

April
2026

LAND PARCELS ADJACENT TO WORSELL DRIVE, COPTHORNE

Energy Statement



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Document revision

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00

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April 2026

Description of changes

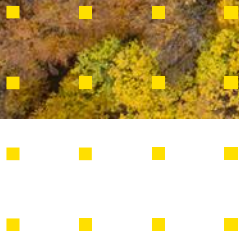
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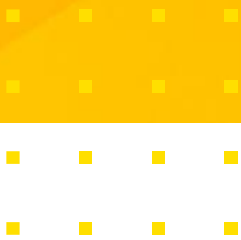
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OBJECTIVES OF THE REPORT

Introduction

Introduction

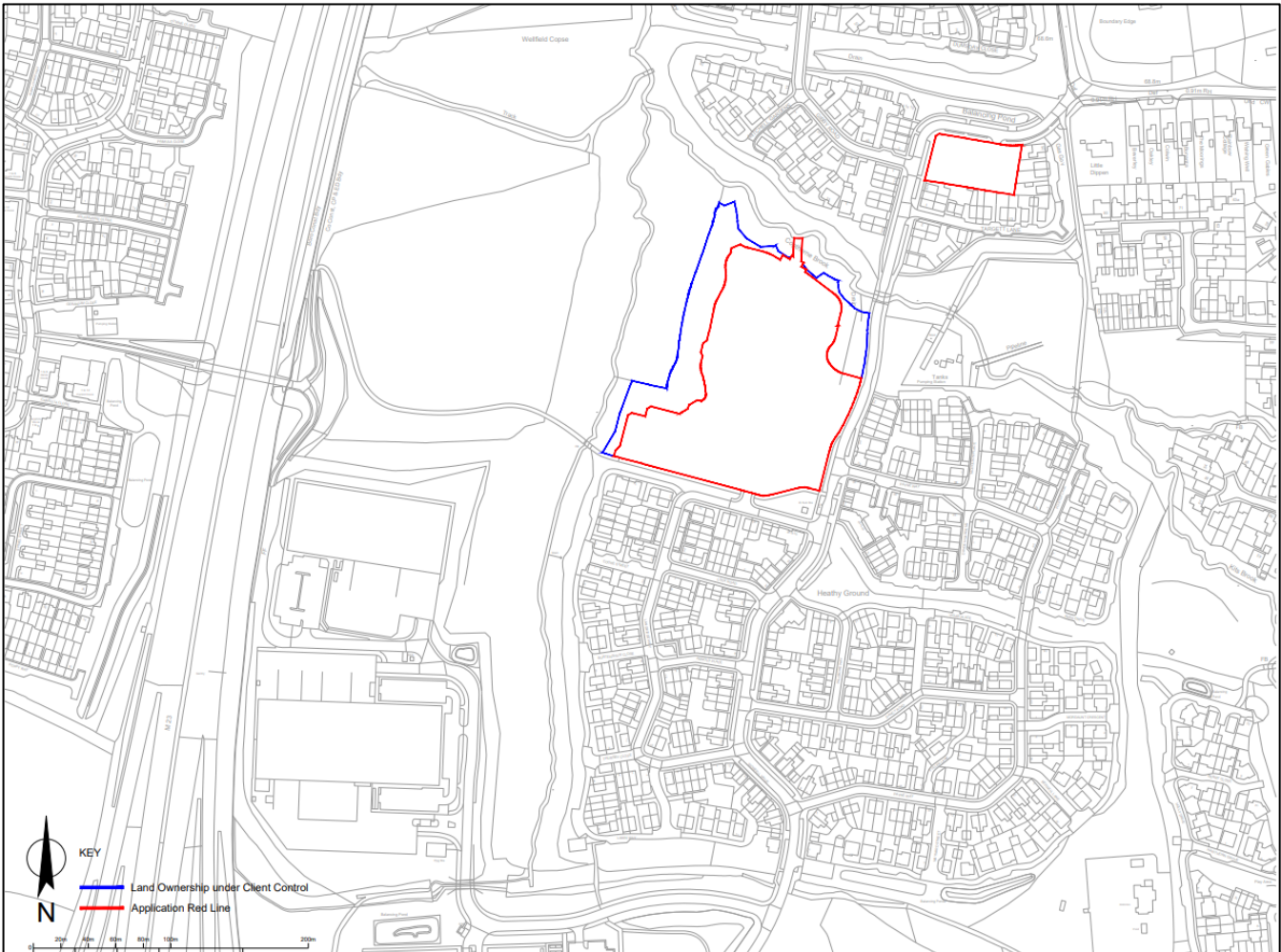
Savills has been appointed by Miller Homes to prepare this Energy Statement in support of a full planning application for two parcels of land adjacent to Worsell Drive, Copthorne. The site is accessed via existing bell-mouth junctions from Worsell Drive and Langridge Way. The proposals comprise the erection of 69 new homes (Use Class C3), including 30% affordable housing, alongside internal access roads, landscaping and associated

infrastructure.

The scheme has been designed to make efficient use of the available land within the established residential context of Heathy Woods. The proposed housing mix includes 1, 2, 3 and 4-bedroom homes, all designed to meet the Nationally Described Space Standard and to provide appropriate private amenity space. Overall, the development has been

sensitively designed to
integrate with its surroundings
while establishing a clear
identity of its own.

Site location plan of the proposed development



Report Objectives

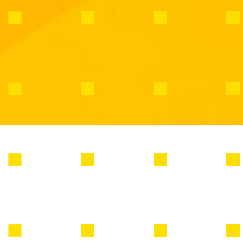
The report will target the following objectives:

- Set out how the proposed development meets current planning and Building Regulations requirements in relation to energy efficiency and operational carbon emissions;
- Review proportionate passive design measures and appropriate active energy strategies, including consideration of low and zero carbon technologies, demonstrating how the scheme seeks to minimise energy demand and make use of renewable generation where feasible; and
- Describe how the layout and building design have taken account of future climate risks, illustrating how the development is intended to respond to and remain resilient to the impacts of climate change over its lifetime.

Proposed site plan



01



OUTLINING PLANNING CONTEXT AND REQUIREMENTS

Planning Context

Planning Context

This section sets out the planning policy framework that underpins the sustainability and energy strategy for the proposed development. It identifies and summarises the key policies at national, county, and local levels that inform the design, construction, and long-term operation of the scheme.

By mapping the proposed development's sustainability commitments against these policies, this section provides a clear and comprehensive overview of how the project meets and, in many cases, exceeds statutory and strategic expectations.

National Policy

National Planning Policy Framework (December 2024)



The NPPF sets out the Government's planning policies for England and how these should be applied. It provides a framework within which locally prepared plans for housing and other development can be produced. At the heart of the NPPF is a presumption in favour of sustainable development. Achieving sustainable development means that the planning system has three overarching objectives, which are interdependent and need to be pursued in mutually supportive ways (so that opportunities can be taken to secure net gains across each of the different objectives).

An economic objective

To help build a strong, responsive and competitive economy, by ensuring that sufficient land of the right types is available in the right places and at the right time to support growth, innovation and improved productivity; and by identifying and coordinating the provision of infrastructure.

A social objective

To support strong, vibrant and healthy communities, by ensuring that a sufficient number and range of homes can be provided to meet the

needs of present and future generations; and by fostering a well-designed and safe built environment, with accessible services and open spaces that reflect current and future needs and support communities' health, social and cultural well-being.

An environmental objective

To contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating adapting to climate change, including moving to a low carbon economy.

This energy statement has been developed in line with the NPPF and alongside the suite of documents submitted as part of this application

National Planning Policy Framework (February 2025)

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An economic objective: To help build a strong, responsive and competitive economy, by ensuring that sufficient land of the right types is available in the right places and at the right time to support growth, innovation and improved productivity; and by identifying and coordinating the provision of infrastructure.

A social objective: To support strong, vibrant and healthy communities, by ensuring that a sufficient number and range of homes can be provided to meet the needs of present and future generations; and by fostering a well-designed and safe built environment, with accessible services and open spaces that reflect current and future needs and support

communities' health, social and cultural well-being.

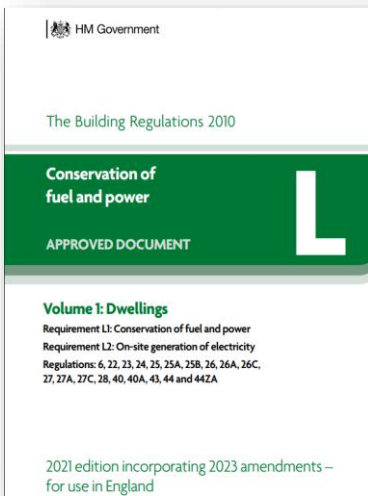
An environmental objective:

To contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.

This sustainability statement has been developed in line with the NPPF and alongside the suite of documents submitted as part of this application.

At the time of writing, revisions to the current NPPF are undergoing consultation, with a final version expected to be published later in 2026.

Building Regulations Approved document Part L1



Part L of the Building Regulations is the mechanism by which the Government is driving reductions in the regulated CO₂ emissions from new buildings. The current version is Part L 2021.

It aims to provide a framework for more sustainable development by introducing more stringent performance targets.

Residential buildings L1

A typical home built to the Part L1 2021 version will have 31% less CO₂ emissions than one built to the previous version.

The current document has key criteria which must be satisfied as follows:

- Energy performance of dwellings calculations to achieve the Target Emission Rate (TER), the Target Fabric Energy Efficiency

Rate (TFEER) and the newly introduced Target Primary Energy Rate (TPER);

- Consideration of high-efficiency alternative systems: feasibility analysis of installing high-efficiency alternative systems such as a decentralised energy supply system based on energy from renewable sources, cogeneration, district heating/cooling and heat pumps;
- Fixed building services energy efficiency and controls and on-Site generation of electricity: system specific minimum efficiencies and design guidance, including BMS and on-Site electricity generation and storage;
- Limiting heat gains and losses: limiting standards on building fabric such as U-values;
- Pressure testing: minimum air permeability standard and demonstrating compliance and commissioning: system specific guidance for commissioning; and
- Providing information: operating and maintenance instructions for the new dwellings.

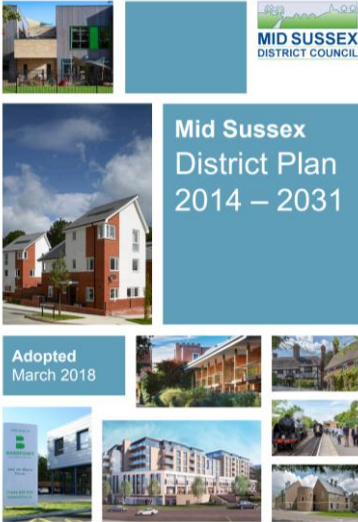
Building Regulations Approved document Part L 2026

The Approved Document Part L 2026 implements the Future Homes and Building Standard, setting out the Government's approach to delivering homes that are net zero carbon ready, with a strong emphasis on low-carbon heating, reduced regulated emissions and improved real-world energy performance. The new regulation was published in March 2026 and will come into force from 2027.

The regulations remain focused on reducing emissions associated with regulated energy use only, not extending to unregulated energy consumption or embodied carbon arising from construction materials and processes.

Local Policy

Mid Sussex District Plan 2014 - 2031 (Adopted March 2018)



Mid Sussex District Council adopted the Mid Sussex District Plan 2014-2031 as a Development Plan Document on 28th March 2018. The adopted District Plan sets the vision and strategy, with accompanying site allocations and policies to achieve the vision and strategy.

Key policies include:

DP39: Sustainable Design and Construction

All development proposals must seek to improve the sustainability of development and should where appropriate and feasible according to the type and size of development and location, incorporate the following measures:

- Minimise energy use through the design and layout of the scheme including through

the use of natural lighting and ventilation;

- Explore opportunities for efficient energy supply through the use of communal heating networks where viable and feasible;
- Use renewable sources of energy;
- Maximise efficient use of resources, including minimising waste and maximising recycling/ re-use of materials through both construction and occupation;
- Limit water use to 110 litres/person/day in accordance with Policy DP42: Water Infrastructure and the Water Environment; and
- Demonstrate how the risks associated with future climate change have been planned for as part of the layout of the scheme and design of its buildings to ensure its longer term resilience.

DP40: Renewable Energy Schemes

Proposals for new renewable and low carbon energy projects, including community-led schemes, will be permitted provided that any adverse local impacts can be made acceptable, with particular regard to:

- Landscape and visual impacts, including cumulative impacts, such as

on the setting of the South Downs National Park and High Weald Area of Outstanding Natural Beauty, and the appearance of existing buildings;

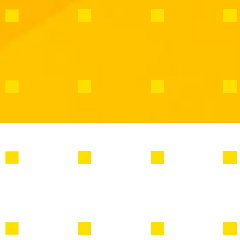
- Ecology and biodiversity, including protected species, and designated and non-designated wildlife sites; and
- Residential amenity including visual intrusion, air, dust, noise, odour, traffic generation, recreation and access. Assessment of impacts will need to be based on the best available evidence, including landscape capacity studies.

Emerging Local Policy - Mid Sussex District Plan 2021 - 2039

The Mid Sussex District Plan Review is the statutory process through which Mid Sussex District Council is updating and replacing the adopted District Plan (2014–2031). The emerging plan, titled Mid Sussex District Plan 2021–2039, will set the planning policy framework for future development across the district, including housing delivery, infrastructure provision, environmental protection and responses to climate change. The review is required under national planning legislation to ensure local planning policies remain up to date, effective, and aligned with the National Planning Policy Framework, reflecting changes in evidence, local circumstances and national policy priorities.

The Submission Draft District Plan was consulted upon at Regulation 19 stage in early 2024 and formally submitted to the Planning Inspectorate in July 2024. The Plan is currently undergoing Examination in Public, during which an independent Inspector is assessing its legal compliance and soundness. Subject to the outcome of the Examination and any necessary consultation on Main Modifications, the Council anticipates adopting the District Plan 2021–2039 by the end of 2026. It should be noted that this policy is emerging and therefore carries limited weight at present.

02



SAP CALCULATIONS

Energy Strategy

SAP Calculations

Policy DP39: Sustainable Design and Construction of the Mid Sussex District Plan requires development proposals to improve sustainability through measures including energy efficiency, efficient use of resources, climate change resilience and reduced environmental impacts.

Policy DP40: Renewable Energy Schemes supports the incorporation of renewable and low-carbon energy technologies where these are appropriate, viable and can be accommodated without unacceptable impacts on landscape, ecology or residential amenity.

In accordance with these policies, the proposed development has been designed to minimise energy demand through an efficient building fabric, careful layout and orientation, and the use of high-performance building elements. Opportunities for low-carbon and renewable energy generation have been assessed with regard to the site context, proposed dwelling types and technical constraints.

The scheme also seeks to optimise resource efficiency, limit potable water consumption in line with Policy DP42: Water Infrastructure and the Water Environment, and incorporate measures to

enhance resilience to the impacts of future climate change. Overall, the development aims to reduce regulated CO₂ emissions as far as is reasonably practicable within the constraints of the proposed house types and delivery model. A sample of representative dwellings has been modelled using SAP to assess energy and carbon performance.

Table 1: Units modelled in SAP

House Type	Modelled unit name	Unit Floor area (m ²)	Representative area (m ²)
2-bed semi-detached house	Denson	70	738
3-bed detached house	Turnely	89	702
3-bed semi-detached house	Birchgate	113	2,640
4-bed detached house	Bramsgate	128	1,181
1-bed apartment	-	52	599
2-bed apartment	-	72	454
Total		524	6,314

Passive design measures

The proposed and limiting fabric performance for the development is presented in Table 2 and 3.

The following passive design features are proposed:

- Improved fabric performance with high levels of envelope insulation, airtight construction and thermal bridges between building elements minimised to prevent heat loss;
- Good form factors indicate efficient use of space with lower surface area, and thereby, lower heat losses;
- Optimised glazing ratios to minimise heat loss in winter, mitigate overheating and reduce cooling demand in summer whilst maximising daylight; and
- Highly efficient double glazing throughout with low-emissivity coatings to balance winter and summer solar gains for optimum performance.

