.1387	20.1707	20.1672	20.0652	19.5545	18.8375	18.2611 (91)
MIT	18.3083	18.6040	19.0497	19.6033	19.9745	20.1387	20.1707	20.1672	20.0652	19.5545	18.8375	18.2611 (92)
Temperature adjustment												0.0000
adjusted MIT	18.3083	18.6040	19.0497	19.6033	19.9745	20.1387	20.1707	20.1672	20.0652	19.5545	18.8375	18.2611 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9830	0.9683	0.9368	0.8558	0.7152	0.5228	0.3625	0.4124	0.6726	0.9006	0.9695	0.9857	(94)
Useful gains	803.9137	930.9097	1029.3600	1087.8250	985.5353	716.7246	475.1376	497.7135	727.9756	825.3900	786.9247	768.5486	(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	1919.4605	1874.5407	1713.7372	1449.9833	1119.2773	743.9700	479.6219	505.3602	803.4355	1211.2550	1592.5251	1913.8256	(97)
Space heating kWh	829.9668	634.1201	509.1767	260.7540	99.5040	0.0000	0.0000	0.0000	0.0000	287.0836	580.0323	852.0861	(98a)
Space heating requirement - total per year (kWh/year)												4052.7236	
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	829.9668	634.1201	509.1767	260.7540	99.5040	0.0000	0.0000	0.0000	0.0000	287.0836	580.0323	852.0861	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4052.7236	
Space heating per m2										(98c) / (4) =		30.8591	(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	829.9668	634.1201	509.1767	260.7540	99.5040	0.0000	0.0000	0.0000	0.0000	287.0836	580.0323	852.0861	(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)	899.2057	687.0206	551.6540	282.5070	107.8050	0.0000	0.0000	0.0000	0.0000	311.0331	628.4207	923.1702	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)

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Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	253.7476	224.3342	238.4420	210.2535	204.1502	184.3496	182.3702	189.4879	191.3982	212.9208	225.7291	251.0871 (64)
Efficiency of water heater	86.5153	86.2578	85.7168	84.5437	82.5413	79.8000	79.8000	79.8000	79.8000	84.7307	86.0803	79.8000 (216)
Fuel for water heating, kWh/month	293.2978	260.0742	278.1743	248.6922	247.3309	231.0145	228.5341	237.4535	239.8474	251.2913	262.2309	290.0140 (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	32.4344	26.0201	23.4282	17.1645	13.2584	10.8322	12.0947	15.7212	20.4203	26.7925	30.2621	33.3359 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-41.7111	-59.7935	-87.3515	-99.8287	-108.9584	-102.0965	-100.7677	-94.4533	-83.5777	-69.0345	-46.1803	-35.9412 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-20.6491	-43.7447	-87.5397	-132.3733	-175.9408	-177.1803	-175.1682	-147.9596	-107.9318	-62.9382	-27.6859	-16.3116 (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												4390.8164 (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												3067.9551 (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)												261.7645 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2105.1175 (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												5701.4186 (238)

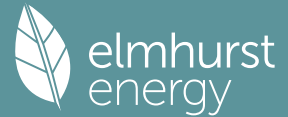
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4390.8164	0.2100	922.0714 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3067.9551	0.2100	644.2706 (264)
Space and water heating			1566.3420 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	261.7645	0.1443	37.7807 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-929.6943	0.1343	-124.8210
PV Unit electricity exported	-1175.4232	0.1257	-147.7347
Total			-272.5558 (269)
Total CO2, kg/year			1343.4962 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.2300 (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	4390.8164	1.1300	4961.6226 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3067.9551	1.1300	3466.7893 (278)
Space and water heating			8428.4119 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	261.7645	1.5338	401.5031 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-929.6943	1.4962	-1390.9949
PV Unit electricity exported	-1175.4232	0.4613	-542.2754
Total			-1933.2703 (283)
Total Primary energy kWh/year			7026.7455 (286)
Target Primary Energy Rate (TPER)			53.5000 (287)

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Plot Reference	23820-B-M			Issued on Date	07/01/2026
Assessment Reference	Renewable	Plot Type Ref	EST		
Plot Address	B-M, Bedford Road, Hitchin, SG5 2TY			SAP Version	10.2
SAP Rating	87 B	DER	2.60	TER	9.14
Environmental	98 A	% DER < TER			71.55
CO ₂ Emissions (t/year)	0.29	DFEE	30.75	TFEE	31.76
Compliance Check	See BREL	% DFEE < TFEE			3.18
% DPER < TPER	37.19	DPER	29.94	TPER	47.66
Assessor Details	Mr. Samuel Marks			Assessor ID	BP82-0001
Client	23820, Jordon Foux				

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					
Ground floor	42.5900 (1b)	x	2.4500 (2b)	=	104.3455 (1b) - (3b)
First floor	44.3700 (1c)	x	2.7100 (2c)	=	120.2427 (1c) - (3c)
Second floor	44.3700 (1d)	x	2.7100 (2d)	=	120.2427 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	131.3300				(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	344.8309 (5)

2. Ventilation rate

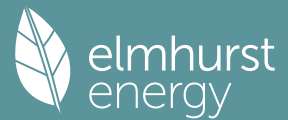
		m ³ per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	4.0000	(17)
Infiltration rate	0.2000	(18)
Number of sides sheltered	4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1400 (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	0.1785	0.1750	0.1715	0.1540	0.1505	0.1330	0.1330	0.1295	0.1400	0.1505	0.1575	0.1645 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												79.2000 (23c)
Effective ac	0.2825	0.2790	0.2755	0.2580	0.2545	0.2370	0.2370	0.2335	0.2440	0.2545	0.2615	0.2685 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			22.0200	1.3258	29.1932		(27)
Solid Door			2.1000	1.2000	2.5200		(26)
Floor			42.5900	0.1100	4.6849	75.0000	3194.2500 (28a)
Exposed Floor			1.7800	0.1800	0.3204	0.0000	0.0000 (28b)
External Wall	82.2900	24.1200	58.1700	0.1800	10.4706	60.0000	3490.2001 (29a)
Plane	44.3700		44.3700	0.1000	4.4370	9.0000	399.3300 (30)
Total net area of external elements Aum (A, m ²)			171.0300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	51.6261		(33)
Main dwelling							
Party Wall			135.0000	0.0000	0.0000	45.0000	6075.0000 (32)
B			68.8800			75.0000	5165.9998 (32c)
T			167.5500			9.0000	1507.9500 (32c)
Internal Floor			86.9600			18.0000	1565.2800 (32d)

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Internal Ceiling	86.9600	9.0000	782.6400 (32e)									
Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 22180.6499 (34)											
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	168.8925 (35)											
List of Thermal Bridges												
K1 Element	Length	Psi-value	Total									
E2 Other lintels (including other steel lintels)	13.5500	0.0240	0.3252									
E3 Sill	12.5500	0.0220	0.2761									
E4 Jamb	36.0000	0.0170	0.6120									
E5 Ground floor (normal)	11.8200	0.0740	0.8747									
E6 Intermediate floor within a dwelling	18.9200	0.0010	0.0189									
E16 Corner (normal)	4.9100	0.0460	0.2259									
E17 Corner (inverted - internal area greater than external area)	2.4500	-0.0880	-0.2156									
E10 Eaves (insulation at ceiling level)	10.2000	0.0600	0.6120									
E18 Party wall between dwellings	31.4900	0.0330	1.0392									
P1 Party wall - Ground floor	15.7800	0.1080	1.7042									
P2 Party wall - Intermediate floor within a dwelling	33.9900	0.0000	0.0000									
P4 Party wall - Roof (insulation at ceiling level)	17.4000	0.1010	1.7574									
P8 Party Wall - Exposed floor (inverted)	0.8100	0.1850	0.1499									
E20 Exposed floor (normal)	2.2000	0.0690	0.1518									
E21 Exposed floor (inverted)	3.0100	0.3200	0.9632									
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.4948 (36)									
Point Thermal Bridges		(36a) =	0.0000									
Total fabric heat loss		(33) + (36) + (36a) =	60.1209 (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	32.1469	31.7486	31.3503	29.3589	28.9606	26.9692	26.9692	26.5709	27.7658	28.9606	29.7572	30.5537 (38)
Average = Sum(39)m / 12 =	92.2678	91.8695	91.4712	89.4798	89.0815	87.0901	87.0901	86.6918	87.8867	89.0815	89.8781	90.6746 (39)
												89.3802
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7026	0.6995	0.6965	0.6813	0.6783	0.6631	0.6631	0.6601	0.6692	0.6783	0.6844	0.6904 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	0.6806
												31

4. Water heating energy requirements (kWh/year)

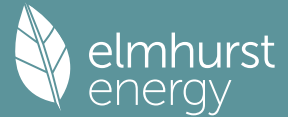
Assumed occupancy												2.8984 (42)
Hot water usage for mixer showers	100.1216	98.6170	96.4245	92.2294	89.1336	85.6811	83.7188	85.8947	88.2800	91.9869	96.2720	99.7380 (42a)
Hot water usage for baths	31.4364	30.9695	30.3120	29.0998	28.1921	27.1856	26.6419	27.2948	28.0056	29.0826	30.3198	31.3301 (42b)
Hot water usage for other uses	44.3121	42.7007	41.0894	39.4780	37.8667	36.2553	36.2553	37.8667	39.4780	41.0894	42.7007	44.3121 (42c)
Average daily hot water use (litres/day)												161.7390 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	175.8701	172.2872	167.8259	160.8073	155.1924	149.1221	146.6160	151.0562	155.7636	162.1589	169.2926	175.3802 (44)
Distribution loss (46)m = 0.15 x (45)m	278.5352	245.3347	257.9421	220.1371	208.9188	183.3630	177.3194	187.0391	192.0721	220.0480	241.1883	274.6030 (45)
Water storage loss (or HIU loss):	Total = Sum(45)m =											2686.5010
Store volume	41.7803	36.8002	38.6913	33.0206	31.3378	27.5044	26.5979	28.0559	28.8108	33.0072	36.1782	41.1905 (46)
a) If manufacturer declared loss factor is known (kWh/day):												210.0000 (47)
Temperature factor from Table 2b												2.3000 (48)
Enter (49) or (54) in (55)												0.5400 (49)
Total storage loss												1.2420 (55)
If cylinder contains dedicated solar storage	38.5020	34.7760	38.5020	37.2600	38.5020	37.2600	38.5020	38.5020	37.2600	38.5020	37.2600	38.5020 (56)
Primary loss	38.5020	34.7760	38.5020	37.2600	38.5020	37.2600	38.5020	38.5020	37.2600	38.5020	37.2600	38.5020 (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	340.2996	301.1219	319.7065	279.9091	270.6832	243.1350	239.0838	248.8035	251.8441	281.8124	300.9603	336.3674 (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)	340.2996	301.1219	319.7065	279.9091	270.6832	243.1350	239.0838	248.8035	251.8441	281.8124	300.9603	336.3674 (64)
Electric shower(s)	Total per year (kWh/year) = Sum(64)m =											3413.7270 (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	142.0245	126.2036	135.1773	121.0132	118.8770	108.7858	108.3702	111.6020	111.6816	122.5775	128.0127	140.7170 (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	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	156.0997	172.8247	156.0997	161.3030	156.0997	161.3030	156.0997	156.0997	161.3030	156.0997	161.3030	156.0997 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	299.3165	302.4224	294.5955	277.9329	256.8993	237.1307	223.9241	220.8181	228.6450	245.3077	266.3412	286.1098 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918 (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)	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343 (71)
Water heating gains (Table 5)	190.8931	187.8029	181.6899	168.0739	159.7809	151.0914	145.6589	150.0027	155.1133	164.7547	177.7954	189.1358 (72)
Total internal gains	715.7847	732.5254	701.8604	676.7851	642.2553	616.0005	592.1580	593.3959	611.5367	635.6374	674.9150	700.8207 (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	7.5000				19.6403	0.6300		0.7000		0.7700		45.0174 (76)
West	14.5200				19.6403	0.6300		0.7000		0.7700		87.1537 (80)
Solar gains	132.1711	258.5547	425.8027	621.0079	761.0685	779.0890	741.7245	637.1304	495.2262	306.7969	164.8018	108.6911 (83)
Total gains	847.9557	991.0801	1127.6632	1297.7930	1403.3238	1395.0895	1333.8825	1230.5263	1106.7629	942.4343	839.7168	809.5117 (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	66.7762	67.0657	67.3577	68.8568	69.1646	70.7462	70.7462	71.0712	70.1049	69.1646	68.5517	67.9494
alpha	5.4517	5.4710	5.4905	5.5905	5.6110	5.7164	5.7164	5.7381	5.6737	5.6110	5.5701	5.5300
util living area	0.9823	0.9601	0.9056	0.7622	0.5774	0.3983	0.2871	0.3237	0.5396	0.8414	0.9613	0.9856 (86)
MIT	20.2885	20.4551	20.6609	20.8576	20.9278	20.9441	20.9455	20.9455	20.9367	20.8204	20.5335	20.2708 (87)
Th 2	20.3386	20.3412	20.3439	20.3573	20.3600	20.3735	20.3735	20.3762	20.3681	20.3600	20.3547	20.3493 (88)
util rest of house	0.9789	0.9530	0.8905	0.7336	0.5409	0.3597	0.2463	0.2800	0.4929	0.8125	0.9532	0.9828 (89)
MIT 2	19.4946	19.7055	19.9599	20.1989	20.2744	20.3027	20.3038	20.3066	20.2916	20.1652	19.8171	19.4811 (90)
Living area fraction	fLA = Living area / (4) = 0.1204 (91)											
MIT	19.5902	19.7958	20.0443	20.2782	20.3530	20.3799	20.3810	20.3835	20.3692	20.2441	19.9033	19.5762 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.5902	19.7958	20.0443	20.2782	20.3530	20.3799	20.3810	20.3835	20.3692	20.2441	19.9033	19.5762 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9742	0.9461	0.8828	0.7300	0.5405	0.3601	0.2468	0.2805	0.4930	0.8068	0.9465	0.9786 (94)
Useful gains	826.0503	937.6854	995.4843	947.3313	758.5438	502.4263	329.2058	345.1704	545.6425	760.3934	794.8134	792.2214 (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	1410.7887	1368.4670	1238.9093	1018.1200	770.8244	503.3753	329.2893	345.3397	550.9818	859.1121	1150.7388	1394.2311 (97)
Space heating kWh	435.0454	289.4853	181.1082	50.9679	9.1368	0.0000	0.0000	0.0000	0.0000	73.4467	256.2663	447.8952 (98a)
Space heating requirement - total per year (kWh/year)	1743.3517											
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	435.0454	289.4853	181.1082	50.9679	9.1368	0.0000	0.0000	0.0000	0.0000	73.4467	256.2663	447.8952 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1743.3517											
Space heating per m2	(98c) / (4) = 13.2746 (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 %)												219.3000 (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	435.0454	289.4853	181.1082	50.9679	9.1368	0.0000	0.0000	0.0000	0.0000	73.4467	256.2663	447.8952 (98)
Space heating efficiency (main heating system 1)	219.3000	219.3000	219.3000	219.3000	219.3000	0.0000	0.0000	0.0000	0.0000	219.3000	219.3000	219.3000 (210)
Space heating fuel (main heating system)	198.3791	132.0042	82.5847	23.2412	4.1663	0.0000	0.0000	0.0000	0.0000	33.4914	116.8565	204.2386 (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	340.2996	301.1219	319.7065	279.9091	270.6832	243.1350	239.0838	248.8035	251.8441	281.8124	300.9603	336.3674 (64)
Water heating requirement	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000 (216)
Efficiency of water heater (217)m	178.7288	158.1523	167.9131	147.0111	142.1655	127.6970	125.5692	130.6741	132.2711	148.0107	158.0674	176.6636 (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	39.7498	35.9030	39.7498	38.4675	39.7498	38.4675	39.7498	39.7498	38.4675	39.7498	38.4675	39.7498 (231)
Pumps and Fa	39.4715	31.6655	28.5113	20.8886	16.1350	13.1824	14.7188	19.1321	24.8507	32.6055	36.8278	40.5686 (232)
Lighting	Electricity generated by PVs (Appendix M) (negative quantity)											
Electricity generated by PVs (Appendix M) (negative quantity)	-21.2669	-35.6566	-61.3439	-79.9651	-95.2153	-92.2630	-90.5378	-80.2399	-63.2141	-44.1304	-24.8748	-17.6165 (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)	-4.0717	-10.6133	-27.1706	-51.3082	-76.8821	-80.7424	-78.5919	-61.1141	-38.4716	-17.7441	-5.9879	-3.0311 (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												

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Space heating fuel - main system 1	794.9620 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	190.4000
Water heating fuel used	1792.9238 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.1125)	
mechanical ventilation fans (SFP = 1.1125)	468.0217 (230a)
Total electricity for the above, kWh/year	468.0217 (231)
Electricity for lighting (calculated in Appendix L)	318.5578 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1162.0534 (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	2212.4120 (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	794.9620	0.1578	125.4564 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1792.9238	0.1410	252.7445 (264)
Space and water heating			378.2009 (265)
Pumps, fans and electric keep-hot	468.0217	0.1387	64.9204 (267)
Energy for lighting	318.5578	0.1443	45.9777 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-706.3242	0.1317	-93.0102
PV Unit electricity exported	-455.7292	0.1209	-55.0998
Total			-148.1100 (269)
Total CO2, kg/year			340.9891 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.6000 (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	794.9620	1.5842	1259.3654 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1792.9238	1.5213	2727.4877 (278)
Space and water heating			3986.8530 (279)
Pumps, fans and electric keep-hot	468.0217	1.5128	708.0233 (281)
Energy for lighting	318.5578	1.5338	488.6147 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-706.3242	1.4865	-1049.9588
PV Unit electricity exported	-455.7292	0.4436	-202.1442
Total			-1252.1031 (283)
Total Primary energy kWh/year			3931.3879 (286)
Dwelling Primary energy Rate (DPER)			29.9400 (287)

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

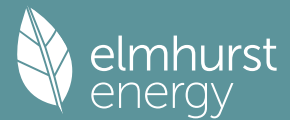
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	42.5900 (1b)	x 2.4500 (2b)	= 104.3455 (1b) - (3b)
First floor	44.3700 (1c)	x 2.7100 (2c)	= 120.2427 (1c) - (3c)
Second floor	44.3700 (1d)	x 2.7100 (2d)	= 120.2427 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	131.3300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 344.8309 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1160 (8)
Pressure test	Yes
Pressure Test Method	Blower Door

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Measured/design AP50 5.0000 (17)
 Infiltration rate 0.3660 (18)
 Number of sides sheltered 4 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.7000 (20)
 Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.2562 (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	0.3267	0.3202	0.3138	0.2818	0.2754	0.2434	0.2434	0.2370	0.2562	0.2754	0.2882	0.3010 (22b)
Effective ac	0.5534	0.5513	0.5492	0.5397	0.5379	0.5296	0.5296	0.5281	0.5328	0.5379	0.5415	0.5453 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			2.1000	1.0000	2.1000		(26)
TER Opening Type			22.0200	1.1450	25.2137		(27)
Floor			42.5900	0.1300	5.5367		(28a)
Exposed Floor			1.7800	0.1300	0.2314		(28b)
External Wall	82.2900	24.1200	58.1700	0.1800	10.4706		(29a)
Plane	44.3700		44.3700	0.1100	4.8807		(30)
Total net area of external elements Aum(A, m2)			171.0300				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	48.4331	(33)
Main dwelling							
Party Wall			135.0000	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 168.8925 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	13.5500	0.0500	0.6775
E2 Other lintels (including other steel lintels)	12.5500	0.0500	0.6275
E3 Sill	36.0000	0.0500	1.8000
E4 Jamb	11.8200	0.1600	1.8912
E5 Ground floor (normal)	18.9200	0.0000	0.0000
E6 Intermediate floor within a dwelling	4.9100	0.0900	0.4419
E16 Corner (normal)	2.4500	-0.0900	-0.2205
E17 Corner (inverted - internal area greater than external area)	10.2000	0.0600	0.6120
E10 Eaves (insulation at ceiling level)	31.4900	0.0600	1.8894
E18 Party wall between dwellings	15.7800	0.0800	1.2624
P1 Party wall - Ground floor	33.9900	0.0000	0.0000
P2 Party wall - Intermediate floor within a dwelling	17.4000	0.1200	2.0880
P4 Party wall - Roof (insulation at ceiling level)	0.8100	0.2400	0.1944
P8 Party Wall - Exposed floor (inverted)	2.2000	0.3200	0.7040
E20 Exposed floor (normal)	3.0100	0.3200	0.9632
E21 Exposed floor (inverted)			

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.9310 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 61.3641 (37)

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

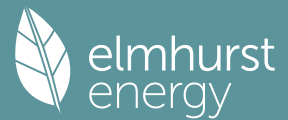
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	62.9682	62.7324	62.5014	61.4160	61.2129	60.2676	60.2676	60.0925	60.6317	61.2129	61.6237	62.0532 (38)
Heat transfer coeff	124.3323	124.0966	123.8655	122.7801	122.5771	121.6317	121.6317	121.4567	121.9959	122.5771	122.9879	123.4173 (39)
Average = Sum(39)m / 12 =												122.7791

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9467	0.9449	0.9432	0.9349	0.9334	0.9262	0.9262	0.9248	0.9289	0.9334	0.9365	0.9397 (40)
HLP (average)												0.9349
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8984 (42)
Hot water usage for mixer showers	72.8157	71.7215	70.1269	67.0759	64.8244	62.3136	60.8864	62.4689	64.2036	66.8995	70.0160	72.5368 (42a)
Hot water usage for baths	31.4364	30.9695	30.3120	29.0998	28.1921	27.1856	26.6419	27.2948	28.0056	29.0826	30.3198	31.3301 (42b)
Hot water usage for other uses	44.3121	42.7007	41.0894	39.4780	37.8667	36.2553	36.2553	37.8667	39.4780	41.0894	42.7007	44.3121 (42c)
Average daily hot water use (litres/day)												136.5638 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	148.5642	145.3917	141.5283	135.6538	130.8832	125.7545	123.7837	127.6304	131.6873	137.0715	143.0366	148.1789 (44)
Distribution loss (46)m = 0.15 x (45)m	235.2894	207.0358	217.5237	185.7032	176.1940	154.6298	149.7056	158.0331	162.3836	186.0048	203.7818	232.0124 (45)
Water storage loss (or HIU loss):	35.2934	31.0554	32.6286	27.8555	26.4291	23.1945	22.4558	23.7050	24.3575	27.9007	30.5673	34.8019 (46)
Store volume												210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7016 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9188 (55)
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842 (56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842 (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	287.0359	253.7747	269.2703	235.7806	227.9406	204.7072	201.4522	209.7796	212.4609	237.7514	253.8591	283.7590 (62)
WWHRS	-33.2883	-29.4405	-30.8284	-25.5271	-23.7903	-20.3576	-19.0820	-20.2918	-21.0627	-24.8306	-28.1301	-32.6719 (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	253.7476	224.3342	238.4420	210.2535	204.1502	184.3496	182.3702	189.4879	191.3982	212.9208	225.7291	251.0871 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											2568.2704 (64)
Electric shower(s)												2568 (64)