Table 2: Building fabric performance targets

Element	Part L Volume 1 – 2021 Limiting Building Fabric	Proposed Building Fabric
Roof	0.16 W/(m ² K)	0.10 W/(m ² K)
External wall	0.26 W/(m ² K)	0.18 W/(m ² K)
Exposed / ground floor	0.18 W/(m ² K)	0.13 W/(m ² K)
Windows	1.6 W/(m ² K) 0.63 g-value	1.2 W/(m ² K) 0.45 g-value
Door	1.6 W/(m ² K)	1.0 W/(m ² K)
Air permeability	8.0 m ³ /(h.m ²) @50Pa	4.0 m ³ /(h.m ²) @50Pa

Table 3: Proposed thermal bridging

Junction type	Psi Value (W/mK)
E2	0.05
E3	0.04
E4	0.05
E5	0.16
E6	0
E7	0.07
E8	0.02
E9	0.15
E10	0.06
E12	0.2
E14	0.08
E16	0.09
E18	0
E25	0.06
P1	0.16
P2	0
P3	0
P4	0.12
R1	0.15
R2	0.15
R3	0.15
R6	0.12

Energy efficiency measures

The overall design approach for the proposed development seeks to maximise energy efficiency through a high-performance building fabric and the use of simple, robust building services. This approach avoids reliance on complex technologies to achieve carbon emissions compliance and instead focuses on reducing energy demand at source.

Energy efficiency has been prioritised through fabric performance and specification, supported by the following measures designed to minimise operational energy consumption:

- low-power fans to ventilation systems;
- waste water heat recovery; and
- low-energy LED lighting throughout.

Details of the proposed active systems for lighting and ventilation are set out in Tables 4 and 5.

These measures collectively contribute to reduce regulated energy demand across the development and support compliance with Part L 2021 energy efficiency standards.

Table 4: Proposed lighting system performance

Use	Lighting Efficacy (lm/W)	Auto presence detection	Daylight control
All dwellings	100	None	None

Table 5: Building Services summary

Use	System type
Space heating	Smaller plots: Ideal Logic Combi ESP1 Larger plots: Ideal Logic Heat+
Heating controls	Time and temperature zone control with delayed-start thermostats and boiler interlock
Domestic Hot Water	From mains gas heating, 150 litre cylinders with timers and thermostats. Waste Water Heat recovery Water use <=110 litres/person/day
Ventilation	System 3: MEV, Greenwood Unity CV2GIP

Renewable Energy measures

This section considers the use of renewable energy technologies as part of the proposed development. It sets out the low and zero carbon (LZC) technologies identified as suitable for the scheme, alongside an accompanying assessment of their feasibility. Further detail on LZC technologies that were considered but found to be unviable is provided in the LZC matrix included in Appendix A.

Photovoltaic Panels (PVs)

PV panels convert sunlight into usable electricity, at relatively low efficiency of conversion at

around 6-24% (depending on the technology). Despite this low efficiency, their advantages include low maintenance and zero-carbon electricity that offsets grid electricity and hence provides considerable carbon emission savings. PVs operate optimally when installed in a southerly orientation with an inclination of 15°-45°.

It is proposed that PV panels at a 30° inclination are to be installed across all the available roof space to maximise the development's renewable energy generation capability. Electricity generated from the

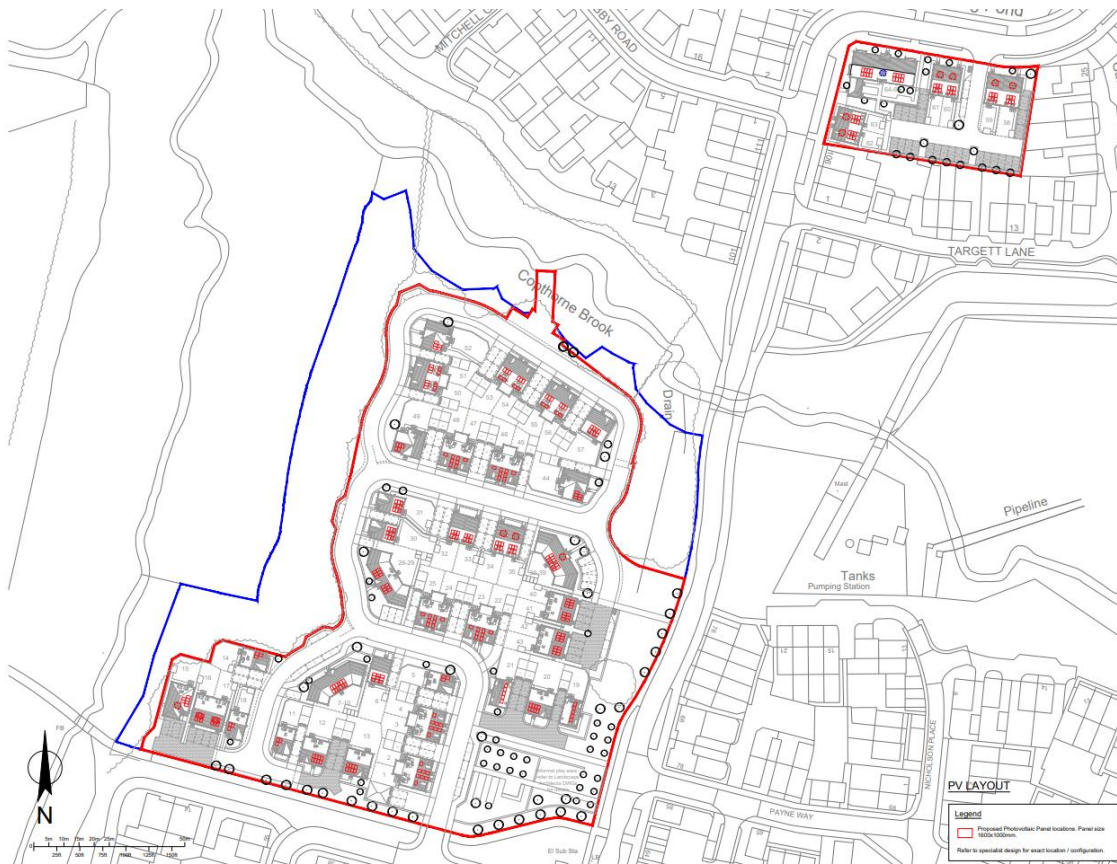
PV system will be directly connected to the dwellings, with surplus electricity exported to the grid via an export-capable meter.

The total site wide installed capacity of the PV array will be approximately 119.3 kWp.

Energy Monitoring

Smart meters will be provided to all dwellings to allow residents to monitor their energy usage in real time.

Proposed PV Layout Plan



Results

This section presents the results of the carbon emissions assessment undertaken for the proposed development, including the baseline Target Emission Rate (TER) and a proposed scenario incorporating photovoltaic (PV) panels. The TER establishes the Building Regulations baseline against which carbon performance and potential reductions are assessed.

Energy modelling has been undertaken using SAP 10.2 for the residential elements of the scheme, in accordance with the latest Building Regulations and associated carbon factors. A representative sample of dwelling types has been modelled, with the results extrapolated across the full development to provide an

accurate assessment of site-wide carbon performance. The modelling is based on design information issued by Roberts Limbrick Architects in December 2025.

The baseline carbon emissions for the development are summarised in Table 6, with the Part L 2021 baseline CO₂ emissions calculated at 89.3 tonnes of CO₂ per year. Two scenarios have been modelled:

- a baseline scenario, representing the Part L 2021 Target Emission Rate; and
- a proposed scenario, incorporating photovoltaic panels maximised at a 30-degree pitch on the south-facing roof elevation.

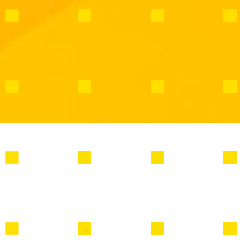
The results of the analysis are

presented in the table below. The combination of an efficient building fabric and on-site renewable energy generation results in a 10.3% reduction in CO₂ emissions compared with the Part L 2021 baseline. Full SAP 10.2 calculations are provided in Appendix B.

Table 6: Carbon emission reductions

Stage	Total emissions (tonnes CO ₂ /yr)	CO ₂ Savings (tonnes CO ₂ /yr)	Percentage Saving over baseline (%)
Baseline	89.3	-	-
Proposed with PV	80.1	9.17	10.3

03



A SUMMARY OF THE ENERGY STRATEGY

Conclusion

Conclusion

This Energy Statement demonstrates how the proposed development at land parcels adjacent to Worsell Drive, Copthorne supports the delivery of sustainable, resilient homes. The strategy integrates relevant national and local planning policy with practical design and construction measures to promote long-term environmental resilience and efficient operation.

The Statement has been prepared with reference to the National Planning Policy Framework (2024) and the Mid Sussex District Plan 2014–2031 (adopted March 2018) and confirms that the proposed development aligns with policies relating to sustainable design, energy efficiency and carbon reduction.

The scheme adopts a fabric-first approach, minimising energy demand through low U-values, reduced air permeability and improved thermal bridging, ensuring compliance with the energy efficiency standards set out in Part L 2021. This is supported by additional energy efficiency measures, including low-energy LED lighting and

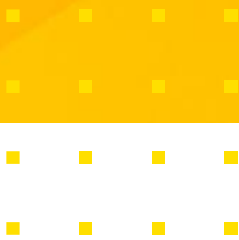
other efficient building services, to further reduce operational energy use.

Opportunities for on-site renewable energy generation have been explored, and the proposed incorporation of roof-mounted photovoltaic panels will reduce site electricity demand and contribute to carbon savings.

The results of the assessment demonstrate that the combination of an efficient building fabric, efficient systems, and on-site renewable energy generation delivers a 10.3% reduction in regulated CO₂ emissions compared with the Part L 2021 baseline.

Appendix

A



APPENDIX A - ENERGY

Low and Zero Carbon technologies

LZC Carbon Feasibility

An options appraisal of the renewable energy generation technologies were considered in the Energy Strategy. The reasons that some technologies have been discounted is detailed below. All technologies will continue to be assessed throughout the design phase.

LZC Carbon Feasibility

Technology	Feasibility	Suitable for use at Land Parcels adjacent to Worsell Drive, Copthorne
Solar water heater	Solar Water heaters are typically installed on roofs, capturing and absorbing solar energy to help reduce buildings hot water demand and offset the cost of electric water heating. Solar thermal technology has not been deemed viable for this development, as it would result in negligible energy and carbon savings. The system’s reliance on solar energy limits its effectiveness to daylight hours. Additionally, solar thermal systems require regular servicing, replacement parts, and careful control optimisation. Hot water storage associated with these systems can also lead to heat loss and contribute to overheating during warmer months. The technology is further constrained by roof orientation requirements. Heat pumps are deemed as an efficient solution to meet hot water demand at the proposed development.	No
Air Source Heat Pumps	Air Source Heat Pumps (ASHPs) are electrically powered systems that can reduce carbon emissions as the national electricity grid decarbonises. However, their feasibility is dependent on a range of site-specific factors, including electrical capacity, space requirements, capital cost and suitability of the building fabric and heat distribution systems. For this development, ASHPs are not proposed as the standard St Modwen house types are not designed to accommodate low-temperature heating systems, and therefore do not support the effective operation of heat pump technology without significant redesign. Instead, high-efficiency gas boilers are considered the most appropriate and viable solution, providing a reliable and space-efficient means of meeting space heating and hot water demand while ensuring compliance with current Building Regulations. This approach avoids the need for fundamental changes to the house type layouts or supporting infrastructure and allows flexibility for future transition to lower-carbon heating technologies should these become viable over time.	No

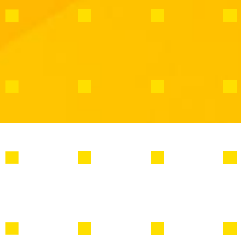
LZC Carbon Feasibility

Technology	Feasibility	Suitable for use at Land at Ripley Avenue / The Crescent
Combined Heat and Power	Combined Heat and Power (CHP) , also known as cogeneration, works simultaneously to generate electricity and useful heat from the same energy source. CHP is not proposed for this development as it would produce significantly higher carbon emissions than ASHP due to the use of gas as a heat source. Additionally, CHP and district heating systems are typically more expensive to operate, offer limited consumer flexibility, and are less effective in meeting carbon reduction targets than decentralised, fabric-first approaches. As such, CHP has been excluded from the proposed energy strategy.	No
Biomass Heating	Biomass heating systems use organic materials such as wood, agricultural residues or crops (wood pellets, chips or logs are common sources) to produce heat through combustion. Biomass has not been proposed for this development due to its environmental and logistical drawbacks. While often considered a carbon-neutral technology, biomass combustion generates significant particulate pollution, making it an unsuitable choice in the context of rising air quality concerns. Additionally, large-scale biomass production can contribute to deforestation and competes with agricultural land that could otherwise be used for food production. The need for regular fuel deliveries also introduces further emissions and traffic impacts, particularly as viable supply chains must be located within a 40-mile radius. Given these limitations, biomass is not considered a sustainable or practical solution for this scheme.	No
Solar Photovoltaics (PV)	Solar Photovoltaics (PV), colloquially known as solar panels, convert sunlight into electricity through the photovoltaic effect creating direct current electricity which is inverted into alternating current electricity to be used in buildings. Solar panels can offer a significant carbon saving as the energy generated can be used to provide electricity within buildings on site, reducing the demand on the system in place further increasing the efficiency of the system. The proposed development includes roof-mounted array, designed to reduce on-site electricity demand and deliver substantial carbon savings.	Yes

LZC Carbon Feasibility

Technology	Feasibility	Suitable for use at Land at Ripley Avenue / The Crescent
Wind Turbines	Wind turbines convert kinetic energy from wind into electrical energy, offering a clean and renewable source of energy. They are seen as a key solution to meeting the UK's decarbonisation plans and are most commonly found offshore due to higher wind speeds and lower visual impacts. This technology has been considered however it has been considered unsuitable for the proposed development due to visual concerns. It also wouldn't provide a consistent enough source of renewable energy in comparison to other technologies such as to meet the demand shortage. Furthermore, there are noise concerns due to the mechanical operation creating a wind vortex via the rotating blades and a potential wildlife impact due to the spinning blades that can pose a threat to local wildlife such as birds and bats. They also require significant upfront CAPEX, large space and maintenance to ensure they operate efficiently and safely.	No
Ground Source Heat Pumps	Ground source heat pumps work by extracting heat from the ground through a series of pipework buried via boreholes. They are typically seen as being more efficient than ASHP as they have a much more consistent source temperature. Ground source heat pumps have also been assessed but are not considered suitable for this development due to significant spatial and technical constraints. Each GSHP system would require up to 400 square metres of trenching or extensive borehole drilling, which would involve costly surveys and potential disruption to existing underground services. Given the high capital expenditure and logistical challenges, GSHPs are not commercially viable for this site and have therefore been excluded from the energy strategy.	No

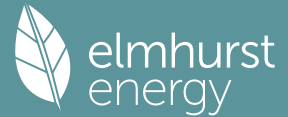
Appendix B



APPENDIX B - SAPS

SAP Worksheets

Full SAP Calculation Printout



Plot Reference	Denson- Be Green				Issued on Date	24/04/2026	
Assessment Reference	00001			Plot Type Ref			
Plot Address					SAP Version	10.2	
SAP Rating	94 A	DER	12.23	TER	14.59		
Environmental	90 B	% DER < TER				16.18	
CO ₂ Emissions (t/year)	0.71	DFEE	41.23	TFEE	48.19		
Compliance Check	See BREL	% DFEE < TFEE				14.44	
% DPER < TPER	16.48	DPER	64.19	TPER	76.86		
Assessor Details	Mr. Stephen Lloyd				Assessor ID	N350-0001	
Client	Miller Homes, Miller Homes						

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	35.2000 (1b)	x 3.0000 (2b)	= 105.6000 (1b) - (3b)
First floor	35.2000 (1c)	x 3.0000 (2c)	= 105.6000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.2000 (5)

2. Ventilation rate

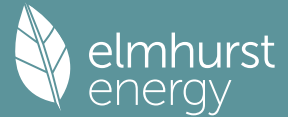
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1850 (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	0.2359	0.2313	0.2266	0.2035	0.1989	0.1758	0.1758	0.1711	0.1850	0.1989	0.2081	0.2174 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			7.1000	1.1450	8.1298		(27)
Door			4.4000	1.0000	4.4000		(26)
Heatloss Floor 1			35.2000	0.1300	4.5760	110.0000	3872.0000 (28a)
External Wall	102.5000	11.5000	91.0000	0.1800	16.3800	190.0000	17290.0000 (29a)
Roof	52.4000		52.4000	0.1000	5.2400	9.0000	471.6000 (30)
Total net area of external elements Aum(A, m ²)			190.1000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 38.7258		(33)
Main dwelling							
Party Wall			58.5000	0.0000	0.0000	110.0000	6435.0000 (32)
Internal Floor 1			35.2000			18.0000	633.6000 (32d)
Internal Ceiling 1			35.2000			9.0000	316.8000 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 29019.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							412.2017 (35)
Thermal bridges (User defined value 0.000 * total exposed area)							0.0000 (36)
Point Thermal bridges							(36a) = 0.0000
Total fabric heat loss							(33) + (36) + (36a) = 38.7258 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.8480	34.8480	34.8480	34.8480	34.8480	34.8480	34.8480	34.8480	34.8480	34.8480	34.8480	34.8480	(38)
Heat transfer coeff	73.5738	73.5738	73.5738	73.5738	73.5738	73.5738	73.5738	73.5738	73.5738	73.5738	73.5738	73.5738	(39)
Average = Sum(39)m / 12 =													73.5738

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0451	1.0451	1.0451	1.0451	1.0451	1.0451	1.0451	1.0451	1.0451	1.0451	1.0451	1.0451	(40)
HLP (average)													1.0451
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2558 (42)
Hot water usage for mixer showers													
69.7972	68.7483	67.2198	64.2953	62.1371	59.7304	58.3624	59.8793	61.5421	64.1262	67.1135	69.5298	69.5298	(42a)
Hot water usage for baths													
26.8033	26.4052	25.8447	24.8111	24.0372	23.1790	22.7155	23.2721	23.8782	24.7964	25.8513	26.7127	26.7127	(42b)
Hot water usage for other uses													
37.7316	36.3596	34.9875	33.6154	32.2434	30.8713	30.8713	32.2434	33.6154	34.9875	36.3596	37.7316	37.7316	(42c)
Average daily hot water use (litres/day)													123.5030 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	134.3321	131.5131	128.0520	122.7219	118.4177	113.7807	111.9491	115.3947	119.0357	123.9102	129.3244	133.9741	(44)
Energy conte	212.7492	187.2728	196.8111	168.0001	159.4130	139.9066	135.3928	142.8828	146.7829	168.1449	184.2463	209.7710	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m	31.9124	28.0909	29.5217	25.2000	23.9119	20.9860	20.3089	21.4324	22.0174	25.2217	27.6369	31.4656	(46)
Water storage loss (or HIU loss):													
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6000 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8640 (55)
Total storage loss													
26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	(56)
If cylinder contains dedicated solar storage													
26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	(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													
262.7956	232.4760	246.8575	216.4321	209.4594	188.3386	185.4392	192.9292	195.2149	218.1913	232.6783	259.8174	259.8174	(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	-35.7431	-31.3560	-32.3583	-24.2161	-16.8835	-12.2420	-12.0535	-12.5404	-12.6890	-22.4431	-30.7957	-35.5387	(63d) eq. (G6)
Output from w/h	227.0525	201.1200	214.4992	192.2160	192.5759	176.0966	173.3856		180.3888	182.5259	195.7482	201.8826	(64)
12Total per year (kWh/year)													2361.7701 (64)
Electric shower(s)													2362 (64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)
Heat gains from water heating, kWh/month													
110.7762	98.4308	105.4768	94.6056	93.0419	85.2646	85.0552	87.5456	87.5509	95.9453	100.0075	109.7860	109.7860	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
118.9195	131.6609	118.9195	122.8835	118.9195	122.8835	118.9195	118.9195	122.8835	118.9195	122.8835	118.9195	118.9195	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
198.2288	200.2858	195.1023	184.0671	170.1371	157.0450	148.2986	146.2416	151.4251	162.4603	176.3903	189.4825	189.4825	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	(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)													
-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	(71)
Water heating gains (Table 5)													
148.8928	146.4744	141.7699	131.3967	125.0564	118.4230	114.3215	117.6689	121.5985	128.9587	138.8993	147.5618	147.5618	(72)
Total internal gains	525.8781	538.2580	515.6286	498.1842	473.9500	455.1884	438.3766	439.6669	452.7441	470.1755	498.0100	515.8007	(73)

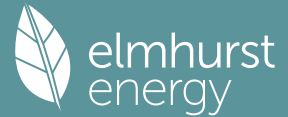
6. Solar gains

[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
Southeast				3.7000	36.7938		0.4500		0.6000		0.7700		25.4726 (77)
Southwest				2.9000	36.7938		0.4500		0.6000		0.7700		19.9650 (79)
Northwest				0.5000	11.2829		0.4500		0.6000		0.7700		1.0556 (81)
Solar gains	46.4932	79.5458	109.7693	137.5706	155.5153	155.0174	149.1925	135.7091	119.3824	88.1662	55.7520		39.7472 (83)
Total gains	572.3713	617.8038	625.3980	635.7548	629.4653	610.2058	587.5691	575.3761	572.1265	558.3417	553.7620		555.5479 (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	109.5612	109.5612	109.5612	109.5612	109.5612	109.5612	109.5612	109.5612	109.5612	109.5612	109.5612	109.5612	
alpha	8.3041	8.3041	8.3041	8.3041	8.3041	8.3041	8.3041	8.3041	8.3041	8.3041	8.3041	8.3041	
util living area	0.9991	0.9978	0.9951	0.9817	0.9258	0.7492	0.5492	0.5852	0.8321	0.9791	0.9972	0.9993	(86)

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MIT	20.3304	20.4209	20.5469	20.7288	20.8966	20.9860	20.9989	20.9983	20.9678	20.7773	20.5204	20.3059 (87)
Th 2	20.0459	20.0459	20.0459	20.0459	20.0459	20.0459	20.0459	20.0459	20.0459	20.0459	20.0459	20.0459 (88)
util rest of house												
	0.9985	0.9967	0.9921	0.9701	0.8811	0.6496	0.4313	0.4658	0.7435	0.9633	0.9953	0.9989 (89)
MIT 2	19.2782	19.3938	19.5539	19.7800	19.9682	20.0404	20.0458	20.0456	20.0301	19.8404	19.5210	19.2469 (90)
Living area fraction									fLA =	Living area / (4) =		0.3949 (91)
MIT	19.6937	19.7994	19.9460	20.1546	20.3348	20.4138	20.4222	20.4218	20.4004	20.2104	19.9157	19.6651 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.5437	19.6494	19.7960	20.0046	20.1848	20.2638	20.2722	20.2718	20.2504	20.0604	19.7657	19.5151 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9982	0.9960	0.9911	0.9694	0.8888	0.6735	0.4594	0.4944	0.7643	0.9636	0.9946	0.9986 (94)
Useful gains	571.3182	615.3164	619.8169	616.3012	559.4548	410.9755	269.9442	284.4425	437.3030	538.0175	550.7555	554.7537 (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	1121.5382	1085.1678	978.2394	817.0101	624.2606	416.7056	270.1746	284.8623	452.5086	696.0355	931.8617	1126.7878 (97)
Space heating kWh	409.3636	315.7402	266.6663	144.5104	48.2155	0.0000	0.0000	0.0000	0.0000	117.5654	274.3965	425.5934 (98a)
Space heating requirement - total per year (kWh/year)												2002.0514
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	409.3636	315.7402	266.6663	144.5104	48.2155	0.0000	0.0000	0.0000	0.0000	117.5654	274.3965	425.5934 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2002.0514
Space heating per m2										(98c) / (4) =		28.4382 (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 %)												89.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	409.3636	315.7402	266.6663	144.5104	48.2155	0.0000	0.0000	0.0000	0.0000	117.5654	274.3965	425.5934 (98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000 (210)
Space heating fuel (main heating system)	459.9592	354.7642	299.6251	162.3713	54.1748	0.0000	0.0000	0.0000	0.0000	132.0960	308.3106	478.1948 (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	227.0525	201.1200	214.4992	192.2160	192.5759	176.0966	173.3856	180.3888	182.5259	195.7482	201.8826	224.2787 (64)
Efficiency of water heater (217)m	85.5657	85.2673	84.7497	83.6294	81.6534	80.0000	80.0000	80.0000	80.0000	83.1553	84.9491	85.6737 (217)
Fuel for water heating, kWh/month	265.3546	235.8699	253.0974	229.8426	235.8456	220.1208	216.7320	225.4860	228.1574	235.4008	237.6512	261.7824 (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	22.9920	18.4450	16.6077	12.1675	9.3985	7.6787	8.5737	11.1444	14.4754	18.9925	21.4520	23.6310 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-33.1190	-47.8072	-70.4043	-80.2741	-86.8193	-81.0683	-79.9922	-75.3586	-66.8646	-55.2292	-36.6996	-28.4179 (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	-18.4563	-40.6085	-85.4057	-134.4707	-182.4021	-184.9217	-181.9548	-151.1271	-106.5541	-59.3189	-24.9641	-14.3992 (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												2249.4960 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.0000
Water heating fuel used												2845.3406 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												86.0000 (231)
Electricity for lighting (calculated in Appendix L)												185.5585 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-1926.6375 (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												3439.7575 (238)

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

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	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2249.4960	0.2100	472.3942 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2845.3406	0.2100	597.5215 (264)
Space and water heating			1069.9157 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	185.5585	0.1443	26.7818 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-742.0543	0.1343	-99.6487
PV Unit electricity exported	-1184.5833	0.1247	-147.7418
Total			-247.3905 (269)
Total CO2, kg/year			861.2363 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.2300 (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	2249.4960	1.1300	2541.9305 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2845.3406	1.1300	3215.2349 (278)
Space and water heating			5757.1654 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	185.5585	1.5338	284.6158 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-742.0543	1.4963	-1110.3290
PV Unit electricity exported	-1184.5833	0.4578	-542.2548
Total			-1652.5838 (283)
Total Primary energy kWh/year			4519.2982 (286)
Dwelling Primary energy Rate (DPER)			64.1900 (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	35.2000 (1b)	x 3.0000 (2b)	= 105.6000 (1b) - (3b)
First floor	35.2000 (1c)	x 3.0000 (2c)	= 105.6000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.2000 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1420 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3920 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3626 (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	0.4624	0.4533	0.4442	0.3989	0.3898	0.3445	0.3445	0.3354	0.3626	0.3898	0.4080	0.4261 (22b)
Effective ac	0.6069	0.6027	0.5987	0.5796	0.5760	0.5593	0.5593	0.5563	0.5658	0.5760	0.5832	0.5908 (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			4.4000	1.0000	4.4000		(26)
TER Opening Type			7.1000	1.1450	8.1298		(27)
Heatloss Floor 1			35.2000	0.1300	4.5760		(28a)
External Wall	102.5000	11.5000	91.0000	0.1800	16.3800		(29a)
Roof	52.4000		52.4000	0.1100	5.7640		(30)
Total net area of external elements Aum(A, m2)			190.1000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	39.2498	(33)

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Main dwelling												
Party Wall	58.5000	0.0000	0.0000									(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												412.2017 (35)
List of Thermal Bridges												
K1 Element												
E2 Other lintels (including other steel lintels)												
E4 Jamb												
E3 Sill												
E18 Party wall between dwellings												
E16 Corner (normal)												
P4 Party wall - Roof (insulation at ceiling level)												
E10 Eaves (insulation at ceiling level)												
E12 Gable (insulation at ceiling level)												
E5 Ground floor (normal)												
P1 Party wall - Ground floor												
E6 Intermediate floor within a dwelling												
P2 Party wall - Intermediate floor within a dwelling												
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												9.5870 (36)
Point Thermal bridges												0.0000
Total fabric heat loss												(33) + (36) + (36a) = 48.8368 (37)

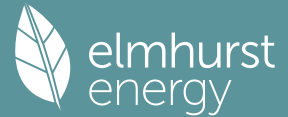
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	42.2980	42.0087	41.7251	40.3932	40.1440	38.9840	38.9840	38.7692	39.4308	40.1440	40.6481	41.1752 (38)
Average = Sum(39)m / 12 =	91.1347	90.8454	90.5619	89.2300	88.9808	87.8208	87.8208	87.6060	88.2676	88.9808	89.4849	90.0119 (39)
	91.1347	90.8454	90.5619	89.2300	88.9808	87.8208	87.8208	87.6060	88.2676	88.9808	89.4849	90.0119 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2945	1.2904	1.2864	1.2675	1.2639	1.2475	1.2475	1.2444	1.2538	1.2639	1.2711	1.2786 (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												2.2558 (42)
Hot water usage for mixer showers												
Hot water usage for baths												
Hot water usage for other uses												
Average daily hot water use (litres/day)												
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	126.5768	123.8744	120.5831	115.5779	111.5136	107.1440	105.4644	108.7415	112.1977	116.7850	121.8673	126.2485 (44)
Energy content (annual)	200.4668	176.3954	185.3317	158.2204	150.1187	131.7460	127.5501	134.6447	138.3510	158.4762	173.6223	197.6747 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss (or HIU loss):												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												
If cylinder contains dedicated solar storage												
Primary loss												
Combi loss												
Total heat required for water heating calculated for each month												
WWHRS												
PV diverter												
Solar input												
FGHRS												
Output from w/h												
12Total per year (kWh/year)												
Electric shower(s)												
Heat gains from water heating, kWh/month												

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
Pumps, fans												
Losses e.g. evaporation (negative values) (Table 5)												
Water heating gains (Table 5)												
Total internal gains												

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

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Southeast			3.7000		36.7938		0.6300		0.7000		0.7700		41.6053 (77)
Southwest			2.9000		36.7938		0.6300		0.7000		0.7700		32.6096 (79)
Northwest			0.5000		11.2829		0.6300		0.7000		0.7700		1.7241 (81)

Solar gains	75.9390	129.9248	179.2899	224.6986	254.0083	253.1951	243.6811	221.6582	194.9913	144.0047	91.0617	64.9204 (83)
Total gains	588.9445	655.0239	682.4049	710.8607	716.4212	697.1091	671.1693	650.2601	636.3356	602.4758	576.6596	567.9318 (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	88.4496	88.7313	89.0091	90.3377	90.5907	91.7873	91.7873	92.0124	91.3227	90.5907	90.0804	89.5529
alpha	6.8966	6.9154	6.9339	7.0225	7.0394	7.1192	7.1192	7.1342	7.0882	7.0394	7.0054	6.9702
util living area	0.9991	0.9979	0.9948	0.9812	0.9291	0.7654	0.5709	0.6118	0.8563	0.9824	0.9975	0.9993 (86)
MIT	20.0765	20.1993	20.3719	20.6207	20.8393	20.9717	20.9968	20.9949	20.9362	20.6689	20.3367	20.0637 (87)
Th 2	19.8451	19.8483	19.8515	19.8664	19.8692	19.8822	19.8822	19.8846	19.8772	19.8692	19.8635	19.8577 (88)
util rest of house	0.9986	0.9966	0.9917	0.9686	0.8819	0.6527	0.4289	0.4683	0.7616	0.9679	0.9959	0.9989 (89)
MIT 2	18.7933	18.9528	19.1750	19.4971	19.7480	19.8709	19.8817	19.8837	19.8449	19.5613	19.1407	18.7867 (90)
Living area fraction									fLA = Living area / (4) =			0.3949 (91)
MIT	19.3001	19.4450	19.6477	19.9408	20.1789	20.3056	20.3220	20.3225	20.2759	19.9987	19.6130	19.2910 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3001	19.4450	19.6477	19.9408	20.1789	20.3056	20.3220	20.3225	20.2759	19.9987	19.6130	19.2910 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9983	0.9960	0.9909	0.9696	0.8971	0.6981	0.4855	0.5258	0.7992	0.9701	0.9953	0.9987 (94)
Useful gains	587.9358	652.4353	676.1915	689.2767	642.6676	486.6531	325.8685	341.9117	508.5704	584.4387	573.9686	567.1736 (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	1367.0258	1321.3491	1190.6769	985.1696	754.4628	501.0693	326.8716	343.6333	545.1296	836.3026	1119.7243	1358.3712 (97)
Space heating kWh	579.6430	449.5100	382.7771	213.0429	83.1756	0.0000	0.0000	0.0000	0.0000	187.3867	392.9441	588.6510 (98a)
Space heating requirement - total per year (kWh/year)												2877.1306
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	579.6430	449.5100	382.7771	213.0429	83.1756	0.0000	0.0000	0.0000	0.0000	187.3867	392.9441	588.6510 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2877.1306
Space heating per m2										(98c) / (4) =		40.8683 (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	579.6430	449.5100	382.7771	213.0429	83.1756	0.0000	0.0000	0.0000	0.0000	187.3867	392.9441	588.6510 (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)	627.9989	487.0098	414.7098	230.8157	90.1144	0.0000	0.0000	0.0000	0.0000	203.0192	425.7249	637.7584 (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	218.6987	193.3967	205.6596	181.5621	176.4433	159.4924	157.8864	163.9502	165.4965	183.9144	194.7462	216.4318 (64)
Efficiency of water heater (217)m	86.1387	85.8862	85.4325	84.4193	82.4781	79.8000	79.8000	79.8000	79.8000	84.1018	85.6008	79.8000 (216)
Fuel for water heating, kWh/month	253.8914	225.1779	240.7277	215.0719	213.9274	199.8652	197.8526	205.4514	207.3891	218.6808	227.5051	251.1193 (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	23.9461	19.2105	17.2969	12.6725	9.7886	7.9973	8.9295	11.6068	15.0761	19.7807	22.3423	24.6117 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-33.1280	-46.7894	-67.3658	-75.8675	-81.9152	-76.5104	-75.6013	-71.3579	-63.8270	-53.6148	-36.4667	-28.6340 (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	-18.4117	-38.7834	-77.1792	-116.0440	-153.5497	-154.3077	-152.4555	-128.9927	-94.4528	-55.4586	-24.5826	-14.5521 (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												3117.1512 (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												2656.6596 (219)
Space cooling fuel												0.0000 (221)