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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											0.0000 (64a)
Heat gains from water heating, kWh/month	119.6310	106.2305	113.7239	101.8082	99.9818	91.4763	91.1744	93.9433	94.0544	103.2439	107.8193	118.5414 (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	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	156.0997	172.8247	156.0997	161.3030	156.0997	161.3030	156.0997	156.0997	161.3030	156.0997	161.3030	156.0997 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	299.3165	302.4224	294.5955	277.9329	256.8993	237.1307	223.9241	220.8181	228.6450	245.3077	266.3412	286.1098 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918 (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)	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343 (71)
Water heating gains (Table 5)	160.7943	158.0811	152.8547	141.4003	134.3841	127.0504	122.5462	126.2678	130.6311	138.7686	149.7491	159.3298 (72)
Total internal gains	685.6859	702.8036	673.0253	650.1115	616.8584	591.9595	569.0453	569.6610	587.0546	609.6514	646.8687	671.0147 (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					7.5000	19.6403	0.6300	0.7000			0.7700			45.0174 (76)
West					14.5200	19.6403	0.6300	0.7000			0.7700			87.1537 (80)
Solar gains	132.1711	258.5547	425.8027	621.0079	761.0685	779.0890	741.7245	637.1304	495.2262	306.7969	164.8018	108.6911 (83)		
Total gains	817.8569	961.3582	1098.8280	1271.1194	1377.9269	1371.0485	1310.7699	1206.7914	1082.2808	916.4483	811.6705	779.7058 (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	49.5550	49.6492	49.7418	50.1815	50.2646	50.6553	50.6553	50.7283	50.5041	50.2646	50.0967	49.9224
alpha	4.3037	4.3099	4.3161	4.3454	4.3510	4.3770	4.3770	4.3819	4.3669	4.3510	4.3398	4.3282
util living area	0.9889	0.9774	0.9497	0.8703	0.7291	0.5461	0.4035	0.4543	0.6999	0.9193	0.9789	0.9909 (86)
MIT	19.5356	19.7767	20.1299	20.5604	20.8431	20.9656	20.9926	20.9879	20.9021	20.4988	19.9401	19.4944 (87)
Th 2	20.1280	20.1295	20.1310	20.1379	20.1392	20.1453	20.1453	20.1465	20.1430	20.1392	20.1366	20.1338 (88)
util rest of house	0.9865	0.9726	0.9391	0.8447	0.6822	0.4805	0.3273	0.3738	0.6346	0.8972	0.9736	0.9889 (89)
MIT 2	18.4066	18.7131	19.1568	19.6827	19.9988	20.1219	20.1420	20.1405	20.0680	19.6229	18.9279	18.3584 (90)
Living area fraction									FLA = Living area / (4) =			0.1204 (91)
MIT	18.5425	18.8412	19.2740	19.7884	20.1004	20.2235	20.2444	20.2425	20.1684	19.7284	19.0498	18.4951 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5425	18.8412	19.2740	19.7884	20.1004	20.2235	20.2444	20.2425	20.1684	19.7284	19.0498	18.4951 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9803	0.9631	0.9260	0.8328	0.6799	0.4867	0.3362	0.3830	0.6367	0.8843	0.9645	0.9835 (94)
Useful gains	801.7505	925.8433	1017.5369	1058.6282	936.9155	667.2601	440.7176	462.2213	689.0940	810.4400	782.8276	766.8431 (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	1770.8082	1730.0495	1582.2529	1336.8774	1029.6972	683.9932	443.2748	466.7024	740.3181	1118.9281	1469.6794	1764.2693 (97)
Space heating kWh	720.9789	540.4266	420.1487	200.3394	69.0296	0.0000	0.0000	0.0000	0.0000	229.5151	494.5333	742.0851 (98a)
Space heating requirement - total per year (kWh/year)												3417.0567
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	720.9789	540.4266	420.1487	200.3394	69.0296	0.0000	0.0000	0.0000	0.0000	229.5151	494.5333	742.0851 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3417.0567
Space heating per m2										(98c) / (4) =		26.0189 (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	720.9789	540.4266	420.1487	200.3394	69.0296	0.0000	0.0000	0.0000	0.0000	229.5151	494.5333	742.0851 (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)	781.1256	585.5109	455.1990	217.0525	74.7883	0.0000	0.0000	0.0000	0.0000	248.6621	535.7890	803.9925 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)

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Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	253.7476	224.3342	238.4420	210.2535	204.1502	184.3496	182.3702	189.4879	191.3982	212.9208	225.7291	251.0871	(64)
Efficiency of water heater	86.2672	85.9563	85.3163	83.9516	81.8974	79.8000	79.8000	79.8000	79.8000	84.2284	85.7685	79.8000	(216)
Fuel for water heating, kWh/month	294.1416	260.9864	279.4799	250.4461	249.2755	231.0145	228.5341	237.4535	239.8474	252.7897	263.1842	290.8179	(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	32.4344	26.0201	23.4282	17.1645	13.2584	10.8322	12.0947	15.7212	20.4203	26.7925	30.2621	33.3359	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-41.7111	-59.7935	-87.3515	-99.8287	-108.9584	-102.0965	-100.7677	-94.4533	-83.5777	-69.0345	-46.1803	-35.9412	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-20.6491	-43.7447	-87.5397	-132.3733	-175.9408	-177.1803	-175.1682	-147.9596	-107.9318	-62.9382	-27.6859	-16.3116	(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												3702.1199	(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												3077.9709	(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)												261.7645	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2105.1175	(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												5022.7379	(238)

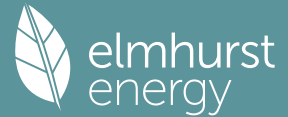
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3702.1199	0.2100	777.4452	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3077.9709	0.2100	646.3739	(264)
Space and water heating			1423.8191	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	261.7645	0.1443	37.7807	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-929.6943	0.1343	-124.8210	
PV Unit electricity exported	-1175.4232	0.1257	-147.7347	
Total			-272.5558	(269)
Total CO2, kg/year			1200.9733	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.1400	(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	3702.1199	1.1300	4183.3955	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3077.9709	1.1300	3478.1072	(278)
Space and water heating			7661.5026	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	261.7645	1.5338	401.5031	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-929.6943	1.4962	-1390.9949	
PV Unit electricity exported	-1175.4232	0.4613	-542.2754	
Total			-1933.2703	(283)
Total Primary energy kWh/year			6259.8363	(286)
Target Primary Energy Rate (TPER)			47.6600	(287)

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Plot Reference	23820-B-MN			Issued on Date	07/01/2026
Assessment Reference	Renewable	Plot Type Ref	EST		
Plot Address	B-MN, Bedford Road, Hitchin, SG5 2TY			SAP Version	10.2
SAP Rating	87 B	DER	2.65	TER	9.25
Environmental	97 A	% DER < TER			71.35
CO ₂ Emissions (t/year)	0.3	DFEE	31.09	TFEE	32.22
Compliance Check	See BREL	% DFEE < TFEE			3.50
% DPER < TPER	36.75	DPER	30.49	TPER	48.20
Assessor Details	Mr. Samuel Marks			Assessor ID	BP82-0001
Client	23820, Jordon Foux				

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					
Ground floor	42.5900 (1b)	x	2.4500 (2b)	=	104.3455 (1b) - (3b)
First floor	44.3700 (1c)	x	2.7100 (2c)	=	120.2427 (1c) - (3c)
Second floor	44.3700 (1d)	x	2.7100 (2d)	=	120.2427 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	131.3300				(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	344.8309 (5)

2. Ventilation rate

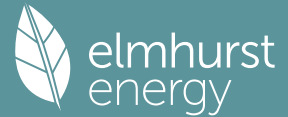
		m ³ per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	4.0000	(17)
Infiltration rate	0.2000	(18)
Number of sides sheltered	3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1550 (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	0.1976	0.1938	0.1899	0.1705	0.1666	0.1473	0.1473	0.1434	0.1550	0.1666	0.1744	0.1821 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												79.2000 (23c)
Effective ac	0.3016	0.2978	0.2939	0.2745	0.2706	0.2512	0.2512	0.2474	0.2590	0.2706	0.2784	0.2861 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			22.0200	1.3258	29.1932		(27)
Solid Door			2.1000	1.2000	2.5200		(26)
Floor			42.5900	0.1100	4.6849	75.0000	3194.2500 (28a)
Exposed Floor			1.7800	0.1800	0.3204	0.0000	0.0000 (28b)
External Wall	82.2900	24.1200	58.1700	0.1800	10.4706	60.0000	3490.2001 (29a)
Plane	44.3700		44.3700	0.1000	4.4370	9.0000	399.3300 (30)
Total net area of external elements Aum (A, m ²)			171.0300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	51.6261		(33)
Main dwelling							
Party Wall			135.0000	0.0000	0.0000	45.0000	6075.0000 (32)
B			68.8800			75.0000	5165.9998 (32c)
T			167.5500			9.0000	1507.9500 (32c)
Internal Floor			86.9600			18.0000	1565.2800 (32d)

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Internal Ceiling	86.9600	9.0000	782.6400 (32e)									
Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 22180.6499 (34)											
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	168.8925 (35)											
List of Thermal Bridges												
K1 Element	Length	Psi-value	Total									
E2 Other lintels (including other steel lintels)	13.5500	0.0240	0.3252									
E3 Sill	12.5500	0.0220	0.2761									
E4 Jamb	36.0000	0.0170	0.6120									
E5 Ground floor (normal)	11.8200	0.0740	0.8747									
E6 Intermediate floor within a dwelling	18.9200	0.0010	0.0189									
E16 Corner (normal)	4.9100	0.0460	0.2259									
E17 Corner (inverted - internal area greater than external area)	2.4500	-0.0880	-0.2156									
E10 Eaves (insulation at ceiling level)	10.2000	0.0600	0.6120									
E18 Party wall between dwellings	31.4900	0.0330	1.0392									
P1 Party wall - Ground floor	15.7800	0.1080	1.7042									
P2 Party wall - Intermediate floor within a dwelling	33.9900	0.0000	0.0000									
P4 Party wall - Roof (insulation at ceiling level)	17.4000	0.1010	1.7574									
P8 Party Wall - Exposed floor (inverted)	0.8100	0.1850	0.1499									
E20 Exposed floor (normal)	2.2000	0.0690	0.1518									
E21 Exposed floor (inverted)	3.0100	0.3200	0.9632									
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.4948 (36)									
Point Thermal bridges		(36a) =	0.0000									
Total fabric heat loss		(33) + (36) + (36a) =	60.1209 (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	34.3232	33.8822	33.4413	31.2365	30.7956	28.5908	28.5908	28.1498	29.4727	30.7956	31.6775	32.5594 (38)
Average = Sum(39)m / 12 =	94.4441	94.0031	93.5622	91.3574	90.9165	88.7117	88.7117	88.2707	89.5936	90.9165	91.7984	92.6803 (39)
												91.2472
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7191	0.7158	0.7124	0.6956	0.6923	0.6755	0.6755	0.6721	0.6822	0.6923	0.6990	0.7057 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

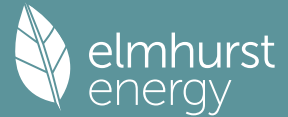
Assumed occupancy												2.8984 (42)
Hot water usage for mixer showers												
100.1216	98.6170	96.4245	92.2294	89.1336	85.6811	83.7188	85.8947	88.2800	91.9869	96.2720	99.7380 (42a)	
Hot water usage for baths												
31.4364	30.9695	30.3120	29.0998	28.1921	27.1856	26.6419	27.2948	28.0056	29.0826	30.3198	31.3301 (42b)	
Hot water usage for other uses												
44.3121	42.7007	41.0894	39.4780	37.8667	36.2553	36.2553	37.8667	39.4780	41.0894	42.7007	44.3121 (42c)	
Average daily hot water use (litres/day)												161.7390 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	175.8701	172.2872	167.8259	160.8073	155.1924	149.1221	146.6160	151.0562	155.7636	162.1589	169.2926	175.3802 (44)
Energy content	278.5352	245.3347	257.9421	220.1371	208.9188	183.3630	177.3194	187.0391	192.0721	220.0480	241.1883	274.6030 (45)
Energy content (annual)	Total = Sum(45)m =											2686.5010
Distribution loss (46)m = 0.15 x (45)m	41.7803	36.8002	38.6913	33.0206	31.3378	27.5044	26.5979	28.0559	28.8108	33.0072	36.1782	41.1905 (46)
Water storage loss (or HIU loss):												
Store volume												210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.3000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.2420 (55)
Total storage loss	38.5020	34.7760	38.5020	37.2600	38.5020	37.2600	38.5020	38.5020	37.2600	38.5020	37.2600	38.5020 (56)
If cylinder contains dedicated solar storage	38.5020	34.7760	38.5020	37.2600	38.5020	37.2600	38.5020	38.5020	37.2600	38.5020	37.2600	38.5020 (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	340.2996	301.1219	319.7065	279.9091	270.6832	243.1350	239.0838	248.8035	251.8441	281.8124	300.9603	336.3674 (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	340.2996	301.1219	319.7065	279.9091	270.6832	243.1350	239.0838	248.8035	251.8441	281.8124	300.9603	336.3674 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											3413.7270 (64)
Electric shower(s)												3414 (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	142.0245	126.2036	135.1773	121.0132	118.8770	108.7858	108.3702	111.6020	111.6816	122.5775	128.0127	140.7170 (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	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	156.0997	172.8247	156.0997	161.3030	156.0997	161.3030	156.0997	156.0997	161.3030	156.0997	161.3030	156.0997 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	299.3165	302.4224	294.5955	277.9329	256.8993	237.1307	223.9241	220.8181	228.6450	245.3077	266.3412	286.1098 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918 (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)	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343 (71)
Water heating gains (Table 5)	190.8931	187.8029	181.6899	168.0739	159.7809	151.0914	145.6589	150.0027	155.1133	164.7547	177.7954	189.1358 (72)
Total internal gains	715.7847	732.5254	701.8604	676.7851	642.2553	616.0005	592.1580	593.3959	611.5367	635.6374	674.9150	700.8207 (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				7.5000	19.6403	0.6300	0.7000		0.7700		45.0174 (76)	
West				14.5200	19.6403	0.6300	0.7000		0.7700		87.1537 (80)	
Solar gains	132.1711	258.5547	425.8027	621.0079	761.0685	779.0890	741.7245	637.1304	495.2262	306.7969	164.8018	108.6911 (83)
Total gains	847.9557	991.0801	1127.6632	1297.7930	1403.3238	1395.0895	1333.8825	1230.5263	1106.7629	942.4343	839.7168	809.5117 (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	65.2375	65.5435	65.8524	67.4416	67.7687	69.4530	69.4530	69.7999	68.7693	67.7687	67.1177	66.4790
alpha	5.3492	5.3696	5.3902	5.4961	5.5179	5.6302	5.6302	5.6533	5.5846	5.5179	5.4745	5.4319
util living area	0.9829	0.9619	0.9101	0.7710	0.5873	0.4054	0.2924	0.3296	0.5488	0.8480	0.9629	0.9860 (86)
MIT	20.2574	20.4262	20.6378	20.8465	20.9240	20.9429	20.9446	20.9446	20.9344	20.8080	20.5107	20.2418 (87)
Th 2	20.3240	20.3269	20.3299	20.3447	20.3477	20.3625	20.3625	20.3655	20.3566	20.3477	20.3417	20.3358 (88)
util rest of house	0.9796	0.9550	0.8953	0.7424	0.5499	0.3656	0.2502	0.2843	0.5008	0.8194	0.9551	0.9833 (89)
MIT 2	19.4432	19.6573	19.9196	20.1746	20.2583	20.2905	20.2917	20.2949	20.2778	20.1399	19.7778	19.4333 (90)
Living area fraction									fLA = Living area / (4) =			0.1204 (91)
MIT	19.5413	19.7499	20.0060	20.2555	20.3385	20.3690	20.3703	20.3731	20.3569	20.2203	19.8661	19.5306 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5413	19.7499	20.0060	20.2555	20.3385	20.3690	20.3703	20.3731	20.3569	20.2203	19.8661	19.5306 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9749	0.9480	0.8873	0.7383	0.5494	0.3660	0.2507	0.2848	0.5008	0.8133	0.9483	0.9792 (94)
Useful gains	826.6683	939.5827	1000.5776	958.1055	770.9933	510.6335	334.3671	350.4990	554.3089	766.4756	796.3195	792.6614 (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	1439.4459	1395.9362	1263.6540	1037.4111	785.3785	511.7793	334.4710	350.7067	560.5760	874.6454	1171.9038	1420.8481 (97)
Space heating kWh	455.9066	306.6695	195.7289	57.1000	10.7026	0.0000	0.0000	0.0000	0.0000	80.4783	270.4207	467.3709 (98a)
Space heating requirement - total per year (kWh/year)												1844.3775
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	455.9066	306.6695	195.7289	57.1000	10.7026	0.0000	0.0000	0.0000	0.0000	80.4783	270.4207	467.3709 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1844.3775
Space heating per m2										(98c) / (4) =		14.0438 (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	455.9066	306.6695	195.7289	57.1000	10.7026	0.0000	0.0000	0.0000	0.0000	80.4783	270.4207	467.3709 (98)
Space heating efficiency (main heating system 1)	219.3000	219.3000	219.3000	219.3000	219.3000	0.0000	0.0000	0.0000	0.0000	219.3000	219.3000	219.3000 (210)
Space heating fuel (main heating system)	207.8917	139.8402	89.2517	26.0374	4.8803	0.0000	0.0000	0.0000	0.0000	36.6978	123.3108	213.1194 (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	340.2996	301.1219	319.7065	279.9091	270.6832	243.1350	239.0838	248.8035	251.8441	281.8124	300.9603	336.3674 (64)
Efficiency of water heater (217)m	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000 (216)
Fuel for water heating, kWh/month	178.7288	158.1523	167.9131	147.0111	142.1655	127.6970	125.5692	130.6741	132.2711	148.0107	158.0674	176.6636 (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	39.7498	35.9030	39.7498	38.4675	39.7498	38.4675	39.7498	39.7498	38.4675	39.7498	38.4675	39.7498 (231)
Lighting	39.4715	31.6655	28.5113	20.8886	16.1350	13.1824	14.7188	19.1321	24.8507	32.6055	36.8278	40.5686 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-21.2891	-35.7110	-61.4585	-80.0685	-95.2559	-92.2630	-90.5378	-80.2399	-63.2141	-44.1750	-24.9017	-17.6323 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-4.0495	-10.5588	-27.0561	-51.2049	-76.8415	-80.7424	-78.5919	-61.1141	-38.4716	-17.6994	-5.9611	-3.0153 (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	841.0294 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	190.4000
Water heating fuel used	1792.9238 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.1125)	
mechanical ventilation fans (SFP = 1.1125)	468.0217 (230a)
Total electricity for the above, kWh/year	468.0217 (231)
Electricity for lighting (calculated in Appendix L)	318.5578 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1162.0534 (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	2258.4794 (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	841.0294	0.1577	132.6331 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1792.9238	0.1410	252.7445 (264)
Space and water heating			385.3776 (265)
Pumps, fans and electric keep-hot	468.0217	0.1387	64.9204 (267)
Energy for lighting	318.5578	0.1443	45.9777 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-706.7467	0.1317	-93.0729
PV Unit electricity exported	-455.3067	0.1209	-55.0302
Total			-148.1031 (269)
Total CO2, kg/year			348.1727 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.6500 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	841.0294	1.5838	1332.0042 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1792.9238	1.5213	2727.4877 (278)
Space and water heating			4059.4919 (279)
Pumps, fans and electric keep-hot	468.0217	1.5128	708.0233 (281)
Energy for lighting	318.5578	1.5338	488.6147 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-706.7467	1.4865	-1050.6137
PV Unit electricity exported	-455.3067	0.4434	-201.8875
Total			-1252.5012 (283)
Total Primary energy kWh/year			4003.6287 (286)
Dwelling Primary energy Rate (DPER)			30.4900 (287)

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

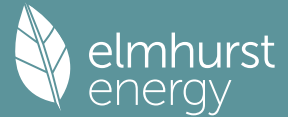
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	42.5900 (1b)	x 2.4500 (2b)	= 104.3455 (1b) - (3b)
First floor	44.3700 (1c)	x 2.7100 (2c)	= 120.2427 (1c) - (3c)
Second floor	44.3700 (1d)	x 2.7100 (2d)	= 120.2427 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	131.3300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	344.8309 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1160 (8)
Pressure test	Yes
Pressure Test Method	Blower Door

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Measured/design AP50												5.0000 (17)
Infiltration rate												0.3660 (18)
Number of sides sheltered												3 (19)
Shelter factor												(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) = 0.2836 (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)
Effective ac	0.3617	0.3546	0.3475	0.3120	0.3049	0.2695	0.2695	0.2624	0.2836	0.3049	0.3191	0.3333 (22b)
	0.5654	0.5629	0.5604	0.5487	0.5465	0.5363	0.5363	0.5344	0.5402	0.5465	0.5509	0.5555 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			2.1000	1.0000	2.1000		(26)
TER Opening Type			22.0200	1.1450	25.2137		(27)
Floor			42.5900	0.1300	5.5367		(28a)
Exposed Floor			1.7800	0.1300	0.2314		(28b)
External Wall	82.2900	24.1200	58.1700	0.1800	10.4706		(29a)
Plane	44.3700		44.3700	0.1100	4.8807		(30)
Total net area of external elements Aum (A, m2)			171.0300				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 48.4331		(33)
Main dwelling							
Party Wall			135.0000	0.0000	0.0000		(32)

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

List of Thermal Bridges												168.8925 (35)
K1 Element												
E2 Other lintels (including other steel lintels)												
E3 Sill												
E4 Jamb												
E5 Ground floor (normal)												
E6 Intermediate floor within a dwelling												
E16 Corner (normal)												
E17 Corner (inverted - internal area greater than external area)												
E10 Eaves (insulation at ceiling level)												
E18 Party wall between dwellings												
P1 Party wall - Ground floor												
P2 Party wall - Intermediate floor within a dwelling												
P4 Party wall - Roof (insulation at ceiling level)												
P8 Party Wall - Exposed floor (inverted)												
E20 Exposed floor (normal)												
E21 Exposed floor (inverted)												

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

Point Thermal bridges												
Total fabric heat loss												(33) + (36) + (36a) = 61.3641 (37)

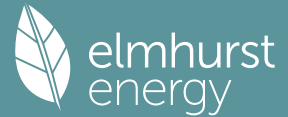
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	64.3388	64.0498	63.7666	62.4362	62.1873	61.0285	61.0285	60.8139	61.4749	62.1873	62.6908	63.2173 (38)
Average = Sum(39)m / 12 =	125.7030	125.4140	125.1307	123.8003	123.5514	122.3927	122.3927	122.1781	122.8390	123.5514	124.0550	124.5814 (39)
												123.7991
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9572	0.9550	0.9528	0.9427	0.9408	0.9319	0.9319	0.9303	0.9353	0.9408	0.9446	0.9486 (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													2.8984 (42)
Hot water usage for mixer showers	72.8157	71.7215	70.1269	67.0759	64.8244	62.3136	60.8864	62.4689	64.2036	66.8995	70.0160	72.5368 (42a)	
Hot water usage for baths	31.4364	30.9695	30.3120	29.0998	28.1921	27.1856	26.6419	27.2948	28.0056	29.0826	30.3198	31.3301 (42b)	
Hot water usage for other uses	44.3121	42.7007	41.0894	39.4780	37.8667	36.2553	36.2553	37.8667	39.4780	41.0894	42.7007	44.3121 (42c)	
Average daily hot water use (litres/day)												136.5638 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	148.5642	145.3917	141.5283	135.6538	130.8832	125.7545	123.7837	127.6304	131.6873	137.0715	143.0366	148.1789 (44)	
Distribution loss (46)m = 0.15 x (45)m	235.2894	207.0358	217.5237	185.7032	176.1940	154.6298	149.7056	158.0331	162.3836	186.0048	203.7818	232.0124 (45)	
Water storage loss (or HIU loss):										Total = Sum (45)m =		2268.2972	
Store volume	35.2934	31.0554	32.6286	27.8555	26.4291	23.1945	22.4558	23.7050	24.3575	27.9007	30.5673	34.8019 (46)	
a) If manufacturer declared loss factor is known (kWh/day):												210.0000 (47)	
Temperature factor from Table 2b												1.7016 (48)	
Enter (49) or (54) in (55)												0.5400 (49)	
Total storage loss												0.9188 (55)	
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842 (56)	
Primary loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842 (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	287.0359	253.7747	269.2703	235.7806	227.9406	204.7072	201.4522	209.7796	212.4609	237.7514	253.8591	283.7590 (62)	
PV diverter	-33.2883	-29.4405	-30.8284	-25.5271	-23.7903	-20.3576	-19.0820	-20.2918	-21.0627	-24.8306	-28.1301	-32.6719 (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)	253.7476	224.3342	238.4420	210.2535	204.1502	184.3496	182.3702	189.4879	191.3982	212.9208	225.7291	251.0871 (64)	
Electric shower(s)								Total per year (kWh/year) = Sum (64)m =				2568.2704 (64)	
												2568 (64)	