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Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	193.2590 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1739.8482 (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	4313.2216 (238)

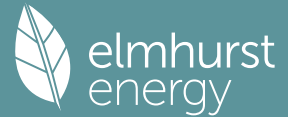
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3117.1512	0.2100	654.6018 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2656.6596	0.2100	557.8985 (264)
Space and water heating			1212.5003 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	193.2590	0.1443	27.8932 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-711.0780	0.1345	-95.6724
PV Unit electricity exported	-1028.7702	0.1259	-129.4897
Total			-225.1621 (269)
Total CO2, kg/year			1027.1607 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.5900 (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	3117.1512	1.1300	3522.3809 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2656.6596	1.1300	3002.0254 (278)
Space and water heating			6524.4062 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	193.2590	1.5338	296.4271 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-711.0780	1.4973	-1064.6654
PV Unit electricity exported	-1028.7702	0.4620	-475.3154
Total			-1539.9807 (283)
Total Primary energy kWh/year			5410.9534 (286)
Target Primary Energy Rate (TPER)			76.8600 (287)

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Plot Reference	Bramsgate- Be Green				Issued on Date	24/04/2026	
Assessment Reference	00001			Plot Type Ref			
Plot Address					SAP Version	10.2	
SAP Rating	93 A	DER	11.96	TER	12.83		
Environmental	89 B	% DER < TER				6.78	
CO ₂ Emissions (t/year)	1.25	DFEE	48.12	TFEE	52.51		
Compliance Check	See BREL	% DFEE < TFEE				8.36	
% DPER < TPER	6.99	DPER	62.79	TPER	67.51		
Assessor Details	Mr. Stephen Lloyd				Assessor ID	N350-0001	
Client	Miller Homes, Miller Homes						

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	64.0000 (1b)	x 3.0000 (2b)	= 192.0000 (1b) - (3b)
First floor	64.0000 (1c)	x 3.0000 (2c)	= 192.0000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	128.0000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 384.0000 (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	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2000 (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	0.2550	0.2500	0.2450	0.2200	0.2150	0.1900	0.1900	0.1850	0.2000	0.2150	0.2250	0.2350 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5050	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			18.6000	1.1450	21.2977		(27)
Glazed Door			3.8000	1.0000	3.8000		(26a)
Door			2.0000	1.0000	2.0000		(26)
Heatloss Floor 1			64.0000	0.1300	8.3200	110.0000	7040.0000 (28a)
External Wall	194.2000	24.4000	169.8000	0.1800	30.5640	190.0000	32262.0000 (29a)
Roof	97.1000		97.1000	0.1000	9.7100	9.0000	873.9000 (30)
Total net area of external elements Aum(A, m ²)			355.3000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	75.6917		(33)
Main dwelling							
Internal Floor 1			64.0000			18.0000	1152.0000 (32d)
Internal Ceiling 1			64.0000			9.0000	576.0000 (32e)
Heat capacity Cm = Sum (A x k)							(28)...(30) + (32) + (32a)...(32e) = 41903.9000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							327.3742 (35)
Thermal bridges (User defined value 0.000 * total exposed area)							0.0000 (36)
Point Thermal bridges							(36a) = 0.0000
Total fabric heat loss							(33) + (36) + (36a) = 75.6917 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	63.9936	63.3600	63.3600	63.3600	63.3600	63.3600	63.3600	63.3600	63.3600	63.3600	63.3600	63.3600	(38)
Heat transfer coeff	139.6853	139.0517	139.0517	139.0517	139.0517	139.0517	139.0517	139.0517	139.0517	139.0517	139.0517	139.0517	(39)
Average = Sum(39)m / 12 =													139.1045

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0913	1.0863	1.0863	1.0863	1.0863	1.0863	1.0863	1.0863	1.0863	1.0863	1.0863	1.0863	(40)
HLP (average)													1.0868
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8896 (42)
Hot water usage for mixer showers												
81.7528	80.5242	78.7339	75.3085	72.7806	69.9616	68.3592	70.1360	72.0836	75.1104	78.6094	81.4395 (42a)	
Hot water usage for baths												
31.3733	30.9074	30.2512	29.0414	28.1356	27.1311	26.5885	27.2401	27.9495	29.0243	30.2590	31.2673 (42b)	
Hot water usage for other uses												
44.2225	42.6144	41.0063	39.3982	37.7901	36.1821	36.1821	37.7901	39.3982	41.0063	42.6144	44.2225 (42c)	
Average daily hot water use (litres/day)												144.6636 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
157.3486	154.0460	149.9915	143.7482	138.7063	133.2747	131.1298	135.1662	139.4313	145.1411	151.4828	156.9293 (44)	
Energy conte	249.2017	219.3594	230.5313	196.7841	186.7254	163.8768	158.5901	167.3640	171.9328	196.9550	215.8151	245.7134 (45)
Energy content (annual)										Total = Sum (45)m =		2402.8490
Distribution loss (46)m = 0.15 x (45)m												
37.3803	32.9039	34.5797	29.5176	28.0088	24.5815	23.7885	25.1046	25.7899	29.5433	32.3723	36.8570 (46)	
Water storage loss (or HIU loss):												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8640 (55)
Total storage loss												
26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (56)	
If cylinder contains dedicated solar storage												
26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)	
Total heat required for water heating calculated for each month												
299.2481	264.5626	280.5777	245.2161	236.7718	212.3088	208.6365	217.4104	220.3648	247.0014	264.2471	295.7598 (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	-45.9649	-39.6955	-40.4713	-33.4830	-28.2470	-13.8001	-13.5614	-14.1317	-14.3237	-33.2847	-38.6997	-45.7467 (63d)
Output from w/h												eq. (G6)
253.2832	224.8672	240.1064	211.7330	208.5248	198.5087	195.0752	203.2787	206.0411	213.7167	225.5474	250.0130 (64)	
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2630.6954 (64)
Electric shower(s)												2631 (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												
122.8967	109.0996	116.6888	104.1763	102.1233	93.2346	92.7683	95.6856	95.9132	105.5247	110.5041	121.7368 (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	144.4806	144.4806	144.4806	144.4806	144.4806	144.4806	144.4806	144.4806	144.4806	144.4806	144.4806	144.4806 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	163.9605	181.5277	163.9605	169.4259	163.9605	169.4259	163.9605	163.9605	169.4259	163.9605	169.4259	163.9605 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.2936	298.3578	290.6360	274.1974	253.4465	233.9436	220.9145	217.8502	225.5720	242.0107	262.7615	282.2644 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4481	37.4481	37.4481	37.4481	37.4481	37.4481	37.4481	37.4481	37.4481	37.4481	37.4481	37.4481 (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)	-115.5845	-115.5845	-115.5845	-115.5845	-115.5845	-115.5845	-115.5845	-115.5845	-115.5845	-115.5845	-115.5845	-115.5845 (71)
Water heating gains (Table 5)	165.1837	162.3505	156.8397	144.6893	137.2625	129.4926	124.6886	128.6097	133.2128	141.8342	153.4779	163.6247 (72)
Total internal gains	693.7820	711.5802	680.7805	657.6567	624.0137	599.2062	575.9078	576.7647	594.5549	617.1496	655.0095	679.1939 (73)

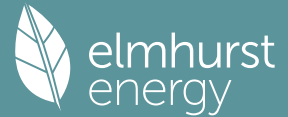
6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d	Gains W			
Northeast				1.4000	11.2829	0.4500	0.6000		0.7700	2.9556 (75)			
Southwest				11.4000	36.7938	0.4500	0.6000		0.7700	78.4832 (79)			
Northwest				5.8000	11.2829	0.4500	0.6000		0.7700	12.2447 (81)			
Solar gains	93.6835	164.6266	238.6602	318.1901	376.9169	383.2162	365.7055	320.5129	265.9846	185.5634	113.1307	79.5786	(83)
Total gains	787.4655	876.2068	919.4407	975.8468	1000.9306	982.4224	941.6133	897.2776	860.5395	802.7130	768.1402	758.7725	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nll,m (see Table 9a)													
Jan	83.3300	83.7097	83.7097	83.7097	83.7097	83.7097	83.7097	83.7097	83.7097	83.7097	83.7097	83.7097	
alpha	6.5553	6.5806	6.5806	6.5806	6.5806	6.5806	6.5806	6.5806	6.5806	6.5806	6.5806	6.5806	
util living area	0.9995	0.9987	0.9969	0.9882	0.9511	0.8215	0.6359	0.6890	0.9103	0.9906	0.9986	0.9996	(86)

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MIT	19.9510	20.0738	20.2531	20.5122	20.7683	20.9437	20.9911	20.9854	20.8804	20.5579	20.2083	19.9285 (87)
Th 2	20.0080	20.0120	20.0120	20.0120	20.0120	20.0120	20.0120	20.0120	20.0120	20.0120	20.0120	20.0120 (88)
util rest of house	0.9992	0.9982	0.9953	0.9815	0.9217	0.7303	0.5011	0.5543	0.8474	0.9841	0.9979	0.9994 (89)
MIT 2	18.7824	18.9429	19.1721	19.5001	19.8087	19.9814	20.0097	20.0077	19.9311	19.5599	19.1153	18.7567 (90)
Living area fraction									fLA =	Living area / (4) =		0.3242 (91)
MIT	19.1612	19.3096	19.5226	19.8283	20.1198	20.2934	20.3279	20.3247	20.2389	19.8834	19.4696	19.1366 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.0112	19.1596	19.3726	19.6783	19.9698	20.1434	20.1779	20.1747	20.0889	19.7334	19.3196	18.9866 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9989	0.9974	0.9939	0.9784	0.9201	0.7439	0.5246	0.5777	0.8534	0.9815	0.9970	0.9991 (94)
Useful gains	786.5620	873.9359	913.8257	954.8123	920.9662	730.8109	493.9634	518.3751	734.4003	787.8272	765.8690	758.0943 (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	2054.9440	1982.8151	1789.9580	1498.7368	1149.9342	770.8180	497.5165	524.8801	832.7632	1270.0215	1699.1607	2056.1064 (97)
Space heating kWh	943.6762	745.1668	651.8424	391.6257	170.3522	0.0000	0.0000	0.0000	0.0000	358.7526	671.9700	965.7210 (98a)
Space heating requirement - total per year (kWh/year)												4899.1071
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	943.6762	745.1668	651.8424	391.6257	170.3522	0.0000	0.0000	0.0000	0.0000	358.7526	671.9700	965.7210 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4899.1071
Space heating per m2										(98c) / (4) =		38.2743 (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 %)												89.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	943.6762	745.1668	651.8424	391.6257	170.3522	0.0000	0.0000	0.0000	0.0000	358.7526	671.9700	965.7210 (98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000 (210)
Space heating fuel (main heating system)	1060.3104	837.2661	732.4072	440.0288	191.4070	0.0000	0.0000	0.0000	0.0000	403.0928	755.0225	1085.0798 (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	253.2832	224.8672	240.1064	211.7330	208.5248	198.5087	195.0752	203.2787	206.0411	213.7167	225.5474	250.0130 (64)
Efficiency of water heater (217)m	86.9306	86.7380	86.3839	85.6198	83.8107	80.0000	80.0000	80.0000	80.0000	85.4128	86.5530	86.9875 (217)
Fuel for water heating, kWh/month	291.3627	259.2489	277.9527	247.2944	248.8045	248.1359	243.8440	254.0984	257.5513	250.2164	260.5887	287.4126 (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	31.7002	25.4311	22.8979	16.7760	12.9583	10.5870	11.8210	15.3653	19.9580	26.1860	29.5770	32.5813 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-44.9270	-65.3017	-96.8453	-111.1959	-120.8354	-112.9257	-111.2884	-104.4664	-92.2302	-75.6194	-49.8907	-38.4897 (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	-23.8401	-52.5859	-110.9014	-175.1306	-238.1265	-241.7276	-237.9742	-197.5146	-138.9948	-77.1115	-32.3276	-18.5999 (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												5504.6147 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.0000
Water heating fuel used												3126.5104 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												86.0000 (231)
Electricity for lighting (calculated in Appendix L)												255.8391 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2568.8500 (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												6404.1141 (238)

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

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	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	5504.6147	0.2100	1155.9691 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3126.5104	0.2100	656.5672 (264)
Space and water heating			1812.5363 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	255.8391	0.1443	36.9255 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1024.0156	0.1342	-137.3879
PV Unit electricity exported	-1544.8344	0.1246	-192.5290
Total			-329.9169 (269)
Total CO2, kg/year			1531.4741 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.9600 (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	5504.6147	1.1300	6220.2146 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3126.5104	1.1300	3532.9567 (278)
Space and water heating			9753.1713 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	255.8391	1.5338	392.4146 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1024.0156	1.4958	-1531.7577
PV Unit electricity exported	-1544.8344	0.4574	-706.6272
Total			-2238.3849 (283)
Total Primary energy kWh/year			8037.3018 (286)
Dwelling Primary energy Rate (DPER)			62.7900 (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	64.0000 (1b)	x 3.0000 (2b)	= 192.0000 (1b) - (3b)
First floor	64.0000 (1c)	x 3.0000 (2c)	= 192.0000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	128.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)... (3n) =	384.0000 (5)

2. Ventilation rate

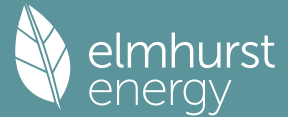
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1042 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3542 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3542 (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	0.4516	0.4427	0.4339	0.3896	0.3807	0.3365	0.3365	0.3276	0.3542	0.3807	0.3984	0.4161 (22b)
Effective ac	0.6020	0.5980	0.5941	0.5759	0.5725	0.5566	0.5566	0.5537	0.5627	0.5725	0.5794	0.5866 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
TER Opaque door			2.0000	1.0000	2.0000		(26)
TER Semi-glazed door			3.8000	1.0000	3.8000		(26a)
TER Opening Type			18.6000	1.1450	21.2977		(27)
Heatloss Floor 1			64.0000	0.1300	8.3200		(28a)
External Wall	194.2000	24.4000	169.8000	0.1800	30.5640		(29a)
Roof	97.1000		97.1000	0.1100	10.6810		(30)
Total net area of external elements Aum(A, m ²)			355.3000				(31)

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Fabric heat loss, $W/K = \text{Sum}(A \times U)$ (26)...(30) + (32) = 76.6627 (33)

Thermal mass parameter (TMP = C_m / TFA) in $\text{kJ/m}^2\text{K}$ 327.3742 (35)

List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	17.0000	0.0500	0.8500
E4 Jamb	34.5000	0.0500	1.7250
E3 Sill	17.0000	0.0500	0.8500
E16 Corner (normal)	24.0000	0.0900	2.1600
E10 Eaves (insulation at ceiling level)	17.6000	0.0600	1.0560
E12 Gable (insulation at ceiling level)	6.0000	0.0600	0.3600
E5 Ground floor (normal)	32.0000	0.1600	5.1200
E6 Intermediate floor within a dwelling	31.3000	0.0000	0.0000
E13 Gable (insulation at rafter level)	14.0000	0.0800	1.1200
R7 Flat ceiling (inverted)	10.5000	0.0400	0.4200
R9 Roof to wall (flat ceiling)	5.0000	0.0400	0.2000
R4 Ridge (vaulted ceiling)	3.0000	0.0800	0.2400
Thermal bridges (Sum($L \times \text{Psi}$) calculated using Appendix K)			14.1010 (36)
Point Thermal bridges			0.0000 (36a) =
Total fabric heat loss		(33) + (36) + (36a) =	90.7637 (37)

Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)\text{m} \times (5)$												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	76.2797	75.7780	75.2862	72.9765	72.5443	70.5326	70.5326	70.1601	71.3075	72.5443	73.4186	74.3325 (38)
Average = $\text{Sum}(39)\text{m} / 12 =$	167.0434	166.5417	166.0499	163.7402	163.3080	161.2963	161.2963	160.9238	162.0712	163.3080	164.1823	165.0962 (39)
												163.7381
HLP	1.3050	1.3011	1.2973	1.2792	1.2758	1.2601	1.2601	1.2572	1.2662	1.2758	1.2827	1.2898 (40)
HLP (average)												1.2792
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8896 (42)
Hot water usage for mixer showers	72.6691	71.5770	69.9857	66.9409	64.6939	62.1881	60.7638	62.3431	64.0743	66.7648	69.8750	72.3907 (42a)	
Hot water usage for baths	31.3733	30.9074	30.2512	29.0414	28.1356	27.1311	26.5885	27.2401	27.9495	29.0243	30.2590	31.2673 (42b)	
Hot water usage for other uses	44.2225	42.6144	41.0063	39.3982	37.7901	36.1821	36.1821	37.7901	39.3982	41.0063	42.6144	44.2225 (42c)	
Average daily hot water use (litres/day)												136.2888 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	148.2650	145.0988	141.2432	135.3806	130.6196	125.5012	123.5343	127.3733	131.4220	136.7954	142.7485	147.8805 (44)	
Distribution loss (46)m = 0.15 x (45)m	234.8154	206.6188	217.0856	185.3292	175.8391	154.3184	149.4041	157.7148	162.0565	185.6301	203.3713	231.5451 (45)	
Water storage loss (or HIU loss):	35.2223	30.9928	32.5628	27.7994	26.3759	23.1478	22.4106	23.6572	24.3085	27.8445	30.5057	34.7318 (46)	
Store volume												150.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)	
Temperature factor from Table 2b												0.5400 (49)	
Enter (49) or (54) in (55)												0.7527 (55)	
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)	
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (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	281.4103	248.7045	263.6805	230.4211	222.4340	199.4102	195.9990	204.3097	207.1484	232.2250	248.4632	278.1400 (62)	
WWHRS	-33.2213	-29.3812	-30.7663	-25.4757	-23.7424	-20.3166	-19.0435	-20.2509	-21.0203	-24.7806	-28.0734	-32.6061 (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	248.1891	219.3234	232.9142	204.9454	198.6916	179.0937	176.9554	184.0588	186.1281	207.4444	220.3897	245.5339 (64)	
12Total per year (kWh/year)												2503.6675 (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	115.3521	102.3693	109.4569	97.6954	95.7424	87.3843	86.9528	89.7161	89.9573	98.9979	103.6944	114.2647 (65)	

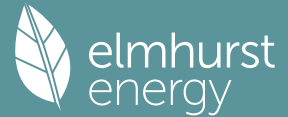
5. Internal gains (see Table 5 and 5a)

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	144.4806	144.4806	144.4806	144.4806	144.4806	144.4806	144.4806	144.4806	144.4806	144.4806	144.4806	144.4806 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	158.5079	175.4909	158.5079	163.7915	158.5079	163.7915	158.5079	158.5079	163.7915	158.5079	163.7915	158.5079 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	295.2936	298.3578	290.6360	274.1974	253.4465	233.9436	220.9145	217.8502	225.5720	242.0107	262.7615	282.2644 (68)
Pumps, fans	37.4481	37.4481	37.4481	37.4481	37.4481	37.4481	37.4481	37.4481	37.4481	37.4481	37.4481	37.4481 (69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Water heating gains (Table 5)	-115.5845	-115.5845	-115.5845	-115.5845	-115.5845	-115.5845	-115.5845	-115.5845	-115.5845	-115.5845	-115.5845	-115.5845 (71)
Total internal gains	155.0431	152.3353	147.1195	135.6881	128.6860	121.3671	116.8720	120.5861	124.9406	133.0617	144.0201	153.5815 (72)
	678.1887	695.5282	665.6076	643.0212	609.9846	585.4464	562.6386	563.2884	580.6483	602.9245	639.9173	663.6980 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
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Northeast			1.4000		11.2829		0.6300		0.7000		0.7700		4.8275 (75)
Southwest			11.4000		36.7938		0.6300		0.7000		0.7700		128.1893 (79)
Northwest			5.8000		11.2829		0.6300		0.7000		0.7700		19.9996 (81)

Solar gains	153.0164	268.8901	389.8116	519.7105	615.6309	625.9197	597.3190	523.5045	434.4415	303.0869	184.7802	129.9784 (83)
Total gains	831.2052	964.4183	1055.4192	1162.7317	1225.6155	1211.3661	1159.9575	1086.7929	1015.0898	906.0114	824.6975	793.6765 (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	69.6823	69.8922	70.0992	71.0881	71.2762	72.1651	72.1651	72.3322	71.8201	71.2762	70.8966	70.5042	
alpha	5.6455	5.6595	5.6733	5.7392	5.7517	5.8110	5.8110	5.8221	5.7880	5.7517	5.7264	5.7003	
util living area	0.9992	0.9980	0.9948	0.9801	0.9265	0.7772	0.5977	0.6561	0.8906	0.9873	0.9981	0.9994 (86)	
MIT	19.7111	19.8685	20.1057	20.4442	20.7468	20.9399	20.9891	20.9820	20.8583	20.4688	20.0370	19.6942 (87)	
Th 2	19.8369	19.8400	19.8430	19.8571	19.8598	19.8722	19.8722	19.8745	19.8674	19.8598	19.8544	19.8488 (88)	
util rest of house	0.9989	0.9971	0.9921	0.9691	0.8851	0.6726	0.4524	0.5092	0.8153	0.9783	0.9971	0.9992 (89)	
MIT 2	18.3468	18.5505	18.8554	19.2917	19.6497	19.8419	19.8697	19.8696	19.7765	19.3292	18.7773	18.3339 (90)	
Living area fraction									fLA = Living area / (4) =				0.3242 (91)
MIT	18.7891	18.9778	19.2608	19.6654	20.0054	20.1979	20.2326	20.2303	20.1272	19.6987	19.1857	18.7749 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.7891	18.9778	19.2608	19.6654	20.0054	20.1979	20.2326	20.2303	20.1272	19.6987	19.1857	18.7749 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9984	0.9961	0.9903	0.9667	0.8914	0.7056	0.5004	0.5579	0.8358	0.9765	0.9962	0.9988 (94)	
Useful gains	829.8962	960.6866	1045.1634	1124.0530	1092.5381	854.7308	580.3945	606.3503	848.4288	884.7117	821.5304	792.7209 (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	2420.3103	2344.5482	2118.9239	1762.7228	1356.3402	902.9221	585.9276	616.3818	976.8404	1485.8890	1984.2625	2406.2642 (97)	
Space heating kWh	1183.2681	929.9550	798.8778	459.8423	196.2688	0.0000	0.0000	0.0000	0.0000	447.2759	837.1671	1200.4762 (98a)	
Space heating requirement - total per year (kWh/year)												6053.1311	
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	1183.2681	929.9550	798.8778	459.8423	196.2688	0.0000	0.0000	0.0000	0.0000	447.2759	837.1671	1200.4762 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												6053.1311	
Space heating per m2										(98c) / (4) =		47.2901 (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	1183.2681	929.9550	798.8778	459.8423	196.2688	0.0000	0.0000	0.0000	0.0000	447.2759	837.1671	1200.4762 (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)	1281.9806	1007.5352	865.5231	498.2040	212.6422	0.0000	0.0000	0.0000	0.0000	484.5892	907.0066	1300.6243 (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	248.1891	219.3234	232.9142	204.9454	198.6916	179.0937	176.9554	184.0588	186.1281	207.4444	220.3897	245.5339 (64)	
Efficiency of water heater (217)m	87.0969	86.9290	86.5954	85.8162	84.0323	79.8000	79.8000	79.8000	79.8000	85.7363	86.7608	79.8000 (216)	
Fuel for water heating, kWh/month	284.9575	252.3016	268.9685	238.8189	236.4467	224.4281	221.7487	230.6501	233.2432	241.9564	254.0198	281.7973 (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	32.9348	26.4215	23.7897	17.4293	13.4629	10.9993	12.2813	15.9637	20.7353	27.2058	30.7289	33.8502 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-56.9622	-78.8457	-111.2577	-122.6704	-130.1906	-120.6842	-119.0981	-113.3982	-103.1086	-88.9279	-62.0653	-49.4123 (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	-36.7464	-76.7412	-151.5513	-226.2595	-297.9275	-298.9851	-295.5507	-250.8758	-184.6728	-109.3874	-48.9335	-29.1081 (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												6558.1052 (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												2969.3368 (219)	
Space cooling fuel												0.0000 (221)	

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Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	265.8028 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-3163.3603 (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	6715.8844 (238)

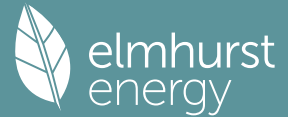
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	6558.1052	0.2100	1377.2021 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2969.3368	0.2100	623.5607 (264)
Space and water heating			2000.7628 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	265.8028	0.1443	38.3636 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1156.6212	0.1350	-156.1517
PV Unit electricity exported	-2006.7392	0.1261	-252.9830
Total			-409.1347 (269)
Total CO2, kg/year			1641.9209 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.8300 (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	6558.1052	1.1300	7410.6588 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2969.3368	1.1300	3355.3506 (278)
Space and water heating			10766.0094 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	265.8028	1.5338	407.6972 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1156.6212	1.4990	-1733.7587
PV Unit electricity exported	-2006.7392	0.4628	-928.6359
Total			-2662.3946 (283)
Total Primary energy kWh/year			8641.4128 (286)
Target Primary Energy Rate (TPER)			67.5100 (287)

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Plot Reference	2 Bed Flat - Be Green				Issued on Date	24/04/2026	
Assessment Reference	00001			Plot Type Ref			
Plot Address					SAP Version	10.2	
SAP Rating	90 B	DER	12.42	TER	13.71		
Environmental	90 B	% DER < TER				9.41	
CO ₂ Emissions (t/year)	0.75	DFEE	37.16	TFEE	42.52		
Compliance Check	See BREL	% DFEE < TFEE				12.61	
% DPER < TPER	8.79	DPER	65.65	TPER	71.98		
Assessor Details	Mr. Stephen Lloyd				Assessor ID	N350-0001	
Client	Miller Homes, Miller Homes						

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	72.4000 (1b)	2.9000 (2b)	209.9600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.4000		209.9600 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	209.9600 (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)

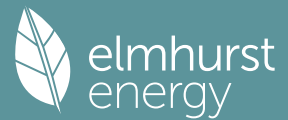
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	4.0000	(17)
Infiltration rate	0.2000	(18)
Number of sides sheltered	1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1850 (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	0.2359	0.2313	0.2266	0.2035	0.1989	0.1758	0.1758	0.1711	0.1850	0.1989	0.2081	0.2174 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			10.5000	1.1450	12.0229		(27)
External Wall	88.4000	10.5000	77.9000	0.1800	14.0220	190.0000	14801.0000 (29a)
Roof	103.4000		103.4000	0.1000	10.3400	9.0000	930.6000 (30)
Total net area of external elements Aum(A, m ²)			191.8000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	36.3849	(33)
Main dwelling							
Party Wall			25.4000	0.0000	0.0000	110.0000	2794.0000 (32)
Party Floor			72.4000			80.0000	5792.0000 (32d)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		24317.6000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							335.8785 (35)
Thermal bridges (User defined value 0.000 * total exposed area)							0.0000 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	36.3849 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							

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(38)m	Jan 34.6434	Feb 34.6434	Mar 34.6434	Apr 34.6434	May 34.6434	Jun 34.6434	Jul 34.6434	Aug 34.6434	Sep 34.6434	Oct 34.6434	Nov 34.6434	Dec 34.6434	(38)
Heat transfer coeff	71.0283	71.0283	71.0283	71.0283	71.0283	71.0283	71.0283	71.0283	71.0283	71.0283	71.0283	71.0283	(39)
Average = Sum(39)m / 12 =												71.0283	
HLP	0.9811	0.9811	0.9811	0.9811	0.9811	0.9811	0.9811	0.9811	0.9811	0.9811	0.9811	0.9811	(40)
HLP (average)												0.9811	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.3030	(42)
Hot water usage for mixer showers	70.6867	69.6244	68.0764	65.1147	62.9290	60.4916	59.1061	60.6424	62.3264	64.9435	67.9688	70.4159	(42a)	
Hot water usage for baths	27.1433	26.7402	26.1725	25.1258	24.3421	23.4730	23.0036	23.5673	24.1811	25.1110	26.1792	27.0515	(42b)	
Hot water usage for other uses	38.2145	36.8249	35.4353	34.0457	32.6561	31.2664	31.2664	32.6561	34.0457	35.4353	36.8249	38.2145	(42c)	
Average daily hot water use (litres/day)												125.0774	(43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use	136.0445	133.1895	129.6843	124.2862	119.9272	115.2310	113.3762	116.8657	120.5531	125.4898	130.9730	135.6819	(44)	
Energy conte	215.4613	189.6601	199.3199	170.1416	161.4450	141.6900	137.1187	144.7042	148.6541	170.2884	186.5950	212.4451	(45)	
Energy content (annual)										Total = Sum(45)m =		2077.5234		
Distribution loss (46)m = 0.15 x (45)m	32.3192	28.4490	29.8980	25.5212	24.2168	21.2535	20.5678	21.7056	22.2981	25.5433	27.9892	31.8668	(46)	
Water storage loss (or HIU loss):														
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)	
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)	
Combi loss	3.4770	3.1306	3.4447	3.2881	3.3690	3.2312	3.3203	3.3355	3.2451	3.3866	3.3210	3.4710	(61)	
Total heat required for water heating calculated for each month	218.9383	192.7907	202.7646	173.4297	164.8140	144.9212	140.4390	148.0397	151.8992	173.6750	189.9160	215.9161	(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	218.9383	192.7907	202.7646	173.4297	164.8140	144.9212	140.4390	148.0397	151.8992	173.6750	189.9160	215.9161	(64)	
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2117.5433	(64)	
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)	
												0.0000	(64a)	
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000		
Heat gains from water heating, kWh/month	72.5101	63.8446	67.1350	57.3941	54.5227	47.9197	46.4220	48.9480	50.2388	57.4676	62.8731	71.5057	(65)	

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

Metabolic gains (Table 5), Watts													
(66)m	115.1476	115.1476	115.1476	115.1476	115.1476	115.1476	115.1476	115.1476	115.1476	115.1476	115.1476	115.1476	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	112.6709	124.7428	112.6709	116.4266	112.6709	116.4266	112.6709	112.6709	116.4266	112.6709	116.4266	112.6709	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	202.8324	204.9372	199.6333	188.3418	174.0883	160.6921	151.7426	149.6378	154.9418	166.2332	180.4867	193.8829	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5148	34.5148	34.5148	34.5148	34.5148	34.5148	34.5148	34.5148	34.5148	34.5148	34.5148	34.5148	(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)	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	(71)
Water heating gains (Table 5)	97.4598	95.0069	90.2353	79.7140	73.2832	66.5552	62.3952	65.7903	69.7760	77.2413	87.3237	96.1099	(72)
Total internal gains	473.5075	485.2312	463.0837	445.0267	420.5868	401.2182	384.3530	385.6434	398.6887	416.6898	444.7813	463.2080	(73)