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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											0.0000 (64a)
Heat gains from water heating, kWh/month	119.6310	106.2305	113.7239	101.8082	99.9818	91.4763	91.1744	93.9433	94.0544	103.2439	107.8193	118.5414 (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	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	156.0997	172.8247	156.0997	161.3030	156.0997	161.3030	156.0997	156.0997	161.3030	156.0997	161.3030	156.0997 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	299.3165	302.4224	294.5955	277.9329	256.8993	237.1307	223.9241	220.8181	228.6450	245.3077	266.3412	286.1098 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918 (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)	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343 (71)
Water heating gains (Table 5)	160.7943	158.0811	152.8547	141.4003	134.3841	127.0504	122.5462	126.2678	130.6311	138.7686	149.7491	159.3298 (72)
Total internal gains	685.6859	702.8036	673.0253	650.1115	616.8584	591.9595	569.0453	569.6610	587.0546	609.6514	646.8687	671.0147 (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	7.5000		19.6403		0.6300		0.7000		0.7700		45.0174 (76)	
West	14.5200		19.6403		0.6300		0.7000		0.7700		87.1537 (80)	
Solar gains	132.1711	258.5547	425.8027	621.0079	761.0685	779.0890	741.7245	637.1304	495.2262	306.7969	164.8018	108.6911 (83)
Total gains	817.8569	961.3582	1098.8280	1271.1194	1377.9269	1371.0485	1310.7699	1206.7914	1082.2808	916.4483	811.6705	779.7058 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	49.0147	49.1276	49.2388	49.7680	49.8682	50.3404	50.3404	50.4288	50.1575	49.8682	49.6658	49.4559	
alpha	4.2676	4.2752	4.2826	4.3179	4.3245	4.3560	4.3560	4.3619	4.3438	4.3245	4.3111	4.2971	
util living area	0.9890	0.9776	0.9505	0.8720	0.7320	0.5488	0.4058	0.4567	0.7026	0.9203	0.9791	0.9909 (86)	
MIT	19.5132	19.7556	20.1118	20.5495	20.8376	20.9642	20.9923	20.9874	20.8990	20.4891	19.9253	19.4753 (87)	
Th 2	20.1192	20.1210	20.1229	20.1314	20.1330	20.1404	20.1404	20.1418	20.1376	20.1330	20.1298	20.1264 (88)	
util rest of house	0.9866	0.9728	0.9399	0.8465	0.6850	0.4827	0.3288	0.3754	0.6371	0.8983	0.9738	0.9890 (89)	
MIT 2	18.3721	18.6806	19.1284	19.6647	19.9875	20.1161	20.1369	20.1356	20.0601	19.6065	18.9045	18.3289 (90)	
Living area fraction	fLA = Living area / (4) =												0.1204 (91)
MIT	18.5095	18.8100	19.2468	19.7712	20.0899	20.2182	20.2399	20.2382	20.1611	19.7128	19.0274	18.4669 (92)	
Temperature adjustment													0.0000
adjusted MIT	18.5095	18.8100	19.2468	19.7712	20.0899	20.2182	20.2399	20.2382	20.1611	19.7128	19.0274	18.4669 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9803	0.9633	0.9267	0.8344	0.6825	0.4888	0.3378	0.3847	0.6390	0.8853	0.9646	0.9835 (94)
Useful gains	801.7825	926.0527	1018.2766	1060.6114	940.4892	670.2339	442.8182	464.2688	691.6072	811.3038	782.9611	766.8534 (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	1786.1748	1744.5107	1595.0117	1345.8593	1036.5782	687.6283	445.4988	468.9415	744.5349	1125.8937	1479.6524	1777.3938 (97)
Space heating kWh	732.3879	550.0037	429.0909	205.3785	71.4902	0.0000	0.0000	0.0000	0.0000	234.0549	501.6177	751.8421 (98a)
Space heating requirement - total per year (kWh/year)												3475.8659
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	732.3879	550.0037	429.0909	205.3785	71.4902	0.0000	0.0000	0.0000	0.0000	234.0549	501.6177	751.8421 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3475.8659
Space heating per m2												(98c) / (4) = 26.4667 (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	732.3879	550.0037	429.0909	205.3785	71.4902	0.0000	0.0000	0.0000	0.0000	234.0549	501.6177	751.8421 (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)	793.4864	595.8870	464.8872	222.5119	77.4542	0.0000	0.0000	0.0000	0.0000	253.5806	543.4645	814.5635 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)

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Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	253.7476	224.3342	238.4420	210.2535	204.1502	184.3496	182.3702	189.4879	191.3982	212.9208	225.7291	251.0871	(64)
Efficiency of water heater	86.2957	85.9903	85.3612	84.0072	81.9543	79.8000	79.8000	79.8000	79.8000	84.2725	85.7970	79.8000	(216)
Fuel for water heating, kWh/month	294.0445	260.8831	279.3330	250.2804	249.1025	231.0145	228.5341	237.4535	239.8474	252.6575	263.0967	290.7395	(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	7.0685	7.3041	7.0685	7.3041	7.0685	(231)
Lighting	32.4344	26.0201	23.4282	17.1645	13.2584	10.8322	12.0947	15.7212	20.4203	26.7925	30.2621	33.3359	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-41.7111	-59.7935	-87.3515	-99.8287	-108.9584	-102.0965	-100.7677	-94.4533	-83.5777	-69.0345	-46.1803	-35.9412	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-20.6491	-43.7447	-87.5397	-132.3733	-175.9408	-177.1803	-175.1682	-147.9596	-107.9318	-62.9382	-27.6859	-16.3116	(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												3765.8352	(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												3076.9867	(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)												261.7645	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2105.1175	(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												5085.4689	(238)

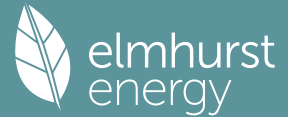
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3765.8352	0.2100	790.8254	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3076.9867	0.2100	646.1672	(264)
Space and water heating			1436.9926	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	261.7645	0.1443	37.7807	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-929.6943	0.1343	-124.8210	
PV Unit electricity exported	-1175.4232	0.1257	-147.7347	
Total			-272.5558	(269)
Total CO2, kg/year			1214.1468	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.2500	(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	3765.8352	1.1300	4255.3937	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3076.9867	1.1300	3476.9950	(278)
Space and water heating			7732.3888	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	261.7645	1.5338	401.5031	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-929.6943	1.4962	-1390.9949	
PV Unit electricity exported	-1175.4232	0.4613	-542.2754	
Total			-1933.2703	(283)
Total Primary energy kWh/year			6330.7224	(286)
Target Primary Energy Rate (TPER)			48.2000	(287)

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Plot Reference	23820-B-MS			Issued on Date	07/01/2026
Assessment Reference	Renewable	Plot Type Ref	EST		
Plot Address	B-MS, Bedford Road, Hitchin, SG5 2TY			SAP Version	10.2
SAP Rating	86 B	DER	2.66	TER	9.29
Environmental	97 A	% DER < TER			71.37
CO ₂ Emissions (t/year)	0.3	DFEE	31.29	TFEE	32.44
Compliance Check	See BREL	% DFEE < TFEE			3.53
% DPER < TPER	36.81	DPER	30.62	TPER	48.46
Assessor Details	Mr. Samuel Marks			Assessor ID	BP82-0001
Client	23820, Jordon Foux				

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					
Ground floor	42.5900 (1b)	x	2.4500 (2b)	=	104.3455 (1b) - (3b)
First floor	44.3700 (1c)	x	2.7100 (2c)	=	120.2427 (1c) - (3c)
Second floor	44.3700 (1d)	x	2.7100 (2d)	=	120.2427 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	131.3300				(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	344.8309 (5)

2. Ventilation rate

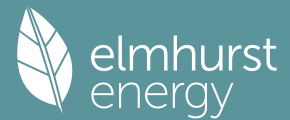
		m ³ per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	4.0000	(17)
Infiltration rate	0.2000	(18)
Number of sides sheltered	3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1550 (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	0.1976	0.1938	0.1899	0.1705	0.1666	0.1473	0.1473	0.1434	0.1550	0.1666	0.1744	0.1821 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												79.2000 (23c)
Effective ac	0.3016	0.2978	0.2939	0.2745	0.2706	0.2512	0.2512	0.2474	0.2590	0.2706	0.2784	0.2861 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			22.0200	1.3258	29.1932		(27)
Solid Door			2.1000	1.2000	2.5200		(26)
Floor			42.5900	0.1100	4.6849	75.0000	3194.2500 (28a)
Exposed Floor			1.7800	0.1800	0.3204	0.0000	0.0000 (28b)
External Wall	84.2800	24.1200	60.1600	0.1800	10.8288	60.0000	3609.5999 (29a)
Plane	44.3700		44.3700	0.1000	4.4370	9.0000	399.3300 (30)
Total net area of external elements Aum (A, m ²)			173.0200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	51.9843		(33)
Main dwelling							
Party Wall			133.0200	0.0000	0.0000	45.0000	5985.9002 (32)
B			68.8800			75.0000	5165.9998 (32c)
T			167.5500			9.0000	1507.9500 (32c)
Internal Floor			86.9600			18.0000	1565.2800 (32d)

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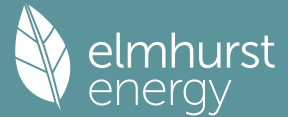
Internal Ceiling	86.9600	9.0000	782.6400 (32e)									
Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 22210.9499 (34)											
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	169.1232 (35)											
List of Thermal Bridges												
K1 Element	Length	Psi-value	Total									
E2 Other lintels (including other steel lintels)	13.5500	0.0240	0.3252									
E3 Sill	12.5500	0.0220	0.2761									
E4 Jamb	36.0000	0.0170	0.6120									
E5 Ground floor (normal)	11.8200	0.0740	0.8747									
E6 Intermediate floor within a dwelling	18.9200	0.0010	0.0189									
E16 Corner (normal)	4.9100	0.0460	0.2259									
E17 Corner (inverted - internal area greater than external area)	2.4500	-0.0880	-0.2156									
E10 Eaves (insulation at ceiling level)	10.2000	0.0600	0.6120									
E18 Party wall between dwellings	31.4900	0.0330	1.0392									
P1 Party wall - Ground floor	15.7800	0.1080	1.7042									
P2 Party wall - Intermediate floor within a dwelling	33.1800	0.0000	0.0000									
P4 Party wall - Roof (insulation at ceiling level)	17.4000	0.1010	1.7574									
P8 Party Wall - Exposed floor (inverted)	1.6200	0.1850	0.2997									
E20 Exposed floor (normal)	2.2000	0.0690	0.1518									
E21 Exposed floor (inverted)	3.0100	0.3200	0.9632									
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.6447 (36)									
Point Thermal bridges		(36a) =	0.0000									
Total fabric heat loss		(33) + (36) + (36a) =	60.6290 (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	34.3232	33.8822	33.4413	31.2365	30.7956	28.5908	28.5908	28.1498	29.4727	30.7956	31.6775	32.5594 (38)
Average = Sum(39)m / 12 =	94.9521	94.5112	94.0702	91.8655	91.4245	89.2197	89.2197	88.7788	90.1016	91.4245	92.3064	93.1883 (39)
												91.7552
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7230	0.7196	0.7163	0.6995	0.6961	0.6794	0.6794	0.6760	0.6861	0.6961	0.7029	0.7096 (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												2.8984 (42)
Hot water usage for mixer showers												
100.1216	98.6170	96.4245	92.2294	89.1336	85.6811	83.7188	85.8947	88.2800	91.9869	96.2720	99.7380	(42a)
Hot water usage for baths												
31.4364	30.9695	30.3120	29.0998	28.1921	27.1856	26.6419	27.2948	28.0056	29.0826	30.3198	31.3301	(42b)
Hot water usage for other uses												
44.3121	42.7007	41.0894	39.4780	37.8667	36.2553	36.2553	37.8667	39.4780	41.0894	42.7007	44.3121	(42c)
Average daily hot water use (litres/day)												161.7390 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use												
175.8701	172.2872	167.8259	160.8073	155.1924	149.1221	146.6160	151.0562	155.7636	162.1589	169.2926	175.3802	(44)
Energy conte	278.5352	245.3347	257.9421	220.1371	208.9188	183.3630	177.3194	187.0391	192.0721	220.0480	241.1883	(45)
Energy content (annual)												Total = Sum(45)m = 2686.5010
Distribution loss (46)m = 0.15 x (45)m												
41.7803	36.8002	38.6913	33.0206	31.3378	27.5044	26.5979	28.0559	28.8108	33.0072	36.1782	41.1905	(46)
Water storage loss (or HIU loss):												
Store volume												210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.3000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.2420 (55)
Total storage loss												
38.5020	34.7760	38.5020	37.2600	38.5020	37.2600	38.5020	38.5020	37.2600	38.5020	37.2600	38.5020	(56)
If cylinder contains dedicated solar storage												
38.5020	34.7760	38.5020	37.2600	38.5020	37.2600	38.5020	38.5020	37.2600	38.5020	37.2600	38.5020	(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	(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												
340.2996	301.1219	319.7065	279.9091	270.6832	243.1350	239.0838	248.8035	251.8441	281.8124	300.9603	336.3674	(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												
340.2996	301.1219	319.7065	279.9091	270.6832	243.1350	239.0838	248.8035	251.8441	281.8124	300.9603	336.3674	(64)
12Total per year (kWh/year)												Total per year (kWh/year) = Sum(64)m = 3413.7270 (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												
142.0245	126.2036	135.1773	121.0132	118.8770	108.7858	108.3702	111.6020	111.6816	122.5775	128.0127	140.7170	(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	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	156.0997	172.8247	156.0997	161.3030	156.0997	161.3030	156.0997	156.0997	161.3030	156.0997	161.3030	156.0997 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	299.3165	302.4224	294.5955	277.9329	256.8993	237.1307	223.9241	220.8181	228.6450	245.3077	266.3412	286.1098 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918 (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)	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343 (71)
Water heating gains (Table 5)	190.8931	187.8029	181.6899	168.0739	159.7809	151.0914	145.6589	150.0027	155.1133	164.7547	177.7954	189.1358 (72)
Total internal gains	715.7847	732.5254	701.8604	676.7851	642.2553	616.0005	592.1580	593.3959	611.5367	635.6374	674.9150	700.8207 (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	7.5000				19.6403		0.6300		0.7000		0.7700		45.0174 (76)	
West	14.5200				19.6403		0.6300		0.7000		0.7700		87.1537 (80)	
Solar gains	132.1711	258.5547	425.8027	621.0079	761.0685	779.0890	741.7245	637.1304	495.2262	306.7969	164.8018	108.6911	(83)	
Total gains	847.9557	991.0801	1127.6632	1297.7930	1403.3238	1395.0895	1333.8825	1230.5263	1106.7629	942.4343	839.7168	809.5117	(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	64.9770	65.2802	65.5862	67.1603	67.4842	69.1518	69.1518	69.4953	68.4750	67.4842	66.8394	66.2069		
alpha	5.3318	5.3520	5.3724	5.4774	5.4989	5.6101	5.6101	5.6330	5.5650	5.4989	5.4560	5.4138		
util living area	0.9832	0.9624	0.9113	0.7734	0.5901	0.4077	0.2941	0.3314	0.5516	0.8498	0.9634	0.9862	(86)	
MIT	20.2511	20.4200	20.6327	20.8437	20.9231	20.9426	20.9444	20.9444	20.9338	20.8049	20.5053	20.2354	(87)	
Th 2	20.3206	20.3235	20.3265	20.3413	20.3442	20.3591	20.3591	20.3621	20.3532	20.3442	20.3383	20.3324	(88)	
util rest of house	0.9799	0.9556	0.8966	0.7448	0.5524	0.3675	0.2514	0.2857	0.5032	0.8214	0.9557	0.9835	(89)	
MIT 2	19.4323	19.6468	19.9104	20.1684	20.2540	20.2867	20.2880	20.2912	20.2739	20.1332	19.7682	19.4223	(90)	
Living area fraction	fLA = Living area / (4) =													
MIT	19.5309	19.7398	19.9974	20.2497	20.3346	20.3657	20.3670	20.3698	20.3533	20.2141	19.8569	19.5202	(92)	
Temperature adjustment	0.0000													
adjusted MIT	19.5309	19.7398	19.9974	20.2497	20.3346	20.3657	20.3670	20.3698	20.3533	20.2141	19.8569	19.5202	(93)	
8. Space heating requirement														
Utilisation	0.9751	0.9486	0.8885	0.7406	0.5519	0.3679	0.2519	0.2862	0.5032	0.8152	0.9489	0.9794	(94)	
Useful gains	826.8769	940.1344	1001.9329	961.0874	774.4558	513.2069	335.9847	352.2143	556.8967	768.2356	796.8023	792.8283	(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	1446.2071	1402.5312	1269.6993	1042.6415	789.4100	514.4127	336.0948	352.4340	563.4328	878.9609	1177.5482	1427.6630	(97)	
Space heating kWh	460.7817	310.7306	199.2182	58.7190	11.1259	0.0000	0.0000	0.0000	0.0000	82.3796	274.1370	472.3170	(98a)	
Space heating requirement - total per year (kWh/year)													1869.4092	
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	460.7817	310.7306	199.2182	58.7190	11.1259	0.0000	0.0000	0.0000	0.0000	82.3796	274.1370	472.3170	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)													1869.4092	
Space heating per m2													(98c) / (4) =	14.2344 (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 %)													219.3000 (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	460.7817	310.7306	199.2182	58.7190	11.1259	0.0000	0.0000	0.0000	0.0000	82.3796	274.1370	472.3170	(98)	
Space heating efficiency (main heating system 1)	219.3000	219.3000	219.3000	219.3000	219.3000	0.0000	0.0000	0.0000	0.0000	219.3000	219.3000	219.3000	(210)	
Space heating fuel (main heating system)	210.1148	141.6920	90.8428	26.7756	5.0734	0.0000	0.0000	0.0000	0.0000	37.5648	125.0055	215.3748	(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	340.2996	301.1219	319.7065	279.9091	270.6832	243.1350	239.0838	248.8035	251.8441	281.8124	300.9603	336.3674	(64)	
Efficiency of water heater (217)m	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	(216)	
Fuel for water heating, kWh/month	178.7288	158.1523	167.9131	147.0111	142.1655	127.6970	125.5692	130.6741	132.2711	148.0107	158.0674	176.6636	(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	39.7498	35.9030	39.7498	38.4675	39.7498	38.4675	39.7498	39.7498	38.4675	39.7498	38.4675	39.7498	(231)	
Lighting	39.4715	31.6655	28.5113	20.8886	16.1350	13.1824	14.7188	19.1321	24.8507	32.6055	36.8278	40.5686	(232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-21.2943	-35.7237	-61.4856	-80.0956	-95.2669	-92.2630	-90.5378	-80.2399	-63.2141	-44.1871	-24.9087	-17.6362	(233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)	
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-4.0443	-10.5461	-27.0289	-51.1777	-76.8306	-80.7424	-78.5919	-61.1141	-38.4716	-17.6874	-5.9541	-3.0113	(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	852.4438 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	190.4000
Water heating fuel used	1792.9238 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.1125)	
mechanical ventilation fans (SFP = 1.1125)	468.0217 (230a)
Total electricity for the above, kWh/year	468.0217 (231)
Electricity for lighting (calculated in Appendix L)	318.5578 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1162.0534 (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	2269.8938 (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	852.4438	0.1577	134.4077 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1792.9238	0.1410	252.7445 (264)
Space and water heating			387.1522 (265)
Pumps, fans and electric keep-hot	468.0217	0.1387	64.9204 (267)
Energy for lighting	318.5578	0.1443	45.9777 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-706.8529	0.1317	-93.0886
PV Unit electricity exported	-455.2006	0.1209	-55.0128
Total			-148.1014 (269)
Total CO2, kg/year			349.9490 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.6600 (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	852.4438	1.5837	1349.9889 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1792.9238	1.5213	2727.4877 (278)
Space and water heating			4077.4766 (279)
Pumps, fans and electric keep-hot	468.0217	1.5128	708.0233 (281)
Energy for lighting	318.5578	1.5338	488.6147 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-706.8529	1.4866	-1050.7779
PV Unit electricity exported	-455.2006	0.4434	-201.8234
Total			-1252.6014 (283)
Total Primary energy kWh/year			4021.5131 (286)
Dwelling Primary energy Rate (DPER)			30.6200 (287)

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

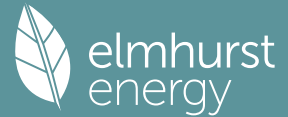
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	42.5900 (1b)	x 2.4500 (2b)	= 104.3455 (1b) - (3b)
First floor	44.3700 (1c)	x 2.7100 (2c)	= 120.2427 (1c) - (3c)
Second floor	44.3700 (1d)	x 2.7100 (2d)	= 120.2427 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	131.3300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 344.8309 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1160 (8)
Pressure test	Yes
Pressure Test Method	Blower Door

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Measured/design AP50 5.0000 (17)
Infiltration rate 0.3660 (18)
Number of sides sheltered 3 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.2836 (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)
Effective ac	0.3617	0.3546	0.3475	0.3120	0.3049	0.2695	0.2695	0.2624	0.2836	0.3049	0.3191	0.3333 (22b)
	0.5654	0.5629	0.5604	0.5487	0.5465	0.5363	0.5363	0.5344	0.5402	0.5465	0.5509	0.5555 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			2.1000	1.0000	2.1000		(26)
TER Opening Type			22.0200	1.1450	25.2137		(27)
Floor			42.5900	0.1300	5.5367		(28a)
Exposed Floor			1.7800	0.1300	0.2314		(28b)
External Wall	84.2800	24.1200	60.1600	0.1800	10.8288		(29a)
Plane	44.3700		44.3700	0.1100	4.8807		(30)
Total net area of external elements Aum (A, m2)			173.0200				(31)
Fabric heat loss, W/K = Sum (A x U)					48.7913		(33)
Main dwelling							
Party Wall			133.0200	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 169.1232 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	13.5500	0.0500	0.6775
E2 Other lintels (including other steel lintels)	12.5500	0.0500	0.6275
E3 Sill	36.0000	0.0500	1.8000
E4 Jamb	11.8200	0.1600	1.8912
E5 Ground floor (normal)	18.9200	0.0000	0.0000
E6 Intermediate floor within a dwelling	4.9100	0.0900	0.4419
E16 Corner (normal)	2.4500	-0.0900	-0.2205
E17 Corner (inverted - internal area greater than external area)	10.2000	0.0600	0.6120
E10 Eaves (insulation at ceiling level)	31.4900	0.0600	1.8894
E18 Party wall between dwellings	15.7800	0.0800	1.2624
P1 Party wall - Ground floor	33.1800	0.0000	0.0000
P2 Party wall - Intermediate floor within a dwelling	17.4000	0.1200	2.0880
P4 Party wall - Roof (insulation at ceiling level)	1.6200	0.2400	0.3888
P8 Party Wall - Exposed floor (inverted)	2.2000	0.3200	0.7040
E20 Exposed floor (normal)	3.0100	0.3200	0.9632
E21 Exposed floor (inverted)			