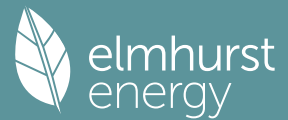
6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Northeast					1.7000	11.2829	0.4500	0.6000	0.7700	3.5890 (75)			
Southwest					4.5000	36.7938	0.4500	0.6000	0.7700	30.9802 (79)			
Northwest					4.3000	11.2829	0.4500	0.6000	0.7700	9.0779 (81)			
Solar gains	43.6471	78.5546	118.6576	165.7547	202.7569	208.8115	198.1867	169.4316	134.7862	89.8329	53.0454	36.8570	(83)
Total gains	517.1546	563.7858	581.7413	610.7814	623.3437	610.0297	582.5398	555.0750	533.4749	506.5227	497.8267	500.0651	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	95.1014	95.1014	95.1014	95.1014	95.1014	95.1014	95.1014	95.1014	95.1014	95.1014	95.1014	95.1014
alpha	7.3401	7.3401	7.3401	7.3401	7.3401	7.3401	7.3401	7.3401	7.3401	7.3401	7.3401	7.3401
util living area												
	0.9987	0.9972	0.9934	0.9750	0.9040	0.7212	0.5339	0.5836	0.8396	0.9794	0.9967	0.9990 (86)
MIT	20.2009	20.3063	20.4606	20.6850	20.8842	20.9825	20.9982	20.9967	20.9497	20.7105	20.4140	20.1722 (87)
Th 2	20.0992	20.0992	20.0992	20.0992	20.0992	20.0992	20.0992	20.0992	20.0992	20.0992	20.0992	20.0992 (88)
util rest of house												

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MIT 2	0.9982	0.9959	0.9902	0.9625	0.8599	0.6313	0.4262	0.4723	0.7623	0.9666	0.9950	0.9986 (89)
Living area fraction	19.1713	19.3059	19.5022	19.7813	20.0064	20.0908	20.0987	20.0983	20.0693	19.8157	19.4439	19.1346 (90)
MIT	19.5197	19.6444	19.8265	20.0871	20.3035	20.3926	20.4031	20.4023	fLA = Living area / (4) =			0.3384 (91)
Temperature adjustment									20.3672	20.1185	19.7721	19.4857 (92)
adjusted MIT	19.3697	19.4944	19.6765	19.9371	20.1535	20.2426	20.2531	20.2523	20.2172	19.9685	19.6221	-0.1500 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9975	0.9947	0.9882	0.9596	0.8630	0.6463	0.4448	0.4916	0.7736	0.9641	0.9937	0.9981	(94)
Useful gains	515.8689	560.8248	574.8979	586.1073	537.9354	394.2900	259.0935	272.8483	412.6850	488.3300	494.7055	499.0921	(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	1070.3742	1036.6149	935.9053	783.9463	600.4348	400.7813	259.4742	273.6219	434.4976	665.4277	889.4267	1075.0646	(97)
Space heating kWh	412.5519	319.7309	268.5895	142.4441	46.4996	0.0000	0.0000	0.0000	0.0000	131.7607	284.1992	428.5235	(98a)
Space heating requirement - total per year (kWh/year)												2034.2994	
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	412.5519	319.7309	268.5895	142.4441	46.4996	0.0000	0.0000	0.0000	0.0000	131.7607	284.1992	428.5235	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2034.2994	
Space heating per m2												(98c) / (4) = 28.0981	(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 %)													89.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	412.5519	319.7309	268.5895	142.4441	46.4996	0.0000	0.0000	0.0000	0.0000	131.7607	284.1992	428.5235	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	463.5415	359.2482	301.7860	160.0495	52.2467	0.0000	0.0000	0.0000	0.0000	148.0457	319.3250	481.4871	(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	218.9383	192.7907	202.7646	173.4297	164.8140	144.9212	140.4390	148.0397	151.8992	173.6750	189.9160	215.9161	(64)
Efficiency of water heater	88.4032	88.3528	88.2607	88.0585	87.6685	87.3000	87.3000	87.3000	87.3000	88.0253	88.3111	88.4231	(216)
Fuel for water heating, kWh/month	247.6589	218.2055	229.7338	196.9483	187.9968	166.0037	160.8694	169.5758	173.9968	197.3012	215.0532	244.1851	(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	21.7839	17.4758	15.7351	11.5282	8.9047	7.2752	8.1232	10.5588	13.7148	17.9946	20.3248	22.3893	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-18.9429	-28.8137	-44.8223	-54.1550	-61.2786	-58.2152	-57.3969	-52.6581	-44.6583	-34.4583	-21.4785	-16.0908	(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)	-6.8447	-15.3941	-33.0827	-53.2174	-73.3321	-74.7797	-73.5766	-60.5847	-42.0511	-22.8158	-9.3534	-5.3177	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1													2285.7296 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													87.3000
Water heating fuel used													2407.5285 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
central heating pump													41.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													86.0000 (231)
Electricity for lighting (calculated in Appendix L)													175.8083 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-963.3188 (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													3991.7477 (238)

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

Energy	Emission factor	Emissions
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Space heating - main system 1	kWh/year	kg CO2/kWh	kg CO2/year
Total CO2 associated with community systems	2285.7296	0.2100	480.0032 (261)
Water heating (other fuel)			0.0000 (373)
Space and water heating	2407.5285	0.2100	505.5810 (264)
Pumps, fans and electric keep-hot	86.0000	0.1387	985.5842 (265)
Energy for lighting	175.8083	0.1443	11.9293 (267)
			25.3746 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-492.9688	0.1332	-65.6439
PV Unit electricity exported	-470.3500	0.1241	-58.3906
Total			-124.0345 (269)
Total CO2, kg/year			898.8535 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.4200 (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	2285.7296	1.1300	2582.8745 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2407.5285	1.1300	2720.5072 (278)
Space and water heating			5303.3817 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	175.8083	1.5338	269.6607 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-492.9688	1.4921	-735.5388
PV Unit electricity exported	-470.3500	0.4556	-214.2955
Total			-949.8343 (283)
Total Primary energy kWh/year			4753.3089 (286)
Dwelling Primary energy Rate (DPER)			65.6500 (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	72.4000 (1b)	x 2.9000 (2b)	= 209.9600 (1b) - (3b)
Ground floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.4000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	209.9600 (5)

2. Ventilation rate

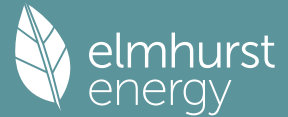
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 30.0000 / (5) = 0.1429 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3929 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3634 (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	0.4634	0.4543	0.4452	0.3998	0.3907	0.3452	0.3452	0.3362	0.3634	0.3907	0.4088	0.4270 (22b)
Effective ac	0.6074	0.6032	0.5991	0.5799	0.5763	0.5596	0.5596	0.5565	0.5660	0.5763	0.5836	0.5912 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opening Type			10.5000	1.1450	12.0229		(27)
External Wall	88.4000	10.5000	77.9000	0.1800	14.0220		(29a)
Roof	103.4000		103.4000	0.1100	11.3740		(30)
Total net area of external elements Aum (A, m2)			191.8000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	37.4189	(33)
Main dwelling							
Party Wall			25.4000	0.0000	0.0000		(32)

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Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												335.8785 (35)
List of Thermal Bridges												
K1 Element												
E2 Other lintels (including other steel lintels)												
E4 Jamb												
E3 Sill												
E17 Corner (inverted - internal area greater than external area)												
E18 Party wall between dwellings												
E16 Corner (normal)												
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)												
E7 Party floor between dwellings (in blocks of flats)												
P4 Party wall - Roof (insulation at ceiling level)												
E10 Eaves (insulation at ceiling level)												
E12 Gable (insulation at ceiling level)												
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												7.4390 (36)
Point Thermal bridges												0.0000
Total fabric heat loss												(33) + (36) + (36a) = 44.8579 (37)

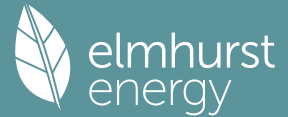
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	42.0814	41.7925	41.5094	40.1797	39.9309	38.7727	38.7727	38.5583	39.2188	39.9309	40.4342	40.9604 (38)
Average = Sum(39)m / 12 =	86.9393	86.6504	86.3673	85.0376	84.7888	83.6306	83.6306	83.4162	84.0767	84.7888	85.2921	85.8183 (39)
												85.0364
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2008	1.1968	1.1929	1.1746	1.1711	1.1551	1.1551	1.1522	1.1613	1.1711	1.1781	1.1853 (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												2.3030 (42)
Hot water usage for mixer showers												
Hot water usage for baths												
Hot water usage for other uses												
Average daily hot water use (litres/day)												117.8362 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	128.1905	125.4535	122.1202	117.0513	112.9351	108.5098	106.8088	110.1277	113.6280	118.2738	123.4209	127.8580 (44)
Energy content (annual)	203.0223	178.6441	187.6942	160.2373	152.0323	133.4254	129.1760	136.3611	140.1147	160.4964	175.8357	200.1947 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss (or HIU loss):												
Total storage loss												
If cylinder contains dedicated solar storage												
Primary loss												
Combi loss												
Total heat required for water heating calculated for each month												
WWHRS	253.9812	224.6715	238.6531	209.5524	202.9912	182.7405	180.1349	187.3200	189.4297	211.4554	225.1507	251.1536 (62)
FV diverter	-28.7244	-25.4041	-26.6017	-22.0273	-20.5287	-17.5665	-16.4658	-17.5097	-18.1750	-21.4263	-24.2734	-28.1925 (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												
12Total per year (kWh/year)	225.2568	199.2673	212.0514	187.5251	182.4626	165.1740	163.6691	169.8103	171.2547	190.0290	200.8773	222.9610 (64)
Electric shower(s)												
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												2290.3387 (64)
Heat gains from water heating, kWh/month												
	80.2447	70.9060	75.1481	65.6077	63.2905	56.6927	55.6908	58.0798	58.9169	66.1048	70.7941	79.3044 (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	115.1476	115.1476	115.1476	115.1476	115.1476	115.1476	115.1476	115.1476	115.1476	115.1476	115.1476	115.1476 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	108.9223	120.5925	108.9223	112.5530	108.9223	112.5530	108.9223	108.9223	112.5530	108.9223	112.5530	108.9223 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	202.8324	204.9372	199.6333	188.3418	174.0883	160.6921	151.7426	149.6378	154.9418	166.2332	180.4867	193.8829 (68)
Pumps, fans	34.5148	34.5148	34.5148	34.5148	34.5148	34.5148	34.5148	34.5148	34.5148	34.5148	34.5148	34.5148 (69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Water heating gains (Table 5)	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181	-92.1181 (71)
Total internal gains	107.8557	105.5149	101.0054	91.1218	85.0678	78.7399	74.8532	78.0642	81.8290	88.8505	98.3252	106.5920 (72)
	480.1547	491.5889	470.1053	452.5609	428.6227	409.5293	393.0623	394.1686	406.8681	424.5503	451.9092	469.9415 (73)

6. Solar gains												
[Jan]												
		Area	Solar flux	g	FF							
		m2	Table 6a	Specific data	Specific data							
			W/m2	or Table 6b	or Table 6c							
Northeast		1.7000	11.2829	0.6300	0.7000							
Southwest		4.5000	36.7938	0.6300	0.7000							
Northwest		4.3000	11.2829	0.6300	0.7000							

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Solar gains	71.2903	128.3059	193.8074	270.7327	331.1696	341.0587	323.7050	276.7383	220.1508	146.7270	86.6408	60.1998 (83)
Total gains	551.4450	619.8948	663.9127	723.2935	759.7924	750.5880	716.7674	670.9069	627.0189	571.2774	538.5500	530.1413 (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	77.6966	77.9556	78.2112	79.4342	79.6672	80.7705	80.7705	80.9782	80.3419	79.6672	79.1971	78.7115
alpha	6.1798	6.1970	6.2141	6.2956	6.3111	6.3847	6.3847	6.3985	6.3561	6.3111	6.2798	6.2474
util living area	0.9984	0.9963	0.9908	0.9650	0.8787	0.6874	0.5098	0.5650	0.8283	0.9763	0.9961	0.9988 (86)
MIT	19.9581	20.1008	20.3120	20.6160	20.8597	20.9775	20.9970	20.9946	20.9293	20.6238	20.2472	19.9431 (87)
Th 2	19.9193	19.9225	19.9257	19.9404	19.9432	19.9561	19.9561	19.9585	19.9511	19.9432	19.9376	19.9317 (88)
util rest of house	0.9977	0.9947	0.9864	0.9478	0.8247	0.5877	0.3910	0.4411	0.7411	0.9610	0.9941	0.9982 (89)
MIT 2	18.7212	18.9057	19.1762	19.5632	19.8354	19.9459	19.9554	19.9571	19.9105	19.5809	19.1048	18.7114 (90)
Living area fraction	19.1397	19.3101	19.5606	19.9195	20.1820	20.2950	20.3079	20.3082	20.2552	19.9338	19.4914	0.3384 (91)
MIT	19.1397	19.3101	19.5606	19.9195	20.1820	20.2950	20.3079	20.3082	20.2552	19.9338	19.4914	19.1282 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1397	19.3101	19.5606	19.9195	20.1820	20.2950	20.3079	20.3082	20.2552	19.9338	19.4914	19.1282 (93)

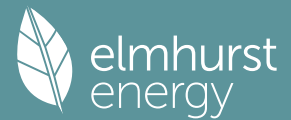
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9970	0.9934	0.9844	0.9474	0.8384	0.6214	0.4315	0.4834	0.7691	0.9608	0.9928	0.9976 (94)
Useful gains	549.7889	615.7972	653.5490	685.2123	637.0106	466.3930	309.2570	324.3434	482.2334	548.8993	534.6927	528.8848 (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	1290.1565	1248.6425	1128.0057	937.0694	719.1792	476.2741	310.0944	326.0060	517.5128	791.4018	1056.8889	1281.1142 (97)
Space heating kWh	550.8335	425.2721	352.9958	181.3371	61.1334	0.0000	0.0000	0.0000	0.0000	180.4219	375.9813	559.6586 (98a)
Space heating requirement - total per year (kWh/year)												2687.6336
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	550.8335	425.2721	352.9958	181.3371	61.1334	0.0000	0.0000	0.0000	0.0000	180.4219	375.9813	559.6586 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2687.6336
Space heating per m2										(98c) / (4) =		37.1220 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	550.8335	425.2721	352.9958	181.3371	61.1334	0.0000	0.0000	0.0000	0.0000	180.4219	375.9813	559.6586 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	596.1402	460.2512	382.0301	196.2522	66.1617	0.0000	0.0000	0.0000	0.0000	195.2618	406.9061	605.6911 (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	225.2568	199.2673	212.0514	187.5251	182.4626	165.1740	163.6691	169.8103	171.2547	190.0290	200.8773	222.9610 (64)
Efficiency of water heater	86.2199	85.9626	85.4650	84.3096	82.2980	80.3000	80.3000	80.3000	80.3000	84.2704	85.7037	80.3000 (216)
Fuel for water heating, kWh/month	261.2586	231.8071	248.1149	222.4245	221.7096	205.6961	203.8221	211.4698	213.2687	225.4993	234.3858	258.4521 (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	22.6319	18.1561	16.3476	11.9770	9.2513	7.5584	8.4394	10.9698	14.2487	18.6951	21.1161	23.2609 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-33.9646	-47.9284	-68.9575	-77.6142	-83.7693	-78.2286	-77.2774	-72.9291	-65.2461	-54.8616	-37.3626	-29.3605 (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)	-19.0393	-40.0754	-79.6938	-119.7493	-158.3849	-159.1468	-157.2583	-133.1133	-97.5302	-57.3105	-25.4211	-15.0526 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												2908.6944 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												2737.9084 (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)												182.6524 (232)

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Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	-1789.2757 (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	4125.9795 (238)

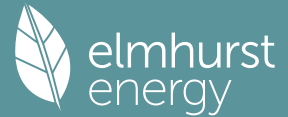
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2908.6944	0.2100	610.8258 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2737.9084	0.2100	574.9608 (264)
Space and water heating			1185.7866 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	182.6524	0.1443	26.3624 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-727.5000	0.1346	-97.8937
PV Unit electricity exported	-1061.7757	0.1259	-133.6613
Total			-231.5550 (269)
Total CO2, kg/year			992.5232 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.7100 (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	2908.6944	1.1300	3286.8247 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2737.9084	1.1300	3093.8365 (278)
Space and water heating			6380.6612 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	182.6524	1.5338	280.1583 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-727.5000	1.4973	-1089.2975
PV Unit electricity exported	-1061.7757	0.4621	-490.6286
Total			-1579.9261 (283)
Total Primary energy kWh/year			5210.9942 (286)
Target Primary Energy Rate (TPER)			71.9800 (287)

Full SAP Calculation Printout



Plot Reference	1 Bed Flat - Be Green				Issued on Date	24/04/2026
Assessment Reference	00001		Plot Type Ref			
Plot Address					SAP Version	10.2
SAP Rating	91 B	DER	12.67	TER	15.46	
Environmental	91 B	% DER < TER				18.05
CO ₂ Emissions (t/year)	0.54	DFEE	35.50	TFEE	42.47	
Compliance Check	See BREL	% DFEE < TFEE				16.40
% DPER < TPER	18.11	DPER	66.77	TPER	81.54	
Assessor Details	Mr. Stephen Lloyd				Assessor ID	N350-0001
Client	Miller Homes, Miller Homes					

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	52.0000 (1b)	2.9000 (2b)	150.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.0000		150.8000 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	150.8000 (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	1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1850 (21)

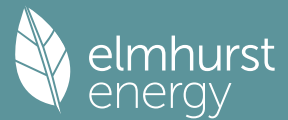
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.2359	0.2313	0.2266	0.2035	0.1989	0.1758	0.1758	0.1711	0.1850	0.1989	0.2081	0.2174 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			7.4000	1.1450	8.4733		(27)
Heatloss Floor 1			52.0000	0.1300	6.7600	110.0000	5720.0000 (28a)
External Wall	74.0000	7.4000	66.6000	0.1800	11.9880	190.0000	12654.0000 (29a)
Total net area of external elements Aum(A, m ²)			126.0000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	27.2213	(33)
Main dwelling							
Party Wall			21.0000	0.0000	0.0000	45.0000	945.0000 (32)
Party Ceiling 1			52.0000			20.0000	1040.0000 (32b)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	20359.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							391.5192 (35)
Thermal bridges (User defined value 0.000 * total exposed area)							0.0000 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	27.2213 (37)

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

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(38)m	Jan 24.8820	Feb 24.8820	Mar 24.8820	Apr 24.8820	May 24.8820	Jun 24.8820	Jul 24.8820	Aug 24.8820	Sep 24.8820	Oct 24.8820	Nov 24.8820	Dec 24.8820	(38)
Heat transfer coeff	52.1033	52.1033	52.1033	52.1033	52.1033	52.1033	52.1033	52.1033	52.1033	52.1033	52.1033	52.1033	(39)
Average = Sum(39)m / 12 =												52.1033	
HLP	Jan 1.0020	Feb 1.0020	Mar 1.0020	Apr 1.0020	May 1.0020	Jun 1.0020	Jul 1.0020	Aug 1.0020	Sep 1.0020	Oct 1.0020	Nov 1.0020	Dec 1.0020	(40)
HLP (average)												1.0020	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.7491 (42)
Hot water usage for mixer showers	60.2389	59.3336	58.0144	55.4905	53.6278	51.5507	50.3700	51.6792	53.1143	55.3445	57.9227	60.0081 (42a)	
Hot water usage for baths	23.1496	22.8058	22.3217	21.4290	20.7606	20.0194	19.6190	20.0998	20.6232	21.4163	22.3274	23.0714 (42b)	
Hot water usage for other uses	32.5422	31.3589	30.1755	28.9922	27.8088	26.6255	26.6255	27.8088	28.9922	30.1755	31.3589	32.5422 (42c)	
Average daily hot water use (litres/day)												106.5854 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	115.9307	113.4983	110.5116	105.9116	102.1972	98.1955	96.6145	99.5878	102.7297	106.9364	111.6090	115.6217 (44)	
Energy content (annual)	183.6059	161.6201	169.8523	144.9877	137.5771	120.7428	116.8468	123.3104	126.6760	145.1117	159.0075	181.0356 (45)	
Distribution loss (46)m = 0.15 x (45)m	27.5409	24.2430	25.4778	21.7482	20.6366	18.1114	17.5270	18.4966	19.0014	21.7668	23.8511	27.1553 (46)	
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)	
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)	
Combi loss	3.4133	3.0745	3.3858	3.2378	3.3212	3.1849	3.2718	3.2917	3.2012	3.3363	3.2658	3.4081 (61)	
Total heat required for water heating calculated for each month	187.0192	164.6946	173.2380	148.2255	140.8983	123.9277	120.1187	126.6021	129.8771	148.4480	162.2733	184.4437 (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	187.0192	164.6946	173.2380	148.2255	140.8983	123.9277	120.1187	126.6021	129.8771	148.4480	162.2733	184.4437 (64)	
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1809.7663 (64)	
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)	
												0.0000 (64a)	
Heat gains from water heating, kWh/month	61.9023	54.5073	57.3223	49.0179	46.5747	40.9432	39.6695	41.8236	42.9200	49.0837	53.6864	61.0464 (65)	

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

Metabolic gains (Table 5), Watts													
(66)m	Jan 87.4535	Feb 87.4535	Mar 87.4535	Apr 87.4535	May 87.4535	Jun 87.4535	Jul 87.4535	Aug 87.4535	Sep 87.4535	Oct 87.4535	Nov 87.4535	Dec 87.4535	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	85.0270	94.1371	85.0270	87.8613	85.0270	87.8613	85.0270	85.0270	87.8613	85.0270	87.8613	85.0270	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	152.4259	154.0076	150.0218	141.5364	130.8251	120.7580	114.0326	112.4509	116.4367	124.9221	135.6334	145.7005	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	(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)	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	(71)
Water heating gains (Table 5)	83.2020	81.1121	77.0461	68.0804	62.6004	56.8656	53.3193	56.2146	59.6112	65.9727	74.5645	82.0516	(72)
Total internal gains	372.8910	381.4928	364.3310	349.7141	330.6886	314.7209	301.6150	302.9286	313.1452	328.1579	350.2952	365.0152	(73)

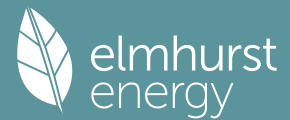
6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Northeast				1.4000	11.2829	0.4500	0.6000	0.7700	2.9556 (75)			
Southwest				6.0000	36.7938	0.4500	0.6000	0.7700	41.3070 (79)			
Solar gains	44.2626	76.3773	107.1104	137.0858	157.5370	158.1526	151.7457	136.2199	117.4491	85.1163	53.1951	37.7639 (83)
Total gains	417.1536	457.8701	471.4414	486.7999	488.2256	472.8736	453.3607	439.1485	430.5943	413.2742	403.4904	402.7790 (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	108.5398	108.5398	108.5398	108.5398	108.5398	108.5398	108.5398	108.5398	108.5398	108.5398	108.5398	108.5398
alpha	8.2360	8.2360	8.2360	8.2360	8.2360	8.2360	8.2360	8.2360	8.2360	8.2360	8.2360	8.2360
util living area	0.9988	0.9969	0.9922	0.9702	0.8883	0.6930	0.5048	0.5441	0.7965	0.9722	0.9964	0.9991 (86)
MIT	20.3419	20.4450	20.5824	20.7705	20.9262	20.9916	20.9994	20.9989	20.9760	20.7967	20.5324	20.3137 (87)
Th 2	20.0817	20.0817	20.0817	20.0817	20.0817	20.0817	20.0817	20.0817	20.0817	20.0817	20.0817	20.0817 (88)
util rest of house	0.9982	0.9953	0.9879	0.9538	0.8359	0.6002	0.4000	0.4365	0.7091	0.9535	0.9942	0.9986 (89)

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MIT 2	19.3258	19.4573	19.6312	19.8614	20.0284	20.0783	20.0816	20.0815	20.0699	19.8955	19.5692	19.2898 (90)
Living area fraction									FLA = Living area / (4) =			0.4712 (91)
MIT	19.8046	19.9227	20.0794	20.2897	20.4514	20.5086	20.5140	20.5137	20.4968	20.3201	20.0230	19.7722 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.6546	19.7727	19.9294	20.1397	20.3014	20.3586	20.3640	20.3637	20.3468	20.1701	19.8730	19.6222 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9978	0.9946	0.9870	0.9550	0.8499	0.6290	0.4323	0.4698	0.7360	0.9557	0.9935	0.9983	(94)
Useful gains	416.2158	455.3929	465.3318	464.9005	414.9190	297.4167	196.0052	206.3037	316.9058	394.9730	400.8877	402.0977	(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	800.0235	774.9156	699.7155	585.6247	448.1615	300.0440	196.1173	206.5230	325.4786	498.6343	665.5158	803.5476	(97)
Space heating kWh	285.5529	214.7193	174.3815	86.9214	24.7324	0.0000	0.0000	0.0000	0.0000	77.1240	190.5322	298.6787	(98a)
Space heating requirement - total per year (kWh/year)												1352.6425	
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	285.5529	214.7193	174.3815	86.9214	24.7324	0.0000	0.0000	0.0000	0.0000	77.1240	190.5322	298.6787	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1352.6425	
Space heating per m2											(98c) / (4) =	26.0124	(99)

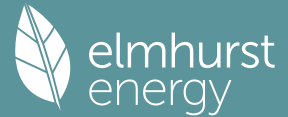
9a. Energy requirements - Individual heating systems, including micro-CHP

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 %)													89.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	285.5529	214.7193	174.3815	86.9214	24.7324	0.0000	0.0000	0.0000	0.0000	77.1240	190.5322	298.6787	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	320.8460	241.2576	195.9343	97.6645	27.7892	0.0000	0.0000	0.0000	0.0000	86.6562	214.0812	335.5941	(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	187.0192	164.6946	173.2380	148.2255	140.8983	123.9277	120.1187	126.6021	129.8771	148.4480	162.2733	184.4437	(64)
Efficiency of water heater													(216)
(217)m	88.3194	88.2540	88.1446	87.9208	87.5497	87.3000	87.3000	87.3000	87.3000	87.8739	88.2099	88.3432	(217)
Fuel for water heating, kWh/month	211.7533	186.6143	196.5385	168.5898	160.9352	141.9562	137.5930	145.0196	148.7710	168.9330	183.9626	208.7808	(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	16.4392	13.1881	11.8744	8.6997	6.7199	5.4902	6.1301	7.9682	10.3499	13.5796	15.3381	16.8961	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.1232	-27.0980	-41.4164	-49.1368	-54.8480	-51.8713	-51.1843	-47.3473	-40.7074	-32.0791	-20.4037	-15.4474	(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	-7.6644	-17.1098	-36.4886	-58.2356	-79.7627	-81.1237	-79.7892	-65.8955	-46.0020	-25.1950	-10.4282	-5.9612	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1													1519.8230 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													87.3000
Water heating fuel used													2059.4473 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
central heating pump													41.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													86.0000 (231)
Electricity for lighting (calculated in Appendix L)													132.6737 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-963.3188 (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													2834.6252 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
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Space heating - main system 1	1519.8230	0.2100	319.1628 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2059.4473	0.2100	432.4839 (264)
Space and water heating			751.6468 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	132.6737	0.1443	19.1489 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-449.6629	0.1335	-60.0298
PV Unit electricity exported	-513.6559	0.1244	-63.8799
Total			-123.9097 (269)
Total CO2, kg/year			658.8152 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.6700 (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	1519.8230	1.1300	1717.4000 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2059.4473	1.1300	2327.1755 (278)
Space and water heating			4044.5754 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	132.6737	1.5338	203.4993 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-449.6629	1.4933	-671.4964
PV Unit electricity exported	-513.6559	0.4564	-234.4481
Total			-905.9445 (283)
Total Primary energy kWh/year			3472.2311 (286)
Dwelling Primary energy Rate (DPER)			66.7700 (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	52.0000 (1b)	x 2.9000 (2b)	= 150.8000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	150.8000 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1326 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3826 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3539 (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	0.4513	0.4424	0.4336	0.3893	0.3805	0.3362	0.3362	0.3274	0.3539	0.3805	0.3982	0.4159 (22b)
Effective ac	0.6018	0.5979	0.5940	0.5758	0.5724	0.5565	0.5565	0.5536	0.5626	0.5724	0.5793	0.5865 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opening Type			7.4000	1.1450	8.4733		(27)
Heatloss Floor 1			52.0000	0.1300	6.7600		(28a)
External Wall	74.0000	7.4000	66.6000	0.1800	11.9880		(29a)
Total net area of external elements Aum(A, m2)			126.0000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.2213		(33)
Main dwelling							
Party Wall			21.0000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							391.5192 (35)

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List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	4.0000	0.0500	0.2000
E4 Jamb	17.6000	0.0500	0.8800
E3 Sill	4.0000	0.0500	0.2000
E5 Ground floor (normal)	25.2000	0.1600	4.0320
E17 Corner (inverted - internal area greater than external area)	5.9000	-0.0900	-0.5310
E18 Party wall between dwellings	5.9000	0.0600	0.3540
E16 Corner (normal)	5.9000	0.0900	0.5310
P1 Party wall - Ground floor	7.2000	0.0800	0.5760
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.2000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	25.2000	0.0700	1.7640
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.0060 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	35.2273 (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	29.9489	29.7521	29.5592	28.6534	28.4839	27.6950	27.6950	27.5489	27.9989	28.4839	28.8268	29.1852 (38)
Heat transfer coeff	65.1761	64.9794	64.7865	63.8807	63.7112	62.9223	62.9223	62.7761	63.2261	63.7112	64.0541	64.4125 (39)
Average = Sum(39)m / 12 =												63.8799
HLP	1.2534	1.2496	1.2459	1.2285	1.2252	1.2100	1.2100	1.2072	1.2159	1.2252	1.2318	1.2387 (40)
HLP (average)												1.2285
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.7491 (42)
Hot water usage for mixer showers													
53.5457	52.7410	51.5684	49.3249	47.6692	45.8228	44.7733	45.9370	47.2127	49.1951	51.4869	53.3405	53.3405 (42a)	
Hot water usage for baths													
23.1496	22.8058	22.3217	21.4290	20.7606	20.0194	19.6190	20.0998	20.6232	21.4163	22.3274	23.0714	23.0714 (42b)	
Hot water usage for other uses													
32.5422	31.3589	30.1755	28.9922	27.8088	26.6255	26.6255	27.8088	28.9922	30.1755	31.3589	32.5422	32.5422 (42c)	
Average daily hot water use (litres/day)													100.4145 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
109.2375	106.9057	104.0656	99.7460	96.2386	92.4676	91.0178	93.8456	96.8281	100.7870	105.1731	108.9541	108.9541 (44)	
Energy content (annual)	173.0055	152.2323	159.9449	136.5473	129.5556	113.6997	110.0781	116.2005	119.3987	136.7670	149.8384	170.5958 (45)	
Distribution loss (46)m = 0.15 x (45)m													Total = Sum(45)m = 1667.8640
25.9508	22.8348	23.9917	20.4821	19.4333	17.0550	16.5117	17.4301	17.9098	20.5151	22.4758	25.5894	25.5894 (46)	
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)	
If cylinder contains dedicated solar storage													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)	
Combi loss	50.9589	46.0274	50.9589	49.1898	49.0421	45.6005	46.3817	47.8227	47.7508	50.9589	49.3151	50.9589 (61)	
Total heat required for water heating calculated for each month													
223.9644	198.2597	210.9038	185.7371	178.5977	159.3002	156.4598	164.0232	167.1496	187.7259	199.1535	221.5547	221.5547 (62)	
WWHRS	-24.4788	-21.6493	-22.6699	-18.7716	-17.4944	-14.9701	-14.0321	-14.9217	-15.4886	-18.2594	-20.6857	-24.0255 (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	199.4856	176.6104	188.2340	166.9656	161.1033	144.3301	142.4277	149.1015	151.6609	169.4665	178.4678	197.5292 (64)	
12Total per year (kWh/year)													2025.3825 (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													
70.2641	62.1241	65.9214	57.6994	55.3378	49.2053	48.1964	50.5923	51.6378	58.2148	62.1500	69.4628	69.4628 (65)	