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.1254 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 61.9167 (37)

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

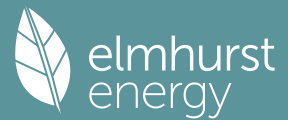
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	64.3388	64.0498	63.7666	62.4362	62.1873	61.0285	61.0285	60.8139	61.4749	62.1873	62.6908	63.2173 (38)
Average = Sum(39)m / 12 =	126.2556	125.9666	125.6833	124.3529	124.1040	122.9453	122.9453	122.7307	123.3916	124.1040	124.6076	125.1340 (39)
												124.3517

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9614	0.9592	0.9570	0.9469	0.9450	0.9362	0.9362	0.9345	0.9396	0.9450	0.9488	0.9528 (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													2.8984 (42)
Hot water usage for mixer showers													
Hot water usage for baths	72.8157	71.7215	70.1269	67.0759	64.8244	62.3136	60.8864	62.4689	64.2036	66.8995	70.0160	72.5368 (42a)	
Hot water usage for other uses	31.4364	30.9695	30.3120	29.0998	28.1921	27.1856	26.6419	27.2948	28.0056	29.0826	30.3198	31.3301 (42b)	
Average daily hot water use (litres/day)	44.3121	42.7007	41.0894	39.4780	37.8667	36.2553	36.2553	37.8667	39.4780	41.0894	42.7007	44.3121 (42c)	
												136.5638 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	148.5642	145.3917	141.5283	135.6538	130.8832	125.7545	123.7837	127.6304	131.6873	137.0715	143.0366	148.1789 (44)	
Distribution loss (46)m = 0.15 x (45)m	235.2894	207.0358	217.5237	185.7032	176.1940	154.6298	149.7056	158.0331	162.3836	186.0048	203.7818	232.0124 (45)	
	35.2934	31.0554	32.6286	27.8555	26.4291	23.1945	22.4558	23.7050	24.3575	27.9007	30.5673	34.8019 (46)	
Water storage loss (or HIU loss):													
Store volume												210.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.7016 (48)	
Temperature factor from Table 2b												0.5400 (49)	
Enter (49) or (54) in (55)												0.9188 (55)	
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842 (56)	
If cylinder contains dedicated solar storage													
Primary loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842 (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	287.0359	253.7747	269.2703	235.7806	227.9406	204.7072	201.4522	209.7796	212.4609	237.7514	253.8591	283.7590 (62)	
PV diverter	-33.2883	-29.4405	-30.8284	-25.5271	-23.7903	-20.3576	-19.0820	-20.2918	-21.0627	-24.8306	-28.1301	-32.6719 (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)	
	253.7476	224.3342	238.4420	210.2535	204.1502	184.3496	182.3702	189.4879	191.3982	212.9208	225.7291	251.0871 (64)	
12Total per year (kWh/year)												2568.2704 (64)	
Electric shower(s)												2568 (64)	

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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											0.0000 (64a)
Heat gains from water heating, kWh/month	119.6310	106.2305	113.7239	101.8082	99.9818	91.4763	91.1744	93.9433	94.0544	103.2439	107.8193	118.5414 (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	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178	144.9178 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	156.0997	172.8247	156.0997	161.3030	156.0997	161.3030	156.0997	156.0997	161.3030	156.0997	161.3030	156.0997 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	299.3165	302.4224	294.5955	277.9329	256.8993	237.1307	223.9241	220.8181	228.6450	245.3077	266.3412	286.1098 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918	37.4918 (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)	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343	-115.9343 (71)
Water heating gains (Table 5)	160.7943	158.0811	152.8547	141.4003	134.3841	127.0504	122.5462	126.2678	130.6311	138.7686	149.7491	159.3298 (72)
Total internal gains	685.6859	702.8036	673.0253	650.1115	616.8584	591.9595	569.0453	569.6610	587.0546	609.6514	646.8687	671.0147 (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					7.5000	19.6403	0.6300	0.7000			0.7700			45.0174 (76)
West					14.5200	19.6403	0.6300	0.7000			0.7700			87.1537 (80)
Solar gains	132.1711	258.5547	425.8027	621.0079	761.0685	779.0890	741.7245	637.1304	495.2262	306.7969	164.8018			108.6911 (83)
Total gains	817.8569	961.3582	1098.8280	1271.1194	1377.9269	1371.0485	1310.7699	1206.7914	1082.2808	916.4483	811.6705			779.7058 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	48.8668	48.9789	49.0893	49.6145	49.7140	50.1826	50.1826	50.2703	50.0010	49.7140	49.5131	49.3048
alpha	4.2578	4.2653	4.2726	4.3076	4.3143	4.3455	4.3455	4.3514	4.3334	4.3143	4.3009	4.2870
util living area	0.9891	0.9778	0.9509	0.8731	0.7338	0.5508	0.4075	0.4585	0.7045	0.9210	0.9792	0.9910 (86)
MIT	19.5058	19.7482	20.1050	20.5443	20.8348	20.9634	20.9921	20.9870	20.8971	20.4843	19.9189	19.4679 (87)
Th 2	20.1157	20.1175	20.1193	20.1278	20.1294	20.1369	20.1369	20.1383	20.1340	20.1294	20.1262	20.1228 (88)
util rest of house	0.9867	0.9730	0.9404	0.8476	0.6867	0.4843	0.3299	0.3767	0.6388	0.8991	0.9740	0.9890 (89)
MIT 2	18.3601	18.6686	19.1172	19.6557	19.9815	20.1120	20.1333	20.1319	20.0551	19.5980	18.8938	18.3169 (90)
Living area fraction	18.4980	18.7986	19.2361	19.7627	20.0842	20.2145	20.2367	20.2349	20.1565	19.7047	19.0172	18.4555 (92)
MIT	18.4980	18.7986	19.2361	19.7627	20.0842	20.2145	20.2367	20.2349	20.1565	19.7047	19.0172	18.4555 (93)
Temperature adjustment												0.0000
adjusted MIT	18.4980	18.7986	19.2361	19.7627	20.0842	20.2145	20.2367	20.2349	20.1565	19.7047	19.0172	18.4555 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9804	0.9635	0.9271	0.8354	0.6841	0.4905	0.3390	0.3860	0.6406	0.8860	0.9648	0.9836 (94)
Useful gains	801.8581	926.2480	1018.7678	1061.9039	942.6759	672.4473	444.3533	465.8544	693.3597	811.9516	783.1193	766.9116 (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	1792.5825	1750.7570	1600.7198	1350.8065	1040.5170	690.2755	447.1126	470.6568	747.3196	1129.9251	1484.9704	1783.8420 (97)
Space heating kWh	737.0990	554.0701	432.9723	208.0099	72.7938	0.0000	0.0000	0.0000	0.0000	236.5723	505.3328	756.5962 (98a)
Space heating requirement - total per year (kWh/year)												3503.4464
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	737.0990	554.0701	432.9723	208.0099	72.7938	0.0000	0.0000	0.0000	0.0000	236.5723	505.3328	756.5962 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3503.4464
Space heating per m2										(98c) / (4) =		26.6767 (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	737.0990	554.0701	432.9723	208.0099	72.7938	0.0000	0.0000	0.0000	0.0000	236.5723	505.3328	756.5962 (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)	798.5904	600.2926	469.0924	225.3628	78.8665	0.0000	0.0000	0.0000	0.0000	256.3080	547.4895	819.7142 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)

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Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	253.7476	224.3342	238.4420	210.2535	204.1502	184.3496	182.3702	189.4879	191.3982	212.9208	225.7291	251.0871	(64)
Efficiency of water heater	86.3072	86.0046	85.3803	84.0357	81.9840	79.8000	79.8000	79.8000	79.8000	84.2966	85.8117	79.8000	(216)
Fuel for water heating, kWh/month	294.0051	260.8399	279.2705	250.1954	249.0121	231.0145	228.5341	237.4535	239.8474	252.5853	263.0515	290.7018	(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	7.0685	7.3041	7.0685	7.3041	7.0685	(231)
Lighting	32.4344	26.0201	23.4282	17.1645	13.2584	10.8322	12.0947	15.7212	20.4203	26.7925	30.2621	33.3359	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-41.7111	-59.7935	-87.3515	-99.8287	-108.9584	-102.0965	-100.7677	-94.4533	-83.5777	-69.0345	-46.1803	-35.9412	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-20.6491	-43.7447	-87.5397	-132.3733	-175.9408	-177.1803	-175.1682	-147.9596	-107.9318	-62.9382	-27.6859	-16.3116	(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												3795.7165	(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												3076.5113	(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)												261.7645	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2105.1175	(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												5114.8748	(238)

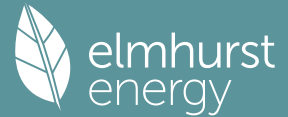
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3795.7165	0.2100	797.1005	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3076.5113	0.2100	646.0674	(264)
Space and water heating			1443.1678	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	261.7645	0.1443	37.7807	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-929.6943	0.1343	-124.8210	
PV Unit electricity exported	-1175.4232	0.1257	-147.7347	
Total			-272.5558	(269)
Total CO2, kg/year			1220.3220	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.2900	(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	3795.7165	1.1300	4289.1597	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3076.5113	1.1300	3476.4577	(278)
Space and water heating			7765.6174	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	261.7645	1.5338	401.5031	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-929.6943	1.4962	-1390.9949	
PV Unit electricity exported	-1175.4232	0.4613	-542.2754	
Total			-1933.2703	(283)
Total Primary energy kWh/year			6363.9510	(286)
Target Primary Energy Rate (TPER)			48.4600	(287)

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Plot Reference	23820-C-EN			Issued on Date	07/01/2026
Assessment Reference	Renewable	Plot Type Ref	EST		
Plot Address	C-EN, Bedford Road, Hitchin, SG5 2TY			SAP Version	10.2
SAP Rating	85 B	DER	2.95	TER	10.86
Environmental	97 A	% DER < TER			72.84
CO ₂ Emissions (t/year)	0.29	DFEE	37.53	TFEE	38.13
Compliance Check	See BREL	% DFEE < TFEE			1.57
% DPER < TPER	39.38	DPER	34.47	TPER	56.86
Assessor Details	Mr. Samuel Marks			Assessor ID	BP82-0001
Client	23820, Jordon Foux				

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			
Ground floor	39.3700 (1b)	x 2.4500 (2b)	= 96.4565 (1b) - (3b)
First floor	40.4800 (1c)	x 2.7100 (2c)	= 109.7008 (1c) - (3c)
Second floor	40.4800 (1d)	x 2.7100 (2d)	= 109.7008 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.3300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	315.8581 (5)

2. Ventilation rate

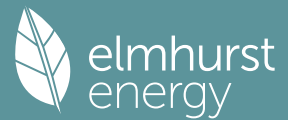
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.2500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2125 (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	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												79.2000 (23c)
Effective ac	0.3749	0.3696	0.3643	0.3377	0.3324	0.3059	0.3059	0.3006	0.3165	0.3324	0.3431	0.3537 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			22.0200	1.3258	29.1932		(27)
Solid Door			2.1000	1.2000	2.5200		(26)
Floor			39.3700	0.1200	4.7244	75.0000	2952.7500 (28a)
Exposed Floor			1.1100	0.1800	0.1998	0.0000	0.0000 (28b)
External Wall	143.5500	24.1200	119.4300	0.1800	21.4974	60.0000	7165.8002 (29a)
Plane	40.4800		40.4800	0.1000	4.0480	9.0000	364.3200 (30)
Total net area of external elements Aum (A, m ²)			224.5100				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	62.1828	(33)
Main dwelling							
Party Wall			70.5900	0.0000	0.0000	45.0000	3176.5498 (32)
B			75.9400			75.0000	5695.5002 (32c)
T			147.3200			9.0000	1325.8801 (32c)
Internal Floor			79.8500			18.0000	1437.3000 (32d)

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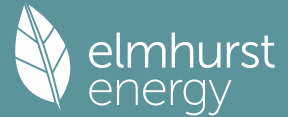


Internal Ceiling	79.8500										9.0000		718.6500 (32e)	
Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...										(32e) =		22836.7503 (34)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K													189.7843 (35)	
List of Thermal Bridges														
K1 Element									Length	Psi-value	Total			
E2 Other lintels (including other steel lintels)									13.5500	0.0240	0.3252			
E3 Sill									12.5500	0.0220	0.2761			
E4 Jamb									36.0000	0.0170	0.6120			
E5 Ground floor (normal)									18.7500	0.0740	1.3875			
E6 Intermediate floor within a dwelling									34.5200	0.0010	0.0345			
E16 Corner (normal)									18.2000	0.0460	0.8372			
E17 Corner (inverted - internal area greater than external area)									2.4500	-0.0880	-0.2156			
E10 Eaves (insulation at ceiling level)									8.8000	0.0600	0.5280			
E12 Gable (insulation at ceiling level)									9.2000	0.0560	0.5152			
E18 Party wall between dwellings									15.7500	0.0330	0.5198			
P1 Party wall - Ground floor									8.4500	0.1080	0.9126			
P2 Party wall - Intermediate floor within a dwelling									17.6500	0.0000	0.0000			
P4 Party wall - Roof (insulation at ceiling level)									9.2000	0.1010	0.9292			
P8 Party Wall - Exposed floor (inverted)									0.7500	0.1850	0.1387			
E20 Exposed floor (normal)									1.4800	0.0690	0.1021			
E21 Exposed floor (inverted)									2.2300	0.3200	0.7136			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)											(36a) =		7.6161 (36)	
Point Thermal bridges													0.0000	
Total fabric heat loss											(33) + (36) + (36a) =		69.7989 (37)	
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)														
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat transfer coeff	39.0809	38.5272	37.9734	35.2048	34.6510	31.8823	31.8823	31.3286	32.9898	34.6510	35.7585	36.8660 (38)		
Average = Sum(39)m / 12 =	108.8798	108.3261	107.7724	105.0037	104.4499	101.6812	101.6812	101.1275	102.7887	104.4499	105.5574	106.6649 (39)		
												104.8652		
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
HLP (average)	0.9048	0.9002	0.8956	0.8726	0.8680	0.8450	0.8450	0.8404	0.8542	0.8680	0.8772	0.8864 (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														
												2.8646 (42)		
Hot water usage for mixer showers														
	99.3430	97.8500	95.6745	91.5121	88.4404	85.0148	83.0677	85.2267	87.5934	91.2714	95.5232	98.9623 (42a)		
Hot water usage for baths														
	31.1928	30.7296	30.0772	28.8744	27.9737	26.9750	26.4355	27.0833	27.7887	28.8573	30.0849	31.0874 (42b)		
Hot water usage for other uses														
	43.9662	42.3674	40.7686	39.1699	37.5711	35.9723	35.9723	37.5711	39.1699	40.7686	42.3674	43.9662 (42c)		
Average daily hot water use (litres/day)														
	160.4808 (43)													
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	174.5020	170.9470	166.5204	159.5563	153.9851	147.9621	145.4755	149.8811	154.5519	160.8974	167.9756	174.0159 (44)		
Energy conte	276.3684	243.4262	255.9356	218.4247	207.2936	181.9366	175.9400	185.5841	190.5780	218.3362	239.3120	272.4668 (45)		
Energy content (annual)	Total = Sum(45)m = 2665.6024													
Distribution loss (46)m = 0.15 x (45)m														
	41.4553	36.5139	38.3903	32.7637	31.0940	27.2905	26.3910	27.8376	28.5867	32.7504	35.8968	40.8700 (46)		
Water storage loss (or HIU loss):														
Store volume												210.0000 (47)		
a) If manufacturer declared loss factor is known (kWh/day):														
Temperature factor from Table 2b												2.3000 (48)		
Enter (49) or (54) in (55)												0.5400 (49)		
Total storage loss														
	38.5020	34.7760	38.5020	37.2600	38.5020	37.2600	38.5020	38.5020	37.2600	38.5020	37.2600	38.5020 (56)		
If cylinder contains dedicated solar storage														
	38.5020	34.7760	38.5020	37.2600	38.5020	37.2600	38.5020	38.5020	37.2600	38.5020	37.2600	38.5020 (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														
	338.1328	299.2134	317.7000	278.1967	269.0580	241.7086	237.7044	247.3485	250.3500	280.1006	299.0840	334.2312 (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	338.1328	299.2134	317.7000	278.1967	269.0580	241.7086	237.7044	247.3485	250.3500	280.1006	299.0840	334.2312 (64)		
										Total per year (kWh/year) = Sum(64)m =			3392.8284 (64)	
												3393 (64)		
12Total per year (kWh/year)														
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	141.3040	125.5690	134.5101	120.4438	118.3366	108.3115	107.9116	111.1182	111.1848	122.0083	127.3888	140.0067 (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	143.2290	143.2290	143.2290	143.2290	143.2290	143.2290	143.2290	143.2290	143.2290	143.2290	143.2290	143.2290 (66)		
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	146.7717	162.4972	146.7717	151.6641	146.7717	151.6641	146.7717	146.7717	151.6641	146.7717	151.6641	146.7717 (67)		
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	285.6422	288.6062	281.1369	265.2355	245.1628	226.2973	213.6941	210.7300	218.1994	234.1007	254.1734	273.0389 (68)		
Pumps, fans	37.3229	37.3229	37.3229	37.3229	37.3229	37.3229	37.3229	37.3229	37.3229	37.3229	37.3229	37.3229 (69)		
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)		
Water heating gains (Table 5)														
	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832 (71)		
Total internal gains	189.9248	186.8586	180.7932	167.2831	159.0546	150.4327	145.0424	149.3525	154.4233	163.9897	176.9290	188.1811 (72)		
	691.3073	706.9308	677.6704	653.1513	619.9578	594.3628	571.4769	572.8228	590.2554	613.8308	651.7351	676.9603 (73)		

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6. Solar gains

[Jan]	Area m2				Solar flux Table 6a W/m2	g Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W		
East	7.5000				19.6403	0.6300	0.7000	0.7000	0.7700	45.0174 (76)		
West	14.5200				19.6403	0.6300	0.7000	0.7000	0.7700	87.1537 (80)		
Solar gains	132.1711	258.5547	425.8027	621.0079	761.0685	779.0890	741.7245	637.1304	495.2262	306.7969	164.8018	108.6911 (83)
Total gains	823.4784	965.4854	1103.4731	1274.1592	1381.0263	1373.4518	1313.2014	1209.9532	1085.4816	920.6277	816.5369	785.6514 (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	58.2619	58.5597	58.8606	60.4126	60.7328	62.3865	62.3865	62.7282	61.7144	60.7328	60.0957	59.4717
alpha	4.8841	4.9040	4.9240	5.0275	5.0489	5.1591	5.1591	5.1819	5.1143	5.0489	5.0064	4.9648
util living area	0.9885	0.9747	0.9393	0.8329	0.6633	0.4685	0.3398	0.3828	0.6256	0.8954	0.9757	0.9906 (86)
MIT	20.0594	20.2347	20.4765	20.7542	20.8899	20.9334	20.9389	20.9384	20.9128	20.7078	20.3485	20.0483 (87)
Th 2	20.1634	20.1673	20.1712	20.1908	20.1948	20.2145	20.2145	20.2184	20.2066	20.1948	20.1869	20.1790 (88)
util rest of house	0.9858	0.9690	0.9262	0.8027	0.6161	0.4130	0.2796	0.3186	0.5629	0.8680	0.9693	0.9884 (89)
MIT 2	19.0560	19.2803	19.5835	19.9278	20.0748	20.1333	20.1370	20.1409	20.1099	19.8864	19.4419	19.0544 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.1705	19.3892	19.6854	20.0221	20.1678	20.2246	20.2285	20.2319	20.2015	19.9801	19.5453	19.1678 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.1705	19.3892	19.6854	20.0221	20.1678	20.2246	20.2285	20.2319	20.2015	19.9801	19.5453	19.1678 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9816	0.9623	0.9172	0.7958	0.6144	0.4137	0.2807	0.3197	0.5625	0.8595	0.9629	0.9848 (94)
Useful gains	808.3004	929.1322	1012.0650	1013.9354	848.5047	568.2644	368.5698	386.7874	610.5760	791.3041	786.2138	773.6708 (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	1619.0952	1569.5578	1421.0249	1167.8616	884.4575	571.9160	368.9494	387.5096	627.1702	979.7524	1313.6979	1596.5399 (97)
Space heating kWh	603.2313	430.3660	304.2662	110.8269	26.7489	0.0000	0.0000	0.0000	0.0000	140.2055	379.7886	612.2145 (98a)
Space heating requirement - total per year (kWh/year)	2607.6478											
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	603.2313	430.3660	304.2662	110.8269	26.7489	0.0000	0.0000	0.0000	0.0000	140.2055	379.7886	612.2145 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2607.6478											
Space heating per m2	(98c) / (4) = 21.6708 (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 %)												219.3000 (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	603.2313	430.3660	304.2662	110.8269	26.7489	0.0000	0.0000	0.0000	0.0000	140.2055	379.7886	612.2145 (98)
Space heating efficiency (main heating system 1)	219.3000	219.3000	219.3000	219.3000	219.3000	0.0000	0.0000	0.0000	0.0000	219.3000	219.3000	219.3000 (210)
Space heating fuel (main heating system)	275.0713	196.2453	138.7443	50.5366	12.1974	0.0000	0.0000	0.0000	0.0000	63.9332	173.1822	279.1676 (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	338.1328	299.2134	317.7000	278.1967	269.0580	241.7086	237.7044	247.3485	250.3500	280.1006	299.0840	334.2312 (64)
Water heating requirement	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000 (216)
Efficiency of water heater	177.5908	157.1499	166.8592	146.1117	141.3120	126.9478	124.8448	129.9099	131.4863	147.1117	157.0819	175.5416 (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	31.0917	28.0828	31.0917	30.0887	31.0917	30.0887	31.0917	31.0917	30.0887	31.0917	30.0887	31.0917 (231)
(221)m	38.6864	31.0356	27.9442	20.4731	15.8140	12.9202	14.4261	18.7515	24.3564	31.9569	36.0953	39.7616 (232)
Pumps and Fa	Electricity generated by PVs (Appendix M) (negative quantity)											
Lighting	-32.3304	-49.2759	-75.7643	-89.5242	-100.4446	-95.1066	-93.9107	-86.1664	-72.8423	-57.5389	-36.5641	-27.5296 (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)	-7.7388	-17.5880	-38.1127	-63.0934	-88.1016	-90.2643	-89.0105	-73.6527	-52.3282	-27.9378	-10.9638	-6.0014 (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)

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Annual totals kWh/year	
Space heating fuel - main system 1	1189.0779 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	190.4000
Water heating fuel used	1781.9477 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.9500)	
mechanical ventilation fans (SFP = 0.9500)	366.0795 (230a)
Total electricity for the above, kWh/year	366.0795 (231)
Electricity for lighting (calculated in Appendix L)	312.2212 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1381.7915 (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	2267.5348 (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	1189.0779	0.1570	186.6503 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1781.9477	0.1410	251.1905 (264)
Space and water heating			437.8408 (265)
Pumps, fans and electric keep-hot	366.0795	0.1387	50.7797 (267)
Energy for lighting	312.2212	0.1443	45.0632 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-816.9982	0.1334	-109.0147
PV Unit electricity exported	-564.7933	0.1236	-69.8000
Total			-178.8147 (269)
Total CO2, kg/year			354.8690 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.9500 (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	1189.0779	1.5811	1880.0508 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1781.9477	1.5212	2710.7651 (278)
Space and water heating			4590.8158 (279)
Pumps, fans and electric keep-hot	366.0795	1.5128	553.8051 (281)
Energy for lighting	312.2212	1.5338	478.8953 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-816.9982	1.4931	-1219.8488
PV Unit electricity exported	-564.7933	0.4535	-256.1594
Total			-1476.0082 (283)
Total Primary energy kWh/year			4147.5080 (286)
Dwelling Primary energy Rate (DPER)			34.4700 (287)

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

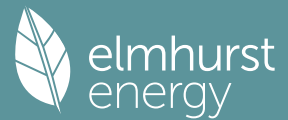
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	39.3700 (1b)	x 2.4500 (2b)	= 96.4565 (1b) - (3b)
First floor	40.4800 (1c)	x 2.7100 (2c)	= 109.7008 (1c) - (3c)
Second floor	40.4800 (1d)	x 2.7100 (2d)	= 109.7008 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.3300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	315.8581 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1266 (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)
0.3766 (18)
2 (19)

Shelter factor

Infiltration rate adjusted to include shelter factor

$$(20) = 1 - [0.075 \times (19)] = 0.8500 (20)$$

$$(21) = (18) \times (20) = 0.3201 (21)$$

	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	0.4082	0.4002	0.3922	0.3522	0.3442	0.3041	0.3041	0.2961	0.3201	0.3442	0.3602	0.3762	(22b)
Effective ac	0.5833	0.5801	0.5769	0.5620	0.5592	0.5462	0.5462	0.5438	0.5512	0.5592	0.5649	0.5708	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1000	1.0000	2.1000			(26)
TER Opening Type			22.0200	1.1450	25.2137			(27)
Floor			39.3700	0.1300	5.1181			(28a)
Exposed Floor			1.1100	0.1300	0.1443			(28b)
External Wall	143.5500	24.1200	119.4300	0.1800	21.4974			(29a)
Plane	40.4800		40.4800	0.1100	4.4528			(30)
Total net area of external elements Aum(A, m2)			224.5100					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	58.5263		(33)
Main dwelling								
Party Wall			70.5900	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							189.7843	(35)

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

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	13.5500	0.0500	0.6775	
E3 Sill	12.5500	0.0500	0.6275	
E4 Jamb	36.0000	0.0500	1.8000	
E5 Ground floor (normal)	18.7500	0.1600	3.0000	
E6 Intermediate floor within a dwelling	34.5200	0.0000	0.0000	
E16 Corner (normal)	18.2000	0.0900	1.6380	
E17 Corner (inverted - internal area greater than external area)	2.4500	-0.0900	-0.2205	
E10 Eaves (insulation at ceiling level)	8.8000	0.0600	0.5280	
E12 Gable (insulation at ceiling level)	9.2000	0.0600	0.5520	
E18 Party wall between dwellings	15.7500	0.0600	0.9450	
P1 Party wall - Ground floor	8.4500	0.0800	0.6760	
P2 Party wall - Intermediate floor within a dwelling	17.6500	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	9.2000	0.1200	1.1040	
P8 Party Wall - Exposed floor (inverted)	0.7500	0.2400	0.1800	
E20 Exposed floor (normal)	1.4800	0.3200	0.4736	
E21 Exposed floor (inverted)	2.2300	0.3200	0.7136	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			12.6947	(36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	71.2210 (37)

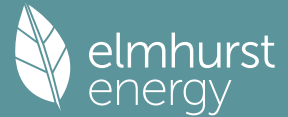
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	60.7999	60.4627	60.1322	58.5798	58.2894	56.9373	56.9373	56.6869	57.4581	58.2894	58.8769	59.4912	(38)
Heat transfer coeff	132.0209	131.6837	131.3532	129.8009	129.5104	128.1583	128.1583	127.9080	128.6791	129.5104	130.0980	130.7123	(39)
Average = Sum(39)m / 12 =												129.7995	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0972	1.0944	1.0916	1.0787	1.0763	1.0651	1.0651	1.0630	1.0694	1.0763	1.0812	1.0863	(40)
HLP (average)												1.0787	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8646 (42)
Hot water usage for mixer showers													
72.2494	71.1637	69.5815	66.5543	64.3203	61.8289	60.4128	61.9830	63.7043	66.3792	69.4715	71.9726	71.9726	(42a)
Hot water usage for baths													
31.1928	30.7296	30.0772	28.8744	27.9737	26.9750	26.4355	27.0833	27.7887	28.8573	30.0849	31.0874	31.0874	(42b)
Hot water usage for other uses													
43.9662	42.3674	40.7686	39.1699	37.5711	35.9723	35.9723	37.5711	39.1699	40.7686	42.3674	43.9662	43.9662	(42c)
Average daily hot water use (litres/day)												135.5015	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.4084	144.2606	140.4273	134.5985	129.8650	124.7762	122.8207	126.6375	130.6628	136.0052	141.9238	147.0262	(44)
Energy conte	233.4589	205.4252	215.8316	184.2586	174.8233	153.4269	148.5410	156.8036	161.1203	184.5577	202.1965	230.2074	(45)
Energy content (annual)										Total = Sum(45)m =		2250.6511	
Distribution loss (46)m = 0.15 x (45)m													
35.0188	30.8138	32.3747	27.6388	26.2235	23.0140	22.2811	23.5205	24.1680	27.6837	30.3295	34.5311	34.5311	(46)
Water storage loss (or HIU loss):													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7016	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9188	(55)
Total storage loss													
28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	(56)
If cylinder contains dedicated solar storage													
28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	(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													
285.2055	252.1641	267.5781	234.3360	226.5699	203.5043	200.2876	208.5502	211.1977	236.3043	252.2738	281.9540	281.9540	(62)
WWHRS	-33.0294	-29.2115	-30.5886	-25.3286	-23.6053	-20.1992	-18.9336	-20.1339	-20.8989	-24.6375	-27.9113	-32.4178	(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													
252.1761	222.9526	236.9896	209.0074	202.9646	183.3051	181.3540	188.4163	190.2988	211.6668	224.3625	249.5363	249.5363	(64)
Total per year (kWh/year) = Sum(64)m =												2553.0300	(64)

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12Total per year (kWh/year)												2553 (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												
119.0224	105.6950	113.1613	101.3279	99.5260	91.0763	90.7872	93.5345	93.6344	102.7627	107.2922	117.9412	(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	143.2290	143.2290	143.2290	143.2290	143.2290	143.2290	143.2290	143.2290	143.2290	143.2290	143.2290	143.2290	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	146.7717	162.4972	146.7717	151.6641	146.7717	151.6641	146.7717	146.7717	151.6641	146.7717	151.6641	146.7717	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	285.6422	288.6062	281.1369	265.2355	245.1628	226.2973	213.6941	210.7300	218.1994	234.1007	254.1734	273.0389	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3229	37.3229	37.3229	37.3229	37.3229	37.3229	37.3229	37.3229	37.3229	37.3229	37.3229	37.3229	(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)	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832	(71)
Water heating gains (Table 5)	159.9763	157.2842	152.0985	140.7331	133.7715	126.4949	122.0257	125.7184	130.0478	138.1219	149.0169	158.5232	(72)
Total internal gains	661.3588	677.3563	648.9757	626.6014	594.6747	570.4250	548.4602	549.1888	565.8799	587.9631	623.8231	647.3024	(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					7.5000	19.6403		0.6300	0.7000	0.7700		45.0174 (76)	
West					14.5200	19.6403		0.6300	0.7000	0.7700		87.1537 (80)	
Solar gains	132.1711	258.5547	425.8027	621.0079	761.0685	779.0890	741.7245	637.1304	495.2262	306.7969	164.8018	108.6911 (83)	
Total gains	793.5299	935.9110	1074.7785	1247.6093	1355.7432	1349.5141	1290.1847	1186.3192	1061.1061	894.7600	788.6249	755.9935 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	48.0495	48.1725	48.2938	48.8713	48.9809	49.4977	49.4977	49.5946	49.2974	48.9809	48.7597	48.5306
alpha	4.2033	4.2115	4.2196	4.2581	4.2654	4.2998	4.2998	4.3063	4.2865	4.2654	4.2506	4.2354
util living area	0.9912	0.9819	0.9590	0.8901	0.7593	0.5776	0.4300	0.4835	0.7325	0.9336	0.9832	0.9928 (86)
MIT	19.4207	19.6615	20.0255	20.4854	20.8042	20.9543	20.9897	20.9833	20.8760	20.4276	19.8455	19.3864 (87)
Th 2	20.0032	20.0054	20.0077	20.0183	20.0202	20.0295	20.0295	20.0312	20.0259	20.0202	20.0162	20.0121 (88)
util rest of house	0.9890	0.9774	0.9487	0.8637	0.7075	0.5007	0.3385	0.3873	0.6592	0.9117	0.9783	0.9910 (89)
MIT 2	18.1622	18.4692	18.9280	19.4937	19.8503	20.0005	20.0254	20.0240	19.9352	19.4398	18.7127	18.1245 (90)
Living area fraction	18.3058	18.6053	19.0532	19.6069	19.9592	20.1093	20.1354	20.1334	20.0426	fLA = Living area / (4) =		0.1141 (91)
MIT	18.3058	18.6053	19.0532	19.6069	19.9592	20.1093	20.1354	20.1334	20.0426	19.5525	18.8420	18.2685 (92)
Temperature adjustment												0.0000
adjusted MIT	18.3058	18.6053	19.0532	19.6069	19.9592	20.1093	20.1354	20.1334	20.0426	19.5525	18.8420	18.2685 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9835	0.9687	0.9359	0.8508	0.7040	0.5073	0.3486	0.3977	0.6606	0.8985	0.9700	0.9862	(94)
Useful gains	780.4320	906.5945	1005.9119	1061.4506	954.4450	684.6000	449.8141	471.8207	700.9570	803.9181	764.9296	745.5783	(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	1849.0536	1804.7620	1648.9035	1389.7588	1069.6490	706.0659	453.0942	477.5351	764.6876	1159.4445	1527.6076	1838.9211	(97)
Space heating kWh	795.0545	603.5686	478.3858	236.3819	85.7118	0.0000	0.0000	0.0000	0.0000	264.5117	549.1282	813.4470	(98a)
Space heating requirement - total per year (kWh/year)												3826.1894	
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	795.0545	603.5686	478.3858	236.3819	85.7118	0.0000	0.0000	0.0000	0.0000	264.5117	549.1282	813.4470	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3826.1894	
Space heating per m2											(98c) / (4) =	31.7975	(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	795.0545	603.5686	478.3858	236.3819	85.7118	0.0000	0.0000	0.0000	0.0000	264.5117	549.1282	813.4470	(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)	861.3808	653.9205	518.2944	256.1017	92.8622	0.0000	0.0000	0.0000	0.0000	286.5782	594.9384	881.3077	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)

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Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	252.1761	222.9526	236.9896	209.0074	202.9646	183.3051	181.3540	188.4163	190.2988	211.6668	224.3625	249.5363	(64)
Efficiency of water heater	86.4521	86.1782	85.6017	84.3365	82.2759	79.8000	79.8000	79.8000	79.8000	84.5607	85.9870	79.8000	(216)
Fuel for water heating, kWh/month	291.6945	258.7110	276.8514	247.8256	246.6878	229.7056	227.2607	236.1107	238.4696	250.3134	260.9260	288.4492	(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	7.0685	7.3041	7.0685	7.3041	7.0685	(231)
Lighting	30.4963	24.4652	22.0282	16.1388	12.4661	10.1849	11.3720	14.7817	19.2000	25.1915	28.4537	31.3438	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-38.8223	-55.7938	-81.7188	-93.6482	-102.4421	-96.0833	-94.8399	-88.7863	-78.3916	-64.5354	-43.0338	-33.4363	(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	-18.8231	-39.9164	-79.9498	-120.9982	-160.9174	-162.0789	-160.2339	-135.2991	-98.6389	-57.4595	-25.2478	-14.8659	(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												4145.3840	(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												3053.0056	(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)												246.1223	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1945.9608	(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												5584.5510	(238)

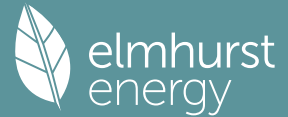
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4145.3840	0.2100	870.5306 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3053.0056	0.2100	641.1312 (264)
Space and water heating			1511.6618 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	246.1223	0.1443	35.5230 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-871.5318	0.1342	-116.9622
PV Unit electricity exported	-1074.4290	0.1257	-135.0156
Total			-251.9778 (269)
Total CO2, kg/year			1307.1363 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.8600 (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	4145.3840	1.1300	4684.2839 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3053.0056	1.1300	3449.8963 (278)
Space and water heating			8134.1802 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	246.1223	1.5338	377.5105 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-871.5318	1.4960	-1303.7856
PV Unit electricity exported	-1074.4290	0.4613	-495.5874
Total			-1799.3730 (283)
Total Primary energy kWh/year			6842.4185 (286)
Target Primary Energy Rate (TPER)			56.8600 (287)

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Plot Reference	23820-C-ES			Issued on Date	07/01/2026
Assessment Reference	Renewable	Plot Type Ref	EST		
Plot Address	C-ES, Bedford Road, Hitchin, SG5 2TY			SAP Version	10.2
SAP Rating	85 B	DER	2.95	TER	10.86
Environmental	97 A	% DER < TER			72.84
CO ₂ Emissions (t/year)	0.29	DFEE	37.53	TFEE	38.13
Compliance Check	See BREL	% DFEE < TFEE			1.57
% DPER < TPER	39.38	DPER	34.47	TPER	56.86
Assessor Details	Mr. Samuel Marks			Assessor ID	BP82-0001
Client	23820, Jordon Foux				

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			
Ground floor	39.3700 (1b)	x 2.4500 (2b)	= 96.4565 (1b) - (3b)
First floor	40.4800 (1c)	x 2.7100 (2c)	= 109.7008 (1c) - (3c)
Second floor	40.4800 (1d)	x 2.7100 (2d)	= 109.7008 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.3300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	315.8581 (5)

2. Ventilation rate

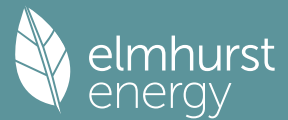
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.2500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2125 (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	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												79.2000 (23c)
Effective ac	0.3749	0.3696	0.3643	0.3377	0.3324	0.3059	0.3059	0.3006	0.3165	0.3324	0.3431	0.3537 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			22.0200	1.3258	29.1932		(27)
Solid Door			2.1000	1.2000	2.5200		(26)
Floor			39.3700	0.1200	4.7244	75.0000	2952.7500 (28a)
Exposed Floor			1.1100	0.1800	0.1998	0.0000	0.0000 (28b)
External Wall	143.5500	24.1200	119.4300	0.1800	21.4974	60.0000	7165.8002 (29a)
Plane	40.4800		40.4800	0.1000	4.0480	9.0000	364.3200 (30)
Total net area of external elements Aum (A, m ²)			224.5100				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	62.1828	(33)
Main dwelling							
Party Wall			70.5900	0.0000	0.0000	45.0000	3176.5498 (32)
B			75.9400			75.0000	5695.5002 (32c)
T			147.3200			9.0000	1325.8801 (32c)
Internal Floor			79.8500			18.0000	1437.3000 (32d)

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Internal Ceiling	79.8500	9.0000	718.6500 (32e)
Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =		
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	22836.7503 (34)		
List of Thermal Bridges	189.7843 (35)		
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	13.5500	0.0240	0.3252
E3 Sill	12.5500	0.0220	0.2761
E4 Jamb	36.0000	0.0170	0.6120
E5 Ground floor (normal)	18.7500	0.0740	1.3875
E6 Intermediate floor within a dwelling	34.5200	0.0010	0.0345
E16 Corner (normal)	18.2000	0.0460	0.8372
E17 Corner (inverted - internal area greater than external area)	2.4500	-0.0880	-0.2156
E10 Eaves (insulation at ceiling level)	8.8000	0.0600	0.5280
E12 Gable (insulation at ceiling level)	9.2000	0.0560	0.5152
E18 Party wall between dwellings	15.7500	0.0330	0.5198
P1 Party wall - Ground floor	8.4500	0.1080	0.9126
P2 Party wall - Intermediate floor within a dwelling	17.6500	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	9.2000	0.1010	0.9292
P8 Party Wall - Exposed floor (inverted)	0.7500	0.1850	0.1387
E20 Exposed floor (normal)	1.4800	0.0690	0.1021
E21 Exposed floor (inverted)	2.2300	0.3200	0.7136
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	7.6161 (36)		
Point Thermal bridges	(36a) = 0.0000		
Total fabric heat loss	(33) + (36) + (36a) = 69.7989 (37)		
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)			
(38)m	Jan	Feb	Mar
Heat transfer coeff	39.0809	38.5272	37.9734
Average = Sum(39)m / 12 =	108.8798	108.3261	107.7724
	Apr	May	Jun
	35.2048	34.6510	31.8823
	Jul	Aug	Sep
	31.8823	31.3286	32.9898
	Oct	Nov	Dec
	34.6510	35.7585	36.8660 (38)
	101.6812	101.6812	101.1275
	102.7887	104.4499	105.5574
	106.6649 (39)	104.8652	
	Jan	Feb	Mar
HLP	0.9048	0.9002	0.8956
HLP (average)	0.8726	0.8680	0.8450
Days in mont	31	28	31
	Apr	May	Jun
	30	31	30
	Jul	Aug	Sep
	31	31	30
	Oct	Nov	Dec
	31	30	31

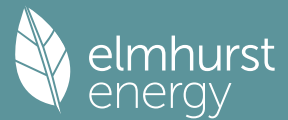
4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.8646 (42)											
Hot water usage for mixer showers	99.3430 97.8500 95.6745 91.5121 88.4404 85.0148 83.0677 85.2267 87.5934 91.2714 95.5232 98.9623 (42a)											
Hot water usage for baths	31.1928 30.7296 30.0772 28.8744 27.9737 26.9750 26.4355 27.0833 27.7887 28.8573 30.0849 31.0874 (42b)											
Hot water usage for other uses	43.9662 42.3674 40.7686 39.1699 37.5711 35.9723 35.9723 37.5711 39.1699 40.7686 42.3674 43.9662 (42c)											
Average daily hot water use (litres/day)	160.4808 (43)											
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	174.5020	170.9470	166.5204	159.5563	153.9851	147.9621	145.4755	149.8811	154.5519	160.8974	167.9756	174.0159 (44)
Energy content (annual)	276.3684	243.4262	255.9356	218.4247	207.2936	181.9366	175.9400	185.5841	190.5780	218.3362	239.3120	272.4668 (45)
Distribution loss (46)m = 0.15 x (45)m	Total = Sum(45)m = 2665.6024											
Water storage loss (or HIU loss):	41.4553	36.5139	38.3903	32.7637	31.0940	27.2905	26.3910	27.8376	28.5867	32.7504	35.8968	40.8700 (46)
Store volume	210.0000 (47)											
a) If manufacturer declared loss factor is known (kWh/day):	2.3000 (48)											
Temperature factor from Table 2b	0.5400 (49)											
Enter (49) or (54) in (55)	1.2420 (55)											
Total storage loss	38.5020	34.7760	38.5020	37.2600	38.5020	37.2600	38.5020	38.5020	37.2600	38.5020	37.2600	38.5020 (56)
If cylinder contains dedicated solar storage	38.5020	34.7760	38.5020	37.2600	38.5020	37.2600	38.5020	38.5020	37.2600	38.5020	37.2600	38.5020 (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	338.1328	299.2134	317.7000	278.1967	269.0580	241.7086	237.7044	247.3485	250.3500	280.1006	299.0840	334.2312 (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	338.1328	299.2134	317.7000	278.1967	269.0580	241.7086	237.7044	247.3485	250.3500	280.1006	299.0840	334.2312 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m = 3392.8284 (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	141.3040	125.5690	134.5101	120.4438	118.3366	108.3115	107.9116	111.1182	111.1848	122.0083	127.3888	140.0067 (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	143.2290	143.2290	143.2290	143.2290	143.2290	143.2290	143.2290	143.2290	143.2290	143.2290	143.2290	143.2290 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	146.7717	162.4972	146.7717	151.6641	146.7717	151.6641	146.7717	146.7717	151.6641	146.7717	151.6641	146.7717 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	285.6422	288.6062	281.1369	265.2355	245.1628	226.2973	213.6941	210.7300	218.1994	234.1007	254.1734	273.0389 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3229	37.3229	37.3229	37.3229	37.3229	37.3229	37.3229	37.3229	37.3229	37.3229	37.3229	37.3229 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832 (71)
Water heating gains (Table 5)	189.9248	186.8586	180.7932	167.2831	159.0546	150.4327	145.0424	149.3525	154.4233	163.9897	176.9290	188.1811 (72)
Total internal gains	691.3073	706.9308	677.6704	653.1513	619.9578	594.3628	571.4769	572.8228	590.2554	613.8308	651.7351	676.9603 (73)

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6. Solar gains

[Jan]	Area m2				Solar flux Table 6a W/m2	g Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W		
East	7.5000				19.6403	0.6300	0.7000	0.7000	0.7700	45.0174 (76)		
West	14.5200				19.6403	0.6300	0.7000	0.7000	0.7700	87.1537 (80)		
Solar gains	132.1711	258.5547	425.8027	621.0079	761.0685	779.0890	741.7245	637.1304	495.2262	306.7969	164.8018	108.6911 (83)
Total gains	823.4784	965.4854	1103.4731	1274.1592	1381.0263	1373.4518	1313.2014	1209.9532	1085.4816	920.6277	816.5369	785.6514 (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	58.2619	58.5597	58.8606	60.4126	60.7328	62.3865	62.3865	62.7282	61.7144	60.7328	60.0957	59.4717
alpha	4.8841	4.9040	4.9240	5.0275	5.0489	5.1591	5.1591	5.1819	5.1143	5.0489	5.0064	4.9648
util living area	0.9885	0.9747	0.9393	0.8329	0.6633	0.4685	0.3398	0.3828	0.6256	0.8954	0.9757	0.9906 (86)
MIT	20.0594	20.2347	20.4765	20.7542	20.8899	20.9334	20.9389	20.9384	20.9128	20.7078	20.3485	20.0483 (87)
Th 2	20.1634	20.1673	20.1712	20.1908	20.1948	20.2145	20.2145	20.2184	20.2066	20.1948	20.1869	20.1790 (88)
util rest of house	0.9858	0.9690	0.9262	0.8027	0.6161	0.4130	0.2796	0.3186	0.5629	0.8680	0.9693	0.9884 (89)
MIT 2	19.0560	19.2803	19.5835	19.9278	20.0748	20.1333	20.1370	20.1409	20.1099	19.8864	19.4419	19.0544 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.1705	19.3892	19.6854	20.0221	20.1678	20.2246	20.2285	20.2319	20.2015	19.9801	19.5453	19.1678 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.1705	19.3892	19.6854	20.0221	20.1678	20.2246	20.2285	20.2319	20.2015	19.9801	19.5453	19.1678 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9816	0.9623	0.9172	0.7958	0.6144	0.4137	0.2807	0.3197	0.5625	0.8595	0.9629	0.9848 (94)
Useful gains	808.3004	929.1322	1012.0650	1013.9354	848.5047	568.2644	368.5698	386.7874	610.5760	791.3041	786.2138	773.6708 (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	1619.0952	1569.5578	1421.0249	1167.8616	884.4575	571.9160	368.9494	387.5096	627.1702	979.7524	1313.6979	1596.5399 (97)
Space heating kWh	603.2313	430.3660	304.2662	110.8269	26.7489	0.0000	0.0000	0.0000	0.0000	140.2055	379.7886	612.2145 (98a)
Space heating requirement - total per year (kWh/year)	2607.6478											
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	603.2313	430.3660	304.2662	110.8269	26.7489	0.0000	0.0000	0.0000	0.0000	140.2055	379.7886	612.2145 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2607.6478											
Space heating per m2	(98c) / (4) = 21.6708 (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 %)	219.3000 (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	603.2313	430.3660	304.2662	110.8269	26.7489	0.0000	0.0000	0.0000	0.0000	140.2055	379.7886	612.2145 (98)
Space heating efficiency (main heating system 1)	219.3000	219.3000	219.3000	219.3000	219.3000	0.0000	0.0000	0.0000	0.0000	219.3000	219.3000	219.3000 (210)
Space heating fuel (main heating system)	275.0713	196.2453	138.7443	50.5366	12.1974	0.0000	0.0000	0.0000	0.0000	63.9332	173.1822	279.1676 (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	338.1328	299.2134	317.7000	278.1967	269.0580	241.7086	237.7044	247.3485	250.3500	280.1006	299.0840	334.2312 (64)
Water heating requirement	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000 (216)
Efficiency of water heater	177.5908	157.1499	166.8592	146.1117	141.3120	126.9478	124.8448	129.9099	131.4863	147.1117	157.0819	175.5416 (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	31.0917	28.0828	31.0917	30.0887	31.0917	30.0887	31.0917	31.0917	30.0887	31.0917	30.0887	31.0917 (231)
(221)m	38.6864	31.0356	27.9442	20.4731	15.8140	12.9202	14.4261	18.7515	24.3564	31.9569	36.0953	39.7616 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-32.3304	-49.2759	-75.7643	-89.5242	-100.4446	-95.1066	-93.9107	-86.1664	-72.8423	-57.5389	-36.5641	-27.5296 (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)	-7.7388	-17.5880	-38.1127	-63.0934	-88.1016	-90.2643	-89.0105	-73.6527	-52.3282	-27.9378	-10.9638	-6.0014 (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)
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

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Annual totals kWh/year	
Space heating fuel - main system 1	1189.0779 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	190.4000
Water heating fuel used	1781.9477 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.9500)	
mechanical ventilation fans (SFP = 0.9500)	366.0795 (230a)
Total electricity for the above, kWh/year	366.0795 (231)
Electricity for lighting (calculated in Appendix L)	312.2212 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1381.7915 (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	2267.5348 (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	1189.0779	0.1570	186.6503 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1781.9477	0.1410	251.1905 (264)
Space and water heating			437.8408 (265)
Pumps, fans and electric keep-hot	366.0795	0.1387	50.7797 (267)
Energy for lighting	312.2212	0.1443	45.0632 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-816.9982	0.1334	-109.0147
PV Unit electricity exported	-564.7933	0.1236	-69.8000
Total			-178.8147 (269)
Total CO2, kg/year			354.8690 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.9500 (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	1189.0779	1.5811	1880.0508 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1781.9477	1.5212	2710.7651 (278)
Space and water heating			4590.8158 (279)
Pumps, fans and electric keep-hot	366.0795	1.5128	553.8051 (281)
Energy for lighting	312.2212	1.5338	478.8953 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-816.9982	1.4931	-1219.8488
PV Unit electricity exported	-564.7933	0.4535	-256.1594
Total			-1476.0082 (283)
Total Primary energy kWh/year			4147.5080 (286)
Dwelling Primary energy Rate (DPER)			34.4700 (287)

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

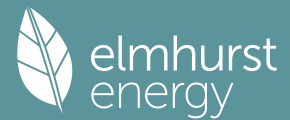
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	39.3700 (1b)	x 2.4500 (2b)	= 96.4565 (1b) - (3b)
First floor	40.4800 (1c)	x 2.7100 (2c)	= 109.7008 (1c) - (3c)
Second floor	40.4800 (1d)	x 2.7100 (2d)	= 109.7008 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.3300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	315.8581 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1266 (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)
0.3766 (18)
2 (19)

Shelter factor

Infiltration rate adjusted to include shelter factor

$$(20) = 1 - [0.075 \times (19)] = 0.8500 (20)$$

$$(21) = (18) \times (20) = 0.3201 (21)$$

	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	0.4082	0.4002	0.3922	0.3522	0.3442	0.3041	0.3041	0.2961	0.3201	0.3442	0.3602	0.3762	(22b)
Effective ac	0.5833	0.5801	0.5769	0.5620	0.5592	0.5462	0.5462	0.5438	0.5512	0.5592	0.5649	0.5708	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1000	1.0000	2.1000			(26)
TER Opening Type			22.0200	1.1450	25.2137			(27)
Floor			39.3700	0.1300	5.1181			(28a)
Exposed Floor			1.1100	0.1300	0.1443			(28b)
External Wall	143.5500	24.1200	119.4300	0.1800	21.4974			(29a)
Plane	40.4800		40.4800	0.1100	4.4528			(30)
Total net area of external elements Aum(A, m2)			224.5100					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	58.5263		(33)
Main dwelling								
Party Wall			70.5900	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							189.7843	(35)

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

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	13.5500	0.0500	0.6775	
E3 Sill	12.5500	0.0500	0.6275	
E4 Jamb	36.0000	0.0500	1.8000	
E5 Ground floor (normal)	18.7500	0.1600	3.0000	
E6 Intermediate floor within a dwelling	34.5200	0.0000	0.0000	
E16 Corner (normal)	18.2000	0.0900	1.6380	
E17 Corner (inverted - internal area greater than external area)	2.4500	-0.0900	-0.2205	
E10 Eaves (insulation at ceiling level)	8.8000	0.0600	0.5280	
E12 Gable (insulation at ceiling level)	9.2000	0.0600	0.5520	
E18 Party wall between dwellings	15.7500	0.0600	0.9450	
P1 Party wall - Ground floor	8.4500	0.0800	0.6760	
P2 Party wall - Intermediate floor within a dwelling	17.6500	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	9.2000	0.1200	1.1040	
P8 Party Wall - Exposed floor (inverted)	0.7500	0.2400	0.1800	
E20 Exposed floor (normal)	1.4800	0.3200	0.4736	
E21 Exposed floor (inverted)	2.2300	0.3200	0.7136	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			12.6947	(36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	71.2210 (37)

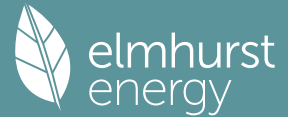
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	60.7999	60.4627	60.1322	58.5798	58.2894	56.9373	56.9373	56.6869	57.4581	58.2894	58.8769	59.4912	(38)
Heat transfer coeff	132.0209	131.6837	131.3532	129.8009	129.5104	128.1583	128.1583	127.9080	128.6791	129.5104	130.0980	130.7123	(39)
Average = Sum(39)m / 12 =												129.7995	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0972	1.0944	1.0916	1.0787	1.0763	1.0651	1.0651	1.0630	1.0694	1.0763	1.0812	1.0863	(40)
HLP (average)												1.0787	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8646 (42)
Hot water usage for mixer showers													
72.2494	71.1637	69.5815	66.5543	64.3203	61.8289	60.4128	61.9830	63.7043	66.3792	69.4715	71.9726	71.9726	(42a)
Hot water usage for baths													
31.1928	30.7296	30.0772	28.8744	27.9737	26.9750	26.4355	27.0833	27.7887	28.8573	30.0849	31.0874	31.0874	(42b)
Hot water usage for other uses													
43.9662	42.3674	40.7686	39.1699	37.5711	35.9723	35.9723	37.5711	39.1699	40.7686	42.3674	43.9662	43.9662	(42c)
Average daily hot water use (litres/day)												135.5015	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.4084	144.2606	140.4273	134.5985	129.8650	124.7762	122.8207	126.6375	130.6628	136.0052	141.9238	147.0262	(44)
Energy conte	233.4589	205.4252	215.8316	184.2586	174.8233	153.4269	148.5410	156.8036	161.1203	184.5577	202.1965	230.2074	(45)
Energy content (annual)										Total = Sum(45)m =		2250.6511	
Distribution loss (46)m = 0.15 x (45)m													
35.0188	30.8138	32.3747	27.6388	26.2235	23.0140	22.2811	23.5205	24.1680	27.6837	30.3295	34.5311	34.5311	(46)
Water storage loss (or HIU loss):													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7016	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9188	(55)
Total storage loss													
28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	(56)
If cylinder contains dedicated solar storage													
28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	(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													
285.2055	252.1641	267.5781	234.3360	226.5699	203.5043	200.2876	208.5502	211.1977	236.3043	252.2738	281.9540	281.9540	(62)
WWHRS	-33.0294	-29.2115	-30.5886	-25.3286	-23.6053	-20.1992	-18.9336	-20.1339	-20.8989	-24.6375	-27.9113	-32.4178	(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													
252.1761	222.9526	236.9896	209.0074	202.9646	183.3051	181.3540	188.4163	190.2988	211.6668	224.3625	249.5363	249.5363	(64)
Total per year (kWh/year) = Sum(64)m =												2553.0300	(64)

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12Total per year (kWh/year)	2553 (64)										
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											0.0000 (64a)
Heat gains from water heating, kWh/month	119.0224	105.6950	113.1613	101.3279	99.5260	91.0763	90.7872	93.5345	93.6344	102.7627	107.2922
											117.9412 (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	143.2290	143.2290	143.2290	143.2290	143.2290	143.2290	143.2290	143.2290	143.2290	143.2290	143.2290	143.2290 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	146.7717	162.4972	146.7717	151.6641	146.7717	151.6641	146.7717	146.7717	151.6641	146.7717	151.6641	146.7717 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	285.6422	288.6062	281.1369	265.2355	245.1628	226.2973	213.6941	210.7300	218.1994	234.1007	254.1734	273.0389 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3229	37.3229	37.3229	37.3229	37.3229	37.3229	37.3229	37.3229	37.3229	37.3229	37.3229	37.3229 (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)	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832 (71)
Water heating gains (Table 5)	159.9763	157.2842	152.0985	140.7331	133.7715	126.4949	122.0257	125.7184	130.0478	138.1219	149.0169	158.5232 (72)
Total internal gains	661.3588	677.3563	648.9757	626.6014	594.6747	570.4250	548.4602	549.1888	565.8799	587.9631	623.8231	647.3024 (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					7.5000	19.6403		0.6300	0.7000	0.7700		45.0174 (76)	
West					14.5200	19.6403		0.6300	0.7000	0.7700		87.1537 (80)	
Solar gains	132.1711	258.5547	425.8027	621.0079	761.0685	779.0890	741.7245	637.1304	495.2262	306.7969	164.8018	108.6911 (83)	
Total gains	793.5299	935.9110	1074.7785	1247.6093	1355.7432	1349.5141	1290.1847	1186.3192	1061.1061	894.7600	788.6249	755.9935 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	48.0495	48.1725	48.2938	48.8713	48.9809	49.4977	49.4977	49.5946	49.2974	48.9809	48.7597	48.5306
alpha	4.2033	4.2115	4.2196	4.2581	4.2654	4.2998	4.2998	4.3063	4.2865	4.2654	4.2506	4.2354
util living area	0.9912	0.9819	0.9590	0.8901	0.7593	0.5776	0.4300	0.4835	0.7325	0.9336	0.9832	0.9928 (86)
MIT	19.4207	19.6615	20.0255	20.4854	20.8042	20.9543	20.9897	20.9833	20.8760	20.4276	19.8455	19.3864 (87)
Th 2	20.0032	20.0054	20.0077	20.0183	20.0202	20.0295	20.0295	20.0312	20.0259	20.0202	20.0162	20.0121 (88)
util rest of house	0.9890	0.9774	0.9487	0.8637	0.7075	0.5007	0.3385	0.3873	0.6592	0.9117	0.9783	0.9910 (89)
MIT 2	18.1622	18.4692	18.9280	19.4937	19.8503	20.0005	20.0254	20.0240	19.9352	19.4398	18.7127	18.1245 (90)
Living area fraction	18.3058	18.6053	19.0532	19.6069	19.9592	20.1093	20.1354	20.1334	20.0426	19.5525	18.8420	18.2685 (92)
MIT	18.3058	18.6053	19.0532	19.6069	19.9592	20.1093	20.1354	20.1334	20.0426	19.5525	18.8420	18.2685 (93)
Temperature adjustment												0.0000
adjusted MIT	18.3058	18.6053	19.0532	19.6069	19.9592	20.1093	20.1354	20.1334	20.0426	19.5525	18.8420	18.2685 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9835	0.9687	0.9359	0.8508	0.7040	0.5073	0.3486	0.3977	0.6606	0.8985	0.9700	0.9862 (94)
Ext temp.	780.4320	906.5945	1005.9119	1061.4506	954.4450	684.6000	449.8141	471.8207	700.9570	803.9181	764.9296	745.5783 (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	1849.0536	1804.7620	1648.9035	1389.7588	1069.6490	706.0659	453.0942	477.5351	764.6876	1159.4445	1527.6076	1838.9211 (97)
Space heating requirement - total per year (kWh/year)	795.0545	603.5686	478.3858	236.3819	85.7118	0.0000	0.0000	0.0000	0.0000	264.5117	549.1282	813.4470 (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)	795.0545	603.5686	478.3858	236.3819	85.7118	0.0000	0.0000	0.0000	0.0000	264.5117	549.1282	813.4470 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3826.1894
Space heating per m2												31.7975 (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	795.0545	603.5686	478.3858	236.3819	85.7118	0.0000	0.0000	0.0000	0.0000	264.5117	549.1282	813.4470 (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)	861.3808	653.9205	518.2944	256.1017	92.8622	0.0000	0.0000	0.0000	0.0000	286.5782	594.9384	881.3077 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)

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Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	252.1761	222.9526	236.9896	209.0074	202.9646	183.3051	181.3540	188.4163	190.2988	211.6668	224.3625	249.5363	(64)
Efficiency of water heater	86.4521	86.1782	85.6017	84.3365	82.2759	79.8000	79.8000	79.8000	79.8000	84.5607	85.9870	79.8000	(216)
Fuel for water heating, kWh/month	291.6945	258.7110	276.8514	247.8256	246.6878	229.7056	227.2607	236.1107	238.4696	250.3134	260.9260	288.4492	(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	7.0685	7.3041	7.0685	7.3041	7.0685	(231)
Lighting	30.4963	24.4652	22.0282	16.1388	12.4661	10.1849	11.3720	14.7817	19.2000	25.1915	28.4537	31.3438	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-38.8223	-55.7938	-81.7188	-93.6482	-102.4421	-96.0833	-94.8399	-88.7863	-78.3916	-64.5354	-43.0338	-33.4363	(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	-18.8231	-39.9164	-79.9498	-120.9982	-160.9174	-162.0789	-160.2339	-135.2991	-98.6389	-57.4595	-25.2478	-14.8659	(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												4145.3840	(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												3053.0056	(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)												246.1223	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1945.9608	(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												5584.5510	(238)

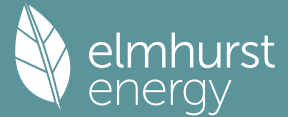
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4145.3840	0.2100	870.5306 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3053.0056	0.2100	641.1312 (264)
Space and water heating			1511.6618 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	246.1223	0.1443	35.5230 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-871.5318	0.1342	-116.9622
PV Unit electricity exported	-1074.4290	0.1257	-135.0156
Total			-251.9778 (269)
Total CO2, kg/year			1307.1363 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.8600 (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	4145.3840	1.1300	4684.2839 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3053.0056	1.1300	3449.8963 (278)
Space and water heating			8134.1802 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	246.1223	1.5338	377.5105 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-871.5318	1.4960	-1303.7856
PV Unit electricity exported	-1074.4290	0.4613	-495.5874
Total			-1799.3730 (283)
Total Primary energy kWh/year			6842.4185 (286)
Target Primary Energy Rate (TPER)			56.8600 (287)

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Plot Reference	23820-C-MN				Issued on Date	07/01/2026	
Assessment Reference	Renewable			Plot Type Ref	EST		
Plot Address	C-MS, Bedford Road, Hitchin, SG5 2TY				SAP Version	10.2	
SAP Rating	87 B	DER	2.50	TER	9.48		
Environmental	98 A	% DER < TER				73.63	
CO ₂ Emissions (t/year)	0.25	DFEE	31.54	TFEE	31.81		
Compliance Check	See BREL	% DFEE < TFEE				0.87	
% DPER < TPER	39.43	DPER	29.94	TPER	49.43		
Assessor Details	Mr. Samuel Marks				Assessor ID	BP82-0001	
Client	23820, Jordon Foux						

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			
Ground floor	39.3700 (1b)	x 2.4500 (2b)	= 96.4565 (1b) - (3b)
First floor	40.4800 (1c)	x 2.7100 (2c)	= 109.7008 (1c) - (3c)
Second floor	40.4800 (1d)	x 2.7100 (2d)	= 109.7008 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.3300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	315.8581 (5)

2. Ventilation rate

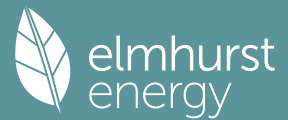
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.2500 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1938 (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	0.2470	0.2422	0.2373	0.2131	0.2083	0.1841	0.1841	0.1792	0.1938	0.2083	0.2180	0.2277 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												79.2000 (23c)
Effective ac	0.3510	0.3462	0.3413	0.3171	0.3123	0.2881	0.2881	0.2832	0.2977	0.3123	0.3220	0.3317 (25)

3. Heat losses and heat loss parameter

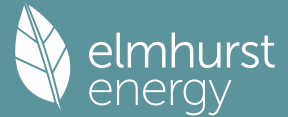
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			22.0200	1.3258	29.1932		(27)
Solid Door			2.1000	1.2000	2.5200		(26)
Floor			39.3700	0.1100	4.3307	75.0000	2952.7500 (28a)
Exposed Floor			1.1100	0.1800	0.1998	0.0000	0.0000 (28b)
External Wall	71.1200	24.1200	47.0000	0.1800	8.4600	60.0000	2820.0000 (29a)
Plane	40.4800		40.4800	0.1000	4.0480	9.0000	364.3200 (30)
Total net area of external elements Aum (A, m ²)			152.0800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	48.7517	(33)
Main dwelling							
Party Wall			143.0200	0.0000	0.0000	45.0000	6435.9000 (32)
B			75.9400			75.0000	5695.5002 (32c)
T			147.3200			9.0000	1325.8801 (32c)
Internal Floor			79.8500			18.0000	1437.3000 (32d)

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Internal Ceiling	79.8500	9.0000	718.6500 (32e)
Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =		
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	21750.3002 (34)		
List of Thermal Bridges	180.7554 (35)		
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	13.5500	0.0240	0.3252
E3 Sill	12.5500	0.0220	0.2761
E4 Jamb	36.0000	0.0170	0.6120
E5 Ground floor (normal)	9.5500	0.0740	0.7067
E6 Intermediate floor within a dwelling	16.1200	0.0010	0.0161
E16 Corner (normal)	2.4500	0.0460	0.1127
E17 Corner (inverted - internal area greater than external area)	2.4500	-0.0880	-0.2156
E10 Eaves (insulation at ceiling level)	8.8000	0.0600	0.5280
E18 Party wall between dwellings	31.4900	0.0330	1.0392
P1 Party wall - Ground floor	17.6500	0.1080	1.9062
P2 Party wall - Intermediate floor within a dwelling	36.0500	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	18.4000	0.1010	1.8584
P8 Party Wall - Exposed floor (inverted)	0.7500	0.1850	0.1387
E20 Exposed floor (normal)	1.4800	0.0690	0.1021
E21 Exposed floor (inverted)	2.2300	0.3200	0.7136
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.1195 (36)		
Point Thermal bridges	(36a) = 0.0000		
Total fabric heat loss	(33) + (36) + (36a) = 56.8711 (37)		
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)			
(38)m	Jan	Feb	Mar
Heat transfer coeff	36.5891	36.0842	35.5793
Average = Sum(39)m / 12 =	30.0257	30.0257	29.5208
	31.0354	32.5501	33.5598
	34.5696	39.4407	89.7999
	93.4602	92.9554	92.4505
	89.9261	89.4212	86.8968
	86.8968	86.3919	87.9066
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	89.4212	90.4310	91.4407
	91.4407	91.4407	89.7999
	93.4602	92.9554	92.4505
	89.9261	89.4212	86.8968
	86.8968	86.3919	87.9066

Full SAP Calculation Printout



[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				7.5000	19.6403	0.6300	0.7000		0.7700		45.0174 (76)	
West				14.5200	19.6403	0.6300	0.7000		0.7700		87.1537 (80)	
Solar gains	132.1711	258.5547	425.8027	621.0079	761.0685	779.0890	741.7245	637.1304	495.2262	306.7969	164.8018	108.6911 (83)
Total gains	823.4784	965.4854	1103.4731	1274.1592	1381.0263	1373.4518	1313.2014	1209.9532	1085.4816	920.6277	816.5369	785.6514 (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	64.6451	64.9963	65.3512	67.1857	67.5651	69.5279	69.5279	69.9342	68.7292	67.5651	66.8106	66.0729
alpha	5.3097	5.3331	5.3567	5.4790	5.5043	5.6352	5.6352	5.6623	5.5819	5.5043	5.4540	5.4049
util living area	0.9839	0.9635	0.9122	0.7720	0.5869	0.4034	0.2910	0.3280	0.5490	0.8505	0.9645	0.9868 (86)
MIT	20.2383	20.4106	20.6285	20.8448	20.9238	20.9430	20.9447	20.9447	20.9344	20.8047	20.5004	20.2265 (87)
Th 2	20.2736	20.2772	20.2809	20.2992	20.3029	20.3213	20.3213	20.3250	20.3139	20.3029	20.2955	20.2882 (88)
util rest of house	0.9805	0.9563	0.8965	0.7413	0.5470	0.3612	0.2462	0.2801	0.4978	0.8201	0.9564	0.9840 (89)
MIT 2	19.3745	19.5935	19.8635	20.1290	20.2137	20.2494	20.2506	20.2545	20.2354	20.0940	19.7235	19.3717 (90)
Living area fraction									fLA = Living area / (4) =			0.1141 (91)
MIT	19.4730	19.6867	19.9508	20.2107	20.2947	20.3285	20.3298	20.3332	20.3152	20.1751	19.8122	19.4692 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4730	19.6867	19.9508	20.2107	20.2947	20.3285	20.3298	20.3332	20.3152	20.1751	19.8122	19.4692 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9758	0.9494	0.8884	0.7372	0.5465	0.3617	0.2467	0.2807	0.4979	0.8140	0.9496	0.9800 (94)
Useful gains	803.5648	916.5876	980.3320	939.3539	754.7075	496.7494	324.0122	339.6154	540.4092	749.3695	775.3977	769.8993 (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	1418.0741	1374.5042	1243.5285	1017.1262	768.5512	497.7924	324.1042	339.7995	546.3528	856.2158	1149.5742	1396.2289 (97)
Space heating kWh	457.1949	307.7199	195.8182	55.9960	10.2997	0.0000	0.0000	0.0000	0.0000	79.4937	269.4071	465.9892 (98a)
Space heating requirement - total per year (kWh/year)												1841.9188
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	457.1949	307.7199	195.8182	55.9960	10.2997	0.0000	0.0000	0.0000	0.0000	79.4937	269.4071	465.9892 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1841.9188
Space heating per m2										(98c) / (4) =		15.3072 (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	457.1949	307.7199	195.8182	55.9960	10.2997	0.0000	0.0000	0.0000	0.0000	79.4937	269.4071	465.9892 (98)
Space heating efficiency (main heating system 1)	219.3000	219.3000	219.3000	219.3000	219.3000	0.0000	0.0000	0.0000	0.0000	219.3000	219.3000	219.3000 (210)
Space heating fuel (main heating system)	208.4792	140.3191	89.2924	25.5340	4.6966	0.0000	0.0000	0.0000	0.0000	36.2488	122.8487	212.4894 (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	338.1328	299.2134	317.7000	278.1967	269.0580	241.7086	237.7044	247.3485	250.3500	280.1006	299.0840	334.2312 (64)
Efficiency of water heater												190.4000 (216)
(217)m	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000 (217)
Fuel for water heating, kWh/month	177.5908	157.1499	166.8592	146.1117	141.3120	126.9478	124.8448	129.9099	131.4863	147.1117	157.0819	175.5416 (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	31.0917	28.0828	31.0917	30.0887	31.0917	30.0887	31.0917	31.0917	30.0887	31.0917	30.0887	31.0917 (231)
Lighting	38.6864	31.0356	27.9442	20.4731	15.8140	12.9202	14.4261	18.7515	24.3564	31.9569	36.0953	39.7616 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-32.0393	-48.6444	-74.5875	-88.3830	-99.9465	-95.1066	-93.9107	-86.1664	-72.8423	-56.9360	-36.1862	-27.2984 (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	-8.0299	-18.2196	-39.2895	-64.2347	-88.5998	-90.2643	-89.0105	-73.6527	-52.3282	-28.5407	-11.3417	-6.2327 (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	839.9083 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	190.4000
Water heating fuel used	1781.9477 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.9500)	
mechanical ventilation fans (SFP = 0.9500)	366.0795 (230a)
Total electricity for the above, kWh/year	366.0795 (231)
Electricity for lighting (calculated in Appendix L)	312.2212 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1381.7915 (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	1918.3652 (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	839.9083	0.1577	132.4820 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1781.9477	0.1410	251.1905 (264)
Space and water heating			383.6725 (265)
Pumps, fans and electric keep-hot	366.0795	0.1387	50.7797 (267)
Energy for lighting	312.2212	0.1443	45.0632 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-812.0474	0.1333	-108.2804
PV Unit electricity exported	-569.7441	0.1239	-70.6145
Total			-178.8949 (269)
Total CO2, kg/year			300.6205 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.5000 (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	839.9083	1.5839	1330.3229 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1781.9477	1.5212	2710.7651 (278)
Space and water heating			4041.0880 (279)
Pumps, fans and electric keep-hot	366.0795	1.5128	553.8051 (281)
Energy for lighting	312.2212	1.5338	478.8953 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-812.0474	1.4927	-1212.1780
PV Unit electricity exported	-569.7441	0.4549	-259.1627
Total			-1471.3407 (283)
Total Primary energy kWh/year			3602.4477 (286)
Dwelling Primary energy Rate (DPER)			29.9400 (287)

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

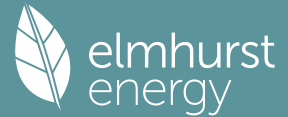
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	39.3700 (1b)	x 2.4500 (2b)	= 96.4565 (1b) - (3b)
First floor	40.4800 (1c)	x 2.7100 (2c)	= 109.7008 (1c) - (3c)
Second floor	40.4800 (1d)	x 2.7100 (2d)	= 109.7008 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.3300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	315.8581 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1266 (8)
Pressure test	Yes
Pressure Test Method	Blower Door

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Measured/design AP50 5.0000 (17)
 Infiltration rate 0.3766 (18)
 Number of sides sheltered 3 (19)

Shelter factor (20) = $1 - [0.075 \times (19)] = 0.7750$ (20)
 Infiltration rate adjusted to include shelter factor (21) = $(18) \times (20) = 0.2919$ (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	0.3722	0.3649	0.3576	0.3211	0.3138	0.2773	0.2773	0.2700	0.2919	0.3138	0.3284	0.3430 (22b)
Effective ac	0.5693	0.5666	0.5639	0.5515	0.5492	0.5384	0.5384	0.5365	0.5426	0.5492	0.5539	0.5588 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			2.1000	1.0000	2.1000		(26)
TER Opening Type			22.0200	1.1450	25.2137		(27)
Floor			39.3700	0.1300	5.1181		(28a)
Exposed Floor			1.1100	0.1300	0.1443		(28b)
External Wall	71.1200	24.1200	47.0000	0.1800	8.4600		(29a)
Plane	40.4800		40.4800	0.1100	4.4528		(30)
Total net area of external elements Aum (A, m2)			152.0800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 45.4889		(33)
Main dwelling							
Party Wall			143.0200	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 180.7554 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	13.5500	0.0500	0.6775
E2 Other lintels (including other steel lintels)	12.5500	0.0500	0.6275
E3 Sill	36.0000	0.0500	1.8000
E4 Jamb	9.5500	0.1600	1.5280
E5 Ground floor (normal)	16.1200	0.0000	0.0000
E6 Intermediate floor within a dwelling	2.4500	0.0900	0.2205
E16 Corner (normal)	2.4500	-0.0900	-0.2205
E17 Corner (inverted - internal area greater than external area)	8.8000	0.0600	0.5280
E10 Eaves (insulation at ceiling level)	31.4900	0.0600	1.8894
E18 Party wall between dwellings	17.6500	0.0800	1.4120
P1 Party wall - Ground floor	36.0500	0.0000	0.0000
P2 Party wall - Intermediate floor within a dwelling	18.4000	0.1200	2.2080
P4 Party wall - Roof (insulation at ceiling level)	0.7500	0.2400	0.1800
P8 Party Wall - Exposed floor (inverted)	1.4800	0.3200	0.4736
E20 Exposed floor (normal)	2.2300	0.3200	0.7136
E21 Exposed floor (inverted)			

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.0376 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 57.5265 (37)

Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)m \times (5)$

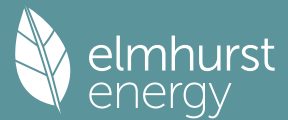
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	59.3351	59.0548	58.7801	57.4896	57.2481	56.1241	56.1241	55.9160	56.5571	57.2481	57.7366	58.2472 (38)
Heat transfer coeff	116.8617	116.5814	116.3066	115.0161	114.7747	113.6507	113.6507	113.4425	114.0836	114.7747	115.2631	115.7738 (39)
Average = Sum(39)m / 12 =												115.0150

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9712	0.9688	0.9666	0.9558	0.9538	0.9445	0.9445	0.9428	0.9481	0.9538	0.9579	0.9621 (40)
HLP (average)												0.9558
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8646 (42)
Hot water usage for mixer showers	72.2494	71.1637	69.5815	66.5543	64.3203	61.8289	60.4128	61.9830	63.7043	66.3792	69.4715	71.9726 (42a)	
Hot water usage for baths	31.1928	30.7296	30.0772	28.8744	27.9737	26.9750	26.4355	27.0833	27.7887	28.8573	30.0849	31.0874 (42b)	
Hot water usage for other uses	43.9662	42.3674	40.7686	39.1699	37.5711	35.9723	35.9723	37.5711	39.1699	40.7686	42.3674	43.9662 (42c)	
Average daily hot water use (litres/day)												135.5015 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	147.4084	144.2606	140.4273	134.5985	129.8650	124.7762	122.8207	126.6375	130.6628	136.0052	141.9238	147.0262 (44)	
Distribution loss (46)m = 0.15 x (45)m	233.4589	205.4252	215.8316	184.2586	174.8233	153.4269	148.5410	156.8036	161.1203	184.5577	202.1965	230.2074 (45)	
Water storage loss (or HIU loss):	35.0188	30.8138	32.3747	27.6388	26.2235	23.0140	22.2811	23.5205	24.1680	27.6837	30.3295	34.5311 (46)	
Store volume												210.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.7016 (48)	
Temperature factor from Table 2b												0.5400 (49)	
Enter (49) or (54) in (55)												0.9188 (55)	
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842 (56)	
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842 (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	285.2055	252.1641	267.5781	234.3360	226.5699	203.5043	200.2876	208.5502	211.1977	236.3043	252.2738	281.9540 (62)	
WWHRS	-33.0294	-29.2115	-30.5886	-25.3286	-23.6053	-20.1992	-18.9336	-20.1339	-20.8989	-24.6375	-27.9113	-32.4178 (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	252.1761	222.9526	236.9896	209.0074	202.9646	183.3051	181.3540	188.4163	190.2988	211.6668	224.3625	249.5363 (64)	
12Total per year (kWh/year)												2553.0300 (64)	
Electric shower(s)												2553 (64)	

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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												
Heat gains from water heating, kWh/month	119.0224	105.6950	113.1613	101.3279	99.5260	91.0763	90.7872	93.5345	93.6344	102.7627	107.2922	117.9412 (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	143.2290	143.2290	143.2290	143.2290	143.2290	143.2290	143.2290	143.2290	143.2290	143.2290	143.2290	143.2290 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	146.7717	162.4972	146.7717	151.6641	146.7717	151.6641	146.7717	146.7717	151.6641	146.7717	151.6641	146.7717 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	285.6422	288.6062	281.1369	265.2355	245.1628	226.2973	213.6941	210.7300	218.1994	234.1007	254.1734	273.0389 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3229	37.3229	37.3229	37.3229	37.3229	37.3229	37.3229	37.3229	37.3229	37.3229	37.3229	37.3229 (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)	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832 (71)
Water heating gains (Table 5)	159.9763	157.2842	152.0985	140.7331	133.7715	126.4949	122.0257	125.7184	130.0478	138.1219	149.0169	158.5232 (72)
Total internal gains	661.3588	677.3563	648.9757	626.6014	594.6747	570.4250	548.4602	549.1888	565.8799	587.9631	623.8231	647.3024 (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	7.5000		19.6403		0.6300		0.7000		0.7700		45.0174 (76)	
West	14.5200		19.6403		0.6300		0.7000		0.7700		87.1537 (80)	
Solar gains	132.1711	258.5547	425.8027	621.0079	761.0685	779.0890	741.7245	637.1304	495.2262	306.7969	164.8018	108.6911 (83)
Total gains	793.5299	935.9110	1074.7785	1247.6093	1355.7432	1349.5141	1290.1847	1186.3192	1061.1061	894.7600	788.6249	755.9935 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	51.7000	51.8243	51.9467	52.5296	52.6401	53.1607	53.1607	53.2583	52.9590	52.6401	52.4170	52.1858
alpha	4.4467	4.4550	4.4631	4.5020	4.5093	4.5440	4.5440	4.5506	4.5306	4.5093	4.4945	4.4791
util living area	0.9891	0.9769	0.9469	0.8599	0.7095	0.5235	0.3844	0.4339	0.6806	0.9142	0.9786	0.9911 (86)
MIT	19.6113	19.8535	20.2031	20.6191	20.8739	20.9750	20.9950	20.9916	20.9222	20.5510	20.0084	19.5736 (87)
Th 2	20.1074	20.1094	20.1113	20.1203	20.1220	20.1298	20.1298	20.1313	20.1268	20.1220	20.1186	20.1150 (88)
util rest of house	0.9865	0.9717	0.9352	0.8318	0.6603	0.4579	0.3099	0.3547	0.6128	0.8898	0.9729	0.9890 (89)
MIT 2	18.4817	18.7895	19.2275	19.7328	20.0124	20.1136	20.1277	20.1274	20.0696	19.6669	18.9949	18.4391 (90)
Living area fraction	18.6106	18.9109	19.3389	19.8339	20.1107	20.2119	20.2267	20.2260	20.1669	19.7678	19.1106	18.5686 (92)
MIT	18.6106	18.9109	19.3389	19.8339	20.1107	20.2119	20.2267	20.2260	20.1669	19.7678	19.1106	18.5686 (93)
Temperature adjustment												0.0000
adjusted MIT	18.6106	18.9109	19.3389	19.8339	20.1107	20.2119	20.2267	20.2260	20.1669	19.7678	19.1106	18.5686 (93)

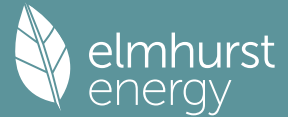
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9806	0.9625	0.9226	0.8215	0.6596	0.4642	0.3183	0.3635	0.6161	0.8780	0.9641	0.9838 (94)
Useful gains	778.1126	900.7926	991.5571	1024.8967	894.2986	626.4538	410.6036	431.1900	653.7927	785.6152	760.2787	743.7741 (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	1672.3616	1633.4140	1493.2445	1257.5801	965.3390	637.7935	412.1769	434.0359	692.1285	1052.2316	1384.3747	1663.5057 (97)
Space heating kWh	665.3212	492.3216	373.2554	167.5321	52.8540	0.0000	0.0000	0.0000	0.0000	198.3626	449.3492	684.2803 (98a)
Space heating requirement - total per year (kWh/year)												3083.2764
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	665.3212	492.3216	373.2554	167.5321	52.8540	0.0000	0.0000	0.0000	0.0000	198.3626	449.3492	684.2803 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3083.2764
Space heating per m2										(98c) / (4) =		25.6235 (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	665.3212	492.3216	373.2554	167.5321	52.8540	0.0000	0.0000	0.0000	0.0000	198.3626	449.3492	684.2803 (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)	720.8247	533.3929	404.3937	181.5082	57.2633	0.0000	0.0000	0.0000	0.0000	214.9107	486.8355	741.3655 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)

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Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	252.1761	222.9526	236.9896	209.0074	202.9646	183.3051	181.3540	188.4163	190.2988	211.6668	224.3625	249.5363 (64)
Efficiency of water heater	86.1301	85.7843	85.0738	83.5684	81.5067	79.8000	79.8000	79.8000	79.8000	83.9144	85.5855	79.8000 (216)
Fuel for water heating, kWh/month	292.7851	259.8990	278.5692	250.1033	249.0157	229.7056	227.2607	236.1107	238.4696	252.2412	262.1502	86.2021 (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	7.0685	7.3041	7.0685	7.3041	7.3041 (231)
Lighting	30.4963	24.4652	22.0282	16.1388	12.4661	10.1849	11.3720	14.7817	19.2000	25.1915	28.4537	31.3438 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-38.8223	-55.7938	-81.7188	-93.6482	-102.4421	-96.0833	-94.8399	-88.7863	-78.3916	-64.5354	-43.0338	-33.4363 (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	-18.8231	-39.9164	-79.9498	-120.9982	-160.9174	-162.0789	-160.2339	-135.2991	-98.6389	-57.4595	-25.2478	-14.8659 (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												3340.4945 (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												3065.7887 (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)												246.1223 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-1945.9608 (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												4792.4445 (238)

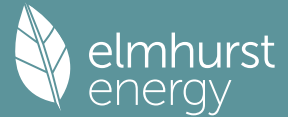
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3340.4945	0.2100	701.5038 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3065.7887	0.2100	643.8156 (264)
Space and water heating			1345.3195 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	246.1223	0.1443	35.5230 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-871.5318	0.1342	-116.9622
PV Unit electricity exported	-1074.4290	0.1257	-135.0156
Total			-251.9778 (269)
Total CO2, kg/year			1140.7940 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.4800 (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	3340.4945	1.1300	3774.7588 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3065.7887	1.1300	3464.3412 (278)
Space and water heating			7239.0999 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	246.1223	1.5338	377.5105 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-871.5318	1.4960	-1303.7856
PV Unit electricity exported	-1074.4290	0.4613	-495.5874
Total			-1799.3730 (283)
Total Primary energy kWh/year			5947.3383 (286)
Target Primary Energy Rate (TPER)			49.4300 (287)

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Plot Reference	23820-C-MS				Issued on Date	07/01/2026		
Assessment Reference	Renewable			Plot Type Ref	EST			
Plot Address	C-MS, Bedford Road, Hitchin, SG5 2TY				SAP Version	10.2		
SAP Rating	87 B		DER	2.50		TER	9.48	
Environmental	98 A		% DER < TER				73.63	
CO ₂ Emissions (t/year)	0.25		DFEE	31.54		TFEE	31.81	
Compliance Check	See BREL		% DFEE < TFEE				0.87	
% DPER < TPER	39.43		DPER	29.94		TPER	49.43	
Assessor Details	Mr. Samuel Marks				Assessor ID	BP82-0001		
Client	23820, Jordon Foux							

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			
Ground floor	39.3700 (1b)	x 2.4500 (2b)	= 96.4565 (1b) - (3b)
First floor	40.4800 (1c)	x 2.7100 (2c)	= 109.7008 (1c) - (3c)
Second floor	40.4800 (1d)	x 2.7100 (2d)	= 109.7008 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.3300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	315.8581 (5)

2. Ventilation rate

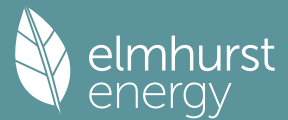
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.2500 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1938 (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	0.2470	0.2422	0.2373	0.2131	0.2083	0.1841	0.1841	0.1792	0.1938	0.2083	0.2180	0.2277 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												79.2000 (23c)
Effective ac	0.3510	0.3462	0.3413	0.3171	0.3123	0.2881	0.2881	0.2832	0.2977	0.3123	0.3220	0.3317 (25)

3. Heat losses and heat loss parameter

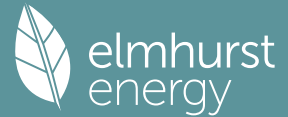
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			22.0200	1.3258	29.1932		(27)
Solid Door			2.1000	1.2000	2.5200		(26)
Floor			39.3700	0.1100	4.3307	75.0000	2952.7500 (28a)
Exposed Floor			1.1100	0.1800	0.1998	0.0000	0.0000 (28b)
External Wall	71.1200	24.1200	47.0000	0.1800	8.4600	60.0000	2820.0000 (29a)
Plane	40.4800		40.4800	0.1000	4.0480	9.0000	364.3200 (30)
Total net area of external elements Aum (A, m ²)			152.0800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	48.7517	(33)
Main dwelling							
Party Wall			143.0200	0.0000	0.0000	45.0000	6435.9000 (32)
B			75.9400			75.0000	5695.5002 (32c)
T			147.3200			9.0000	1325.8801 (32c)
Internal Floor			79.8500			18.0000	1437.3000 (32d)

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Internal Ceiling	79.8500	9.0000	718.6500 (32e)
Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =		
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	21750.3002 (34)		
List of Thermal Bridges	180.7554 (35)		
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	13.5500	0.0240	0.3252
E3 Sill	12.5500	0.0220	0.2761
E4 Jamb	36.0000	0.0170	0.6120
E5 Ground floor (normal)	9.5500	0.0740	0.7067
E6 Intermediate floor within a dwelling	16.1200	0.0010	0.0161
E16 Corner (normal)	2.4500	0.0460	0.1127
E17 Corner (inverted - internal area greater than external area)	2.4500	-0.0880	-0.2156
E10 Eaves (insulation at ceiling level)	8.8000	0.0600	0.5280
E18 Party wall between dwellings	31.4900	0.0330	1.0392
P1 Party wall - Ground floor	17.6500	0.1080	1.9062
P2 Party wall - Intermediate floor within a dwelling	36.0500	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	18.4000	0.1010	1.8584
P8 Party Wall - Exposed floor (inverted)	0.7500	0.1850	0.1387
E20 Exposed floor (normal)	1.4800	0.0690	0.1021
E21 Exposed floor (inverted)	2.2300	0.3200	0.7136
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.1195 (36)		
Point Thermal bridges	(36a) = 0.0000		
Total fabric heat loss	(33) + (36) + (36a) = 56.8711 (37)		
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)			
(38)m	Jan	Feb	Mar
Heat transfer coeff	36.5891	36.0842	35.5793
Average = Sum(39)m / 12 =	30.0257	30.0257	29.5208
	31.0354	32.5501	33.5598
	34.5696	34.5696	34.5696
	35.9233	35.9233	35.9233
	37.5711	37.5711	37.5711
	39.1699	39.1699	39.1699
	40.7686	40.7686	40.7686
	42.3674	42.3674	42.3674
	43.9662	43.9662	43.9662
	45.5650	45.5650	45.5650
	47.1638	47.1638	47.1638
	48.7625	48.7625	48.7625
	50.3613	50.3613	50.3613
	51.9600	51.9600	51.9600
	53.5588	53.5588	53.5588
	55.1575	55.1575	55.1575
	56.7563	56.7563	56.7563
	58.3550	58.3550	58.3550
	59.9538	59.9538	59.9538
	61.5525	61.5525	61.5525
	63.1513	63.1513	63.1513
	64.7500	64.7500	64.7500
	66.3488	66.3488	66.3488
	67.9475	67.9475	67.9475
	69.5463	69.5463	69.5463
	71.1450	71.1450	71.1450
	72.7438	72.7438	72.7438
	74.3425	74.3425	74.3425
	75.9413	75.9413	75.9413
	77.5400	77.5400	77.5400
	79.1388	79.1388	79.1388
	80.7375	80.7375	80.7375
	82.3363	82.3363	82.3363
	83.9350	83.9350	83.9350
	85.5338	85.5338	85.5338
	87.1325	87.1325	87.1325
	88.7313	88.7313	88.7313
	90.3300	90.3300	90.3300
	91.9288	91.9288	91.9288
	93.5275	93.5275	93.5275
	95.1263	95.1263	95.1263
	96.7250	96.7250	96.7250
	98.3238	98.3238	98.3238
	99.9225	99.9225	99.9225
	101.5213	101.5213	101.5213
	103.1200	103.1200	103.1200
	104.7188	104.7188	104.7188
	106.3175	106.3175	106.3175
	107.9163	107.9163	107.9163
	109.5150	109.5150	109.5150
	111.1138	111.1138	111.1138
	112.7125	112.7125	112.7125
	114.3113	114.3113	114.3113
	115.9100	115.9100	115.9100
	117.5088	117.5088	117.5088
	119.1075	119.1075	119.1075
	120.7063	120.7063	120.7063
	122.3050	122.3050	122.3050
	123.9038	123.9038	123.9038
	125.5025	125.5025	125.5025
	127.1013	127.1013	127.1013
	128.7000	128.7000	128.7000
	130.2988	130.2988	130.2988
	131.8975	131.8975	131.8975
	133.4963	133.4963	133.4963
	135.0950	135.0950	135.0950
	136.6938	136.6938	136.6938
	138.2925	138.2925	138.2925
	139.8913	139.8913	139.8913
	141.4900	141.4900	141.4900
	143.0888	143.0888	143.0888
	144.6875	144.6875	144.6875
	146.2863	146.2863	146.2863
	147.8850	147.8850	147.8850
	149.4838	149.4838	149.4838
	151.0825	151.0825	151.0825
	152.6813	152.6813	152.6813
	154.2800	154.2800	154.2800
	155.8788	155.8788	155.8788
	157.4775	157.4775	157.4775
	159.0763	159.0763	159.0763
	160.6750	160.6750	160.6750
	162.2738	162.2738	162.2738
	163.8725	163.8725	163.8725
	165.4713	165.4713	165.4713
	167.0700	167.0700	167.0700
	168.6688	168.6688	168.6688
	170.2675	170.2675	170.2675
	171.8663	171.8663	171.8663
	173.4650	173.4650	173.4650
	175.0638	175.0638	175.0638
	176.6625	176.6625	176.6625
	178.2613	178.2613	178.2613
	179.8600	179.8600	179.8600
	181.4588	181.4588	181.4588
	183.0575	183.0575	183.0575
	184.6563	184.6563	184.6563
	186.2550	186.2550	186.2550
	187.8538	187.8538	187.8538
	189.4525	189.4525	189.4525
	191.0513	191.0513	191.0513
	192.6500	192.6500	192.6500
	194.2488	194.2488	194.2488
	195.8475	195.8475	195.8475
	197.4463	197.4463	197.4463
	199.0450	199.0450	199.0450
	200.6438	200.6438	200.6438
	202.2425	202.2425	202.2425
	203.8413	203.8413	203.8413
	205.4400	205.4400	205.4400
	207.0388	207.0388	207.0388
	208.6375	208.6375	208.6375
	210.2363	210.2363	210.2363
	211.8350	211.8350	211.8350
	213.4338	213.4338	213.4338
	215.0325	215.0325	215.0325
	216.6313	216.6313	216.6313
	218.2300	218.2300	218.2300
	219.8288	219.8288	219.8288
	221.4275	221.4275	221.4275
	223.0263	223.0263	223.0263
	224.6250	224.6250	224.6250
	226.2238	226.2238	226.2238
	227.8225	227.8225	227.8225
	229.4213	229.4213	229.4213
	231.0200	231.0200	231.0200
	232.6188	232.6188	232.6188
	234.2175	234.2175	234.2175
	235.8163	235.8163	235.8163
	237.4150	237.4150	237.4150
	239.0138	239.0138	239.0138
	240.6125	240.6125	240.6125
	242.2113	242.2113	242.2113
	243.8100	243.8100	243.8100
	245.4088	245.4088	245.4088
	247.0075	247.0075	247.0075
	248.6063	248.6063	248.6063
	250.2050	250.2050	250.2050
	251.8038	251.8038	251.8038
	253.4025	253.4025	253.4025
	255.0013	255.0013	255.0013
	256.6000	256.6000	256.6000
	258.1988	258.1988	258.1988
	259.7975	259.7975	259.7975
	261.3963	261.3963	261.3963
	262.9950	262.9950	262.9950
	264.5938	264.5938	264.5938
	266.1925	266.1925	266.1925
	267.7913	267.7913	267.7913
	269.3900	269.3900	269.3900
	270.9888	270.9888	270.9888
	272.5875	272.5875	272.5875
	274.1863	274.1863	274.1863
	275.7850	275.7850	275.7850
	277.3838	277.3838	277.3838
	278.9825	278.9825	278.9825
	280.5813	280.5813	280.5813
	282.1800	282.1800	282.1800
	283.7788	283.7788	283.7788
	285.3775	285.3775	285.3775
	286.9763	286.9763	286.9763
	288.5750	288.5750	288.5750
	290.1738	290.1738	290.1738
	291.7725	291.7725	291.7725
	293.3713	293.3713	293.3713
	294.9700	294.9700	294.9700
	296.5688	296.5688	296.5688
	298.1675	298.1675	298.1675
	299.7663	299.7663	299.7663
	301.3650	301.3650	301.3650
	302.9638	302.9638	302.9638
	304.5625	304.5625	304.5625
	306.1613	306.1613	306.1613
	307.7600	307.7600	307.7600
	309.3588	309.3588	309.3588
	310.9575	310.9575	310.9575
	312.5563	312.5563	312.5563
	314.1550	314.1550	314.1550
	315.7538	315.7538	315.7538
	317.3525	317.3525	317.3525
	318.9513	318.9513	318.9513
	320.5500	320.5500	320.5500
	322.1488	322.1488	322.1488
	323.7475	323.7475	323.7475
	325.3463	325.3463	325.3463
	326.9450	326.9450	326.9450
	328.5438	328.5438	328.5438
	330.1425	330.1425	330.1425
	331.7413	331.7413	331.7413
	333.3400	333.3400	333.3400
	334.9388	334.9388	334.9388
	336.5375	336.5375	336.5375
	338.1363	338.1363	338.1363
	339.7350	339.7350	339.7350
	341.3338	341.3338	341.3338
	342.9325	342.9325	342.9325
	344.5313	344.5313	344.5313
	346.1300	346.1300	346.1300
	347.7288	347.7288	347.7288
	349.3275	349.3275	349.3275
	350.9263	350.9263	350.9263
	352.5250	352.5250	352.5250
	354.1238	354.1238	354.1238
	355.7225	355.7225	355.7225
	357.3213	357.3213	357.3213
	358.9200	358.9200	358.9200
	360.5188	360.5188	360.5188
	362.1175	362.1175	362.1175
	363.7163	363.7163	363.7163
	365.3150	365.3150	365.3150
	366.9138	366.9138	366.9138
	368.5125	368.5125	368.5125
	370.1113	370.1113	370.1113
	371.7100	371.7100	371.7100
	373.3088	373.3088	373.3088
	374.9075	374.9075	374.9075
	376.5063	376.5063	376.5063
	378.1050	378.1050	378.1050
	379.7038	379.7038	379.7038
	381.3025	381.3025	381.3025
	382.9013	382.9013	382.9013
	384.5000	384.5000	384.5000
	386.0988	386.0988	386.0988
	387.6975	387.6975	387.6975
	3		

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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	7.5000				19.6403		0.6300		0.7000		0.7700		45.0174 (76)	
West	14.5200				19.6403		0.6300		0.7000		0.7700		87.1537 (80)	
Solar gains	132.1711	258.5547	425.8027	621.0079	761.0685	779.0890	741.7245	637.1304	495.2262	306.7969	164.8018	108.6911	(83)	
Total gains	823.4784	965.4854	1103.4731	1274.1592	1381.0263	1373.4518	1313.2014	1209.9532	1085.4816	920.6277	816.5369	785.6514	(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	64.6451	64.9963	65.3512	67.1857	67.5651	69.5279	69.5279	69.9342	68.7292	67.5651	66.8106	66.0729		
alpha	5.3097	5.3331	5.3567	5.4790	5.5043	5.6352	5.6352	5.6623	5.5819	5.5043	5.4540	5.4049		
util living area	0.9839	0.9635	0.9122	0.7720	0.5869	0.4034	0.2910	0.3280	0.5490	0.8505	0.9645	0.9868	(86)	
MIT	20.2383	20.4106	20.6285	20.8448	20.9238	20.9430	20.9447	20.9447	20.9344	20.8047	20.5004	20.2265	(87)	
Th 2	20.2736	20.2772	20.2809	20.2992	20.3029	20.3213	20.3213	20.3250	20.3139	20.3029	20.2955	20.2882	(88)	
util rest of house	0.9805	0.9563	0.8965	0.7413	0.5470	0.3612	0.2462	0.2801	0.4978	0.8201	0.9564	0.9840	(89)	
MIT 2	19.3745	19.5935	19.8635	20.1290	20.2137	20.2494	20.2506	20.2545	20.2354	20.0940	19.7235	19.3717	(90)	
Living area fraction	19.4730	19.6867	19.9508	20.2107	20.2947	20.3285	20.3298	20.3332	fLA = Living area / (4) =	20.1751	19.8122	0.1141	(91)	
MIT	19.4730	19.6867	19.9508	20.2107	20.2947	20.3285	20.3298	20.3332	20.3152	20.1751	19.8122	19.4692	(92)	
Temperature adjustment												0.0000		
adjusted MIT	19.4730	19.6867	19.9508	20.2107	20.2947	20.3285	20.3298	20.3332	20.3152	20.1751	19.8122	19.4692	(93)	
8. Space heating requirement														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation	0.9758	0.9494	0.8884	0.7372	0.5465	0.3617	0.2467	0.2807	0.4979	0.8140	0.9496	0.9800	(94)	
Useful gains	803.5648	916.5876	980.3320	939.3539	754.7075	496.7494	324.0122	339.6154	540.4092	749.3695	775.3977	769.8993	(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	1418.0741	1374.5042	1243.5285	1017.1262	768.5512	497.7924	324.1042	339.7995	546.3528	856.2158	1149.5742	1396.2289	(97)	
Space heating kWh	457.1949	307.7199	195.8182	55.9960	10.2997	0.0000	0.0000	0.0000	0.0000	79.4937	269.4071	465.9892	(98a)	
Space heating requirement - total per year (kWh/year)												1841.9188		
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)	
Solar heating contribution - total per year (kWh/year)												0.0000		
Space heating kWh	457.1949	307.7199	195.8182	55.9960	10.2997	0.0000	0.0000	0.0000	0.0000	79.4937	269.4071	465.9892	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1841.9188		
Space heating per m2										(98c) / (4) =		15.3072	(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 %)													219.3000 (206)	
Efficiency of main space heating system 2 (in %)													0.0000 (207)	
Efficiency of secondary/supplementary heating system, %													0.0000 (208)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	457.1949	307.7199	195.8182	55.9960	10.2997	0.0000	0.0000	0.0000	0.0000	79.4937	269.4071	465.9892	(98)	
Space heating efficiency (main heating system 1)	219.3000	219.3000	219.3000	219.3000	219.3000	0.0000	0.0000	0.0000	0.0000	219.3000	219.3000	219.3000	(210)	
Space heating fuel (main heating system)	208.4792	140.3191	89.2924	25.5340	4.6966	0.0000	0.0000	0.0000	0.0000	36.2488	122.8487	212.4894	(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	338.1328	299.2134	317.7000	278.1967	269.0580	241.7086	237.7044	247.3485	250.3500	280.1006	299.0840	334.2312	(64)	
Efficiency of water heater	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	(216)	
Fuel for water heating, kWh/month	177.5908	157.1499	166.8592	146.1117	141.3120	126.9478	124.8448	129.9099	131.4863	147.1117	157.0819	175.5416	(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	31.0917	28.0828	31.0917	30.0887	31.0917	30.0887	31.0917	31.0917	30.0887	31.0917	30.0887	31.0917	(231)	
Lighting	38.6864	31.0356	27.9442	20.4731	15.8140	12.9202	14.4261	18.7515	24.3564	31.9569	36.0953	39.7616	(232)	
Electricity generated by PVs (Appendix M) (negative quantity)														
(233a)m	-32.0393	-48.6444	-74.5875	-88.3830	-99.9465	-95.1066	-93.9107	-86.1664	-72.8423	-56.9360	-36.1862	-27.2984	(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	-8.0299	-18.2196	-39.2895	-64.2347	-88.5998	-90.2643	-89.0105	-73.6527	-52.3282	-28.5407	-11.3417	-6.2327	(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	839.9083 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	190.4000
Water heating fuel used	1781.9477 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.9500)	
mechanical ventilation fans (SFP = 0.9500)	366.0795 (230a)
Total electricity for the above, kWh/year	366.0795 (231)
Electricity for lighting (calculated in Appendix L)	312.2212 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1381.7915 (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	1918.3652 (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	839.9083	0.1577	132.4820 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1781.9477	0.1410	251.1905 (264)
Space and water heating			383.6725 (265)
Pumps, fans and electric keep-hot	366.0795	0.1387	50.7797 (267)
Energy for lighting	312.2212	0.1443	45.0632 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-812.0474	0.1333	-108.2804
PV Unit electricity exported	-569.7441	0.1239	-70.6145
Total			-178.8949 (269)
Total CO2, kg/year			300.6205 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.5000 (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	839.9083	1.5839	1330.3229 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1781.9477	1.5212	2710.7651 (278)
Space and water heating			4041.0880 (279)
Pumps, fans and electric keep-hot	366.0795	1.5128	553.8051 (281)
Energy for lighting	312.2212	1.5338	478.8953 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-812.0474	1.4927	-1212.1780
PV Unit electricity exported	-569.7441	0.4549	-259.1627
Total			-1471.3407 (283)
Total Primary energy kWh/year			3602.4477 (286)
Dwelling Primary energy Rate (DPER)			29.9400 (287)

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

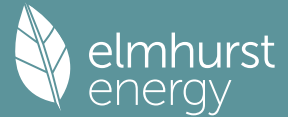
1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	39.3700 (1b)	x 2.4500 (2b)	= 96.4565 (1b) - (3b)
First floor	40.4800 (1c)	x 2.7100 (2c)	= 109.7008 (1c) - (3c)
Second floor	40.4800 (1d)	x 2.7100 (2d)	= 109.7008 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.3300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 315.8581 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1266 (8)
Pressure test	Yes
Pressure Test Method	Blower Door

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Measured/design AP50												5.0000 (17)
Infiltration rate												0.3766 (18)
Number of sides sheltered												3 (19)
Shelter factor												(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) = 0.2919 (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)
Effective ac	0.3722	0.3649	0.3576	0.3211	0.3138	0.2773	0.2773	0.2700	0.2919	0.3138	0.3284	0.3430 (22b)
	0.5693	0.5666	0.5639	0.5515	0.5492	0.5384	0.5384	0.5365	0.5426	0.5492	0.5539	0.5588 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			2.1000	1.0000	2.1000		(26)
TER Opening Type			22.0200	1.1450	25.2137		(27)
Floor			39.3700	0.1300	5.1181		(28a)
Exposed Floor			1.1100	0.1300	0.1443		(28b)
External Wall	71.1200	24.1200	47.0000	0.1800	8.4600		(29a)
Plane	40.4800		40.4800	0.1100	4.4528		(30)
Total net area of external elements Aum (A, m2)			152.0800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 45.4889		(33)
Main dwelling							
Party Wall			143.0200	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 180.7554 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	13.5500	0.0500	0.6775
E3 Sill	12.5500	0.0500	0.6275
E4 Jamb	36.0000	0.0500	1.8000
E5 Ground floor (normal)	9.5500	0.1600	1.5280
E6 Intermediate floor within a dwelling	16.1200	0.0000	0.0000
E16 Corner (normal)	2.4500	0.0900	0.2205
E17 Corner (inverted - internal area greater than external area)	2.4500	-0.0900	-0.2205
E10 Eaves (insulation at ceiling level)	8.8000	0.0600	0.5280
E18 Party wall between dwellings	31.4900	0.0600	1.8894
P1 Party wall - Ground floor	17.6500	0.0800	1.4120
P2 Party wall - Intermediate floor within a dwelling	36.0500	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	18.4000	0.1200	2.2080
P8 Party Wall - Exposed floor (inverted)	0.7500	0.2400	0.1800
E20 Exposed floor (normal)	1.4800	0.3200	0.4736
E21 Exposed floor (inverted)	2.2300	0.3200	0.7136

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.0376 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 57.5265 (37)

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

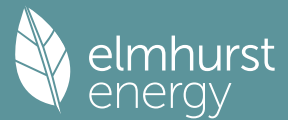
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	59.3351	59.0548	58.7801	57.4896	57.2481	56.1241	56.1241	55.9160	56.5571	57.2481	57.7366	58.2472 (38)
Average = Sum(39)m / 12 =	116.8617	116.5814	116.3066	115.0161	114.7747	113.6507	113.6507	113.4425	114.0836	114.7747	115.2631	115.0150 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9712	0.9688	0.9666	0.9558	0.9538	0.9445	0.9445	0.9428	0.9481	0.9538	0.9579	0.9621 (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													2.8646 (42)
Hot water usage for mixer showers	72.2494	71.1637	69.5815	66.5543	64.3203	61.8289	60.4128	61.9830	63.7043	66.3792	69.4715	71.9726	(42a)
Hot water usage for baths	31.1928	30.7296	30.0772	28.8744	27.9737	26.9750	26.4355	27.0833	27.7887	28.8573	30.0849	31.0874	(42b)
Hot water usage for other uses	43.9662	42.3674	40.7686	39.1699	37.5711	35.9723	35.9723	37.5711	39.1699	40.7686	42.3674	43.9662	(42c)
Average daily hot water use (litres/day)													135.5015 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	147.4084	144.2606	140.4273	134.5985	129.8650	124.7762	122.8207	126.6375	130.6628	136.0052	141.9238	147.0262	(44)
Distribution loss (46)m = 0.15 x (45)m	233.4589	205.4252	215.8316	184.2586	174.8233	153.4269	148.5410	156.8036	161.1203	184.5577	202.1965	230.2074	(45)
Water storage loss (or HIU loss):	35.0188	30.8138	32.3747	27.6388	26.2235	23.0140	22.2811	23.5205	24.1680	27.6837	30.3295	34.5311	(46)
Store volume													210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.7016 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.9188 (55)
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(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	285.2055	252.1641	267.5781	234.3360	226.5699	203.5043	200.2876	208.5502	211.1977	236.3043	252.2738	281.9540	(62)
WWHRS	-33.0294	-29.2115	-30.5886	-25.3286	-23.6053	-20.1992	-18.9336	-20.1339	-20.8989	-24.6375	-27.9113	-32.4178	(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	252.1761	222.9526	236.9896	209.0074	202.9646	183.3051	181.3540	188.4163	190.2988	211.6668	224.3625	249.5363	(64)
12Total per year (kWh/year)													2553.0300 (64)
Electric shower(s)													2553 (64)

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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												
Heat gains from water heating, kWh/month	119.0224	105.6950	113.1613	101.3279	99.5260	91.0763	90.7872	93.5345	93.6344	102.7627	107.2922	117.9412 (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	143.2290	143.2290	143.2290	143.2290	143.2290	143.2290	143.2290	143.2290	143.2290	143.2290	143.2290	143.2290 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	146.7717	162.4972	146.7717	151.6641	146.7717	151.6641	146.7717	146.7717	151.6641	146.7717	151.6641	146.7717 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	285.6422	288.6062	281.1369	265.2355	245.1628	226.2973	213.6941	210.7300	218.1994	234.1007	254.1734	273.0389 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3229	37.3229	37.3229	37.3229	37.3229	37.3229	37.3229	37.3229	37.3229	37.3229	37.3229	37.3229 (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)	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832	-114.5832 (71)
Water heating gains (Table 5)	159.9763	157.2842	152.0985	140.7331	133.7715	126.4949	122.0257	125.7184	130.0478	138.1219	149.0169	158.5232 (72)
Total internal gains	661.3588	677.3563	648.9757	626.6014	594.6747	570.4250	548.4602	549.1888	565.8799	587.9631	623.8231	647.3024 (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	7.5000		19.6403		0.6300		0.7000		0.7700		45.0174 (76)	
West	14.5200		19.6403		0.6300		0.7000		0.7700		87.1537 (80)	
Solar gains	132.1711	258.5547	425.8027	621.0079	761.0685	779.0890	741.7245	637.1304	495.2262	306.7969	164.8018	108.6911 (83)
Total gains	793.5299	935.9110	1074.7785	1247.6093	1355.7432	1349.5141	1290.1847	1186.3192	1061.1061	894.7600	788.6249	755.9935 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	51.7000	51.8243	51.9467	52.5296	52.6401	53.1607	53.1607	53.2583	52.9590	52.6401	52.4170	52.1858
alpha	4.4467	4.4550	4.4631	4.5020	4.5093	4.5440	4.5440	4.5506	4.5306	4.5093	4.4945	4.4791
util living area	0.9891	0.9769	0.9469	0.8599	0.7095	0.5235	0.3844	0.4339	0.6806	0.9142	0.9786	0.9911 (86)
MIT	19.6113	19.8535	20.2031	20.6191	20.8739	20.9750	20.9950	20.9916	20.9222	20.5510	20.0084	19.5736 (87)
Th 2	20.1074	20.1094	20.1113	20.1203	20.1220	20.1298	20.1298	20.1313	20.1268	20.1220	20.1186	20.1150 (88)
util rest of house	0.9865	0.9717	0.9352	0.8318	0.6603	0.4579	0.3099	0.3547	0.6128	0.8898	0.9729	0.9890 (89)
MIT 2	18.4817	18.7895	19.2275	19.7328	20.0124	20.1136	20.1277	20.1274	20.0696	19.6669	18.9949	18.4391 (90)
Living area fraction	18.6106	18.9109	19.3389	19.8339	20.1107	20.2119	20.2267	20.2260	20.1669	19.7678	19.1106	18.5686 (92)
MIT	18.6106	18.9109	19.3389	19.8339	20.1107	20.2119	20.2267	20.2260	20.1669	19.7678	19.1106	18.5686 (93)
Temperature adjustment												0.0000
adjusted MIT	18.6106	18.9109	19.3389	19.8339	20.1107	20.2119	20.2267	20.2260	20.1669	19.7678	19.1106	18.5686 (93)

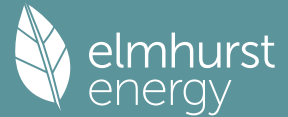
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9806	0.9625	0.9226	0.8215	0.6596	0.4642	0.3183	0.3635	0.6161	0.8780	0.9641	0.9838 (94)
Useful gains	778.1126	900.7926	991.5571	1024.8967	894.2986	626.4538	410.6036	431.1900	653.7927	785.6152	760.2787	743.7741 (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	1672.3616	1633.4140	1493.2445	1257.5801	965.3390	637.7935	412.1769	434.0359	692.1285	1052.2316	1384.3747	1663.5057 (97)
Space heating kWh	665.3212	492.3216	373.2554	167.5321	52.8540	0.0000	0.0000	0.0000	0.0000	198.3626	449.3492	684.2803 (98a)
Space heating requirement - total per year (kWh/year)												3083.2764
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	665.3212	492.3216	373.2554	167.5321	52.8540	0.0000	0.0000	0.0000	0.0000	198.3626	449.3492	684.2803 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3083.2764
Space heating per m2										(98c) / (4) =		25.6235 (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	665.3212	492.3216	373.2554	167.5321	52.8540	0.0000	0.0000	0.0000	0.0000	198.3626	449.3492	684.2803 (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)	720.8247	533.3929	404.3937	181.5082	57.2633	0.0000	0.0000	0.0000	0.0000	214.9107	486.8355	741.3655 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)

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Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	252.1761	222.9526	236.9896	209.0074	202.9646	183.3051	181.3540	188.4163	190.2988	211.6668	224.3625	249.5363 (64)
Efficiency of water heater												79.8000 (216)
(217)m	86.1301	85.7843	85.0738	83.5684	81.5067	79.8000	79.8000	79.8000	79.8000	83.9144	85.5855	86.2021 (217)
Fuel for water heating, kWh/month	292.7851	259.8990	278.5692	250.1033	249.0157	229.7056	227.2607	236.1107	238.4696	252.2412	262.1502	289.4783 (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	7.0685	7.3041	7.0685	7.3041	7.3041 (231)
Lighting	30.4963	24.4652	22.0282	16.1388	12.4661	10.1849	11.3720	14.7817	19.2000	25.1915	28.4537	31.3438 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-38.8223	-55.7938	-81.7188	-93.6482	-102.4421	-96.0833	-94.8399	-88.7863	-78.3916	-64.5354	-43.0338	-33.4363 (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	-18.8231	-39.9164	-79.9498	-120.9982	-160.9174	-162.0789	-160.2339	-135.2991	-98.6389	-57.4595	-25.2478	-14.8659 (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												3340.4945 (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												3065.7887 (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)												246.1223 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-1945.9608 (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												4792.4445 (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	3340.4945	0.2100	701.5038 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3065.7887	0.2100	643.8156 (264)
Space and water heating			1345.3195 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	246.1223	0.1443	35.5230 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-871.5318	0.1342	-116.9622
PV Unit electricity exported	-1074.4290	0.1257	-135.0156
Total			-251.9778 (269)
Total CO2, kg/year			1140.7940 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.4800 (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	3340.4945	1.1300	3774.7588 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3065.7887	1.1300	3464.3412 (278)
Space and water heating			7239.0999 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	246.1223	1.5338	377.5105 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-871.5318	1.4960	-1303.7856
PV Unit electricity exported	-1074.4290	0.4613	-495.5874
Total			-1799.3730 (283)
Total Primary energy kWh/year			5947.3383 (286)
Target Primary Energy Rate (TPER)			49.4300 (287)