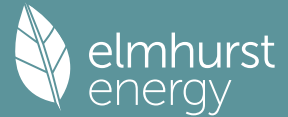
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	82.1877	90.9935	82.1877	84.9273	82.1877	84.9273	82.1877	82.1877	84.9273	82.1877	84.9273	82.1877 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	152.4259	154.0076	150.0218	141.5364	130.8251	120.7580	114.0326	112.4509	116.4367	124.9221	135.6334	145.7005 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454 (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)												
	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628 (71)
Water heating gains (Table 5)												
	94.4410	92.4465	88.6041	80.1381	74.3787	68.3407	64.7801	68.0005	71.7191	78.2456	86.3195	93.3640 (72)
Total internal gains												
	381.2906	389.6838	373.0496	358.8379	339.6276	323.2621	310.2365	311.8751	322.3192	337.5915	359.1163	373.4883 (73)

6. Solar gains

[Jan]												
				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d	Gains W
Northeast				1.4000	11.2829		0.6300		0.7000		0.7700	4.8275 (75)
Southwest				6.0000	36.7938		0.6300		0.7000		0.7700	67.4680 (79)
Solar gains	72.2955	124.7496	174.9470	223.9068	257.3105	258.3160	247.8514	222.4925	191.8335	139.0232	86.8854	61.6810 (83)
Total gains	453.5862	514.4333	547.9966	582.7447	596.9381	581.5780	558.0878	534.3676	514.1527	476.6147	446.0017	435.1692 (84)

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7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	86.7692	87.0319	87.2910	88.5288	88.7643	89.8772	89.8772	90.0864	89.4452	88.7643	88.2891	87.7978	21.0000 (85)
alpha	6.7846	6.8021	6.8194	6.9019	6.9176	6.9918	6.9918	7.0058	6.9630	6.9176	6.8859	6.8532	
util living area	0.9985	0.9959	0.9893	0.9608	0.8704	0.6752	0.4942	0.5370	0.7924	0.9690	0.9957	0.9988	(86)
MIT	20.1065	20.2491	20.4410	20.6995	20.8971	20.9858	20.9985	20.9975	20.9592	20.7168	20.3709	20.0881	(87)
Th 2	19.8775	19.8805	19.8835	19.8973	19.8999	19.9120	19.9120	19.9142	19.9073	19.8999	19.8946	19.8892	(88)
util rest of house													
MIT 2	0.9977	0.9938	0.9834	0.9392	0.8086	0.5696	0.3732	0.4123	0.6931	0.9472	0.9930	0.9982	(89)
Living area fraction	18.8623	19.0464	19.2909	19.6164	19.8279	19.9065	19.9117	19.9137	19.8877	19.6445	19.2133	18.8478	(90)
MIT	19.4485	19.6131	19.8328	20.1267	20.3317	20.4151	20.4238	20.4243	20.3926	20.1497	19.7587	19.4322	(91)
Temperature adjustment												0.0000	(92)
adjusted MIT	19.4485	19.6131	19.8328	20.1267	20.3317	20.4151	20.4238	20.4243	20.3926	20.1497	19.7587	19.4322	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9972	0.9931	0.9831	0.9445	0.8351	0.6198	0.4304	0.4715	0.7401	0.9532	0.9926	0.9979	(94)
Useful gains	452.3310	510.8969	538.7364	550.3996	498.5253	360.4481	240.2189	251.9308	380.5124	454.3176	442.6993	434.2464	(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	987.3215	956.0451	863.7839	717.1710	549.9337	365.8969	240.6009	252.6326	397.8552	608.4227	810.8434	981.1430	(97)
Space heating kWh	398.0330	299.1396	241.8354	120.0754	38.2479	0.0000	0.0000	0.0000	0.0000	114.6542	265.0638	406.8911	(98a)
Space heating requirement - total per year (kWh/year)												1883.9404	
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	398.0330	299.1396	241.8354	120.0754	38.2479	0.0000	0.0000	0.0000	0.0000	114.6542	265.0638	406.8911	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1883.9404	
Space heating per m2										(98c) / (4) =		36.2296	(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	398.0330	299.1396	241.8354	120.0754	38.2479	0.0000	0.0000	0.0000	0.0000	114.6542	265.0638	406.8911	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	430.7716	323.7442	261.7266	129.9517	41.3938	0.0000	0.0000	0.0000	0.0000	124.0846	286.8655	440.3584	(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	199.4856	176.6104	188.2340	166.9656	161.1033	144.3301	142.4277	149.1015	151.6609	169.4665	178.4678	197.5292	(64)
Efficiency of water heater	85.8311	85.5007	84.9194	83.6866	81.8186	80.3000	80.3000	80.3000	80.3000	83.5621	85.2272	80.3000	(216)
Fuel for water heating, kWh/month	232.4165	206.5602	221.6619	199.5129	196.9031	179.7386	177.3695	185.6805	188.8679	202.8031	209.4024	229.9694	(217)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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	17.0770	13.6998	12.3351	9.0373	6.9806	5.7032	6.3680	8.2773	10.7514	14.1065	15.9332	17.5516	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-24.7716	-35.1521	-50.8710	-57.6284	-62.5505	-58.5839	-57.9152	-54.5072	-48.5039	-40.4501	-27.3360	-21.3942	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-13.2976	-28.0551	-55.8951	-84.1244	-111.3725	-111.9068	-110.5359	-93.4791	-68.4073	-40.1155	-17.7572	-10.5047	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2038.8965	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2430.8862	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:

Total electricity for the above, kWh/year

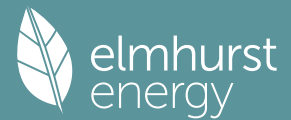
Electricity for lighting (calculated in Appendix L)

	86.0000	(231)
	137.8210	(232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	-1285.1151	(233)
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Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	3408.4885 (238)

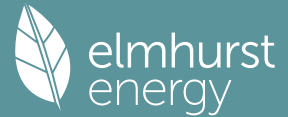
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2038.8965	0.2100	428.1683 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2430.8862	0.2100	510.4861 (264)
Space and water heating			938.6544 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	137.8210	0.1443	19.8918 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-539.6641	0.1344	-72.5400
PV Unit electricity exported	-745.4510	0.1258	-93.8126
Total			-166.3527 (269)
Total CO2, kg/year			804.1228 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.4600 (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	2038.8965	1.1300	2303.9530 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2430.8862	1.1300	2746.9014 (278)
Space and water heating			5050.8544 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	137.8210	1.5338	211.3945 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-539.6641	1.4968	-807.7545
PV Unit electricity exported	-745.4510	0.4619	-344.3559
Total			-1152.1105 (283)
Total Primary energy kWh/year			4240.2392 (286)
Target Primary Energy Rate (TPER)			81.5400 (287)

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Plot Reference	Birchgate- Be Green				Issued on Date	24/04/2026
Assessment Reference	00001		Plot Type Ref			
Plot Address					SAP Version	10.2
SAP Rating	90 B	DER	12.44	TER	13.94	
Environmental	88 B	% DER < TER				10.76
CO ₂ Emissions (t/year)	1.2	DFEE	43.11	TFEE	52.22	
Compliance Check	See BREL	% DFEE < TFEE				17.45
% DPER < TPER	10.33	DPER	65.84	TPER	73.43	
Assessor Details	Mr. Stephen Lloyd				Assessor ID	N350-0001
Client	Miller Homes, Miller Homes					

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	45.0000 (1b)	x 3.0000 (2b)	= 135.0000 (1b) - (3b)
First floor	40.0000 (1c)	x 3.0000 (2c)	= 120.0000 (1c) - (3c)
Second floor	28.7000 (1d)	x 3.0000 (2d)	= 86.1000 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	113.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 341.1000 (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	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2000 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
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	0.2550	0.2500	0.2450	0.2200	0.2150	0.1900	0.1900	0.1850	0.2000	0.2150	0.2250	0.2350 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5050	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			11.7000	1.1450	13.3969		(27)
Glazed Door			3.2000	1.0000	3.2000		(26a)
Door			4.4000	1.0000	4.4000		(26)
Roof window			2.0000	1.1450	2.2901		(27a)
Heatloss Floor 1			45.0000	0.1300	5.8500	110.0000	4950.0000 (28a)
External Wall	137.0000	19.3000	117.7000	0.1800	21.1860	190.0000	22363.0000 (29a)
Roof	77.9000	2.0000	75.9000	0.1000	7.5900	9.0000	683.1000 (30)
Total net area of external elements Aum(A, m ²)			259.9000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	57.9130		(33)
Main dwelling							
Party Wall			75.0000	0.0000	0.0000	110.0000	8250.0000 (32)
Internal Floor 1			68.7000			18.0000	1236.6000 (32d)
Internal Ceiling 1			80.0000			9.0000	720.0000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	38202.7000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							335.9956 (35)

Point Thermal bridges
Total fabric heat loss

$$\begin{array}{rcl} & & 0.0000 \quad (36) \\ & (36\text{a}) = & 0.0000 \\ (33) + (36) + (36\text{a}) = & & 57.9130 \quad (37) \end{array}$$
[illegible]

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0093	1.0043	1.0043	1.0043	1.0043	1.0043	1.0043	1.0043	1.0043	1.0043	1.0043	1.0043 (40)
HLP (average)												1.0048
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

[illegible]

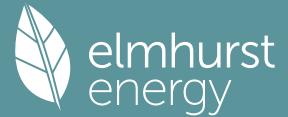
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	155.3765	152.1153	148.1116	141.9466	136.9679	131.6044	129.4864	133.4721	137.6838	143.3219	149.5842	154.9624 (44)
Energy conte	246.0784	216.6101	227.6420	194.3178	184.3852	161.8230	156.6025	165.2664	169.7779	194.4865	213.1102	242.6337 (45)
Energy content (annual)										Total =	Sum (45)m =	2372.7336
Distribution loss (46)m = 0.15 x (45)m												
	36.9118	32.4915	34.1463	29.1477	27.6578	24.2734	23.4904	24.7900	25.4667	29.1730	31.9665	36.3951 (46)
Water storage loss (or HIU loss):												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8640 (55)
Total storage loss	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (56)
If cylinder contains dedicated solar storage	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (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												
WWHRS	296.1248	261.8133	277.6884	242.7498	234.4316	210.2550	206.6489	215.3128	218.2099	244.5329	261.5422	292.6801 (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	-43.3008	-37.6112	-38.4742	-32.0499	-22.7486	-13.6666	-13.4322	-13.9953	-14.1836	-32.0176	-36.7443	-43.0491 (63d) eq. (G6)
Output from w/h	252.8240	224.2021	239.2143	210.6999	211.6830	196.5884	193.2167	201.3174	204.0262	212.5153	224.7978	249.6310 (64)
12Total per year (kWh/year)										Total per year (kWh/year) =	Sum (64)m =	2620.7162 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												0.0000 (64a)
Heat gains from water heating, kWh/month												
	121.8582	108.1854	115.7281	103.3563	101.3452	92.5517	92.1075	94.9882	95.1967	104.7039	109.6047	120.7128 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	141.7652	141.7652	141.7652	141.7652	141.7652	141.7652	141.7652	141.7652	141.7652	141.7652	141.7652	141.7652 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	159.0924	176.1381	159.0924	164.3955	159.0924	164.3955	159.0924	159.0924	164.3955	159.0924	164.3955	159.0924 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	276.7684	279.6404	272.4030	256.9956	237.5466	219.2672	207.0554	204.1834	211.4208	226.8282	246.2772	264.5566 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.1765	37.1765	37.1765	37.1765	37.1765	37.1765	37.1765	37.1765	37.1765	37.1765	37.1765	37.1765 (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)	-113.4122	-113.4122	-113.4122	-113.4122	-113.4122	-113.4122	-113.4122	-113.4122	-113.4122	-113.4122	-113.4122	-113.4122 (71)
Water heating gains (Table 5)	163.7879	160.9902	155.5485	143.5504	136.2167	128.5441	123.8003	127.6723	132.2177	140.7310	152.2288	162.2484 (72)
Total internal gains	668.1783	685.2982	655.5736	633.4711	601.3852	577.7364	555.4778	556.4777	573.5635	595.1812	631.4311	654.4271 (73)

[Jan				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W				
Northeast				2.8000	11.2829	0.4500	0.6000	0.7700	5.9112	(75)			
Southwest				4.0000	36.7938	0.4500	0.6000	0.7700	27.5380	(79)			
Northwest				4.9000	11.2829	0.4500	0.6000	0.7700	10.3446	(81)			
Southwest				2.0000	26.0000	0.4500	0.6000	1.0000	12.6360	(82)			
Solar gains	56.4298	106.2406	170.4531	250.3302	313.9909	325.9347	308.3621	259.0690	198.0276	124.3564	69.4762	47.0481	(83)
Total gains	724.6081	791.5389	826.0266	883.8013	915.3761	903.6710	863.8399	815.5468	771.5911	719.5375	700.9073	701.4752	(84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n11,m (see Table 9a)												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

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tau	92.4722	92.9279	92.9279	92.9279	92.9279	92.9279	92.9279	92.9279	92.9279	92.9279	92.9279	92.9279
alpha	7.1648	7.1952	7.1952	7.1952	7.1952	7.1952	7.1952	7.1952	7.1952	7.1952	7.1952	7.1952
util living area	0.9994	0.9987	0.9966	0.9852	0.9327	0.7680	0.5767	0.6342	0.8870	0.9891	0.9984	0.9995 (86)
MIT	20.0981	20.2066	20.3697	20.6131	20.8423	20.9721	20.9967	20.9939	20.9216	20.6397	20.3281	20.0785 (87)
Th 2	20.0756	20.0797	20.0797	20.0797	20.0797	20.0797	20.0797	20.0797	20.0797	20.0797	20.0797	20.0797 (88)
util rest of house	0.9992	0.9981	0.9949	0.9770	0.8965	0.6765	0.4591	0.5131	0.8182	0.9816	0.9976	0.9993 (89)
MIT 2	19.0210	19.1633	19.3717	19.6784	19.9474	20.0657	20.0789	20.0780	20.0296	19.7142	19.3191	18.9991 (90)
Living area fraction									fLA = Living area / (4) =			0.2946 (91)
MIT	19.3384	19.4707	19.6657	19.9538	20.2111	20.3328	20.3493	20.3479	20.2924	19.9869	19.6164	19.3172 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.1884	19.3207	19.5157	19.8038	20.0611	20.1828	20.1993	20.1979	20.1424	19.8369	19.4664	19.1672 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9988	0.9973	0.9935	0.9738	0.8957	0.6876	0.4746	0.5291	0.8237	0.9788	0.9967	0.9990 (94)
Useful gains	723.7132	789.4216	820.6250	860.6317	819.8649	621.3410	409.9943	431.5240	635.5808	704.2852	698.6153	700.7929 (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	1708.5502	1646.7604	1486.3248	1245.1520	954.7869	637.5246	411.0257	433.6952	690.0143	1054.8052	1412.1752	1709.1668 (97)
Space heating kWh	732.7187	576.1317	495.2807	276.8547	100.3820	0.0000	0.0000	0.0000	0.0000	260.7869	513.7631	750.2301 (98a)
Space heating requirement - total per year (kWh/year)												3706.1478
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	732.7187	576.1317	495.2807	276.8547	100.3820	0.0000	0.0000	0.0000	0.0000	260.7869	513.7631	750.2301 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3706.1478
Space heating per m2										(98c) / (4) =		32.5958 (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 %)												89.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	732.7187	576.1317	495.2807	276.8547	100.3820	0.0000	0.0000	0.0000	0.0000	260.7869	513.7631	750.2301 (98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000 (210)
Space heating fuel (main heating system)	823.2794	647.3390	556.4951	311.0726	112.7887	0.0000	0.0000	0.0000	0.0000	293.0190	577.2619	842.9552 (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	252.8240	224.2021	239.2143	210.6999	211.6830	196.5884	193.2167	201.3174	204.0262	212.5153	224.7978	249.6310 (64)
Efficiency of water heater												80.0000 (216)
(217)m	86.5035	86.2808	85.8543	84.8736	82.6898	80.0000	80.0000	80.0000	80.0000	84.7205	86.0534	86.5685 (217)
Fuel for water heating, kWh/month	292.2702	259.8516	278.6281	248.2512	255.9966	245.7355	241.5209	251.6468	255.0328	250.8428	261.2307	288.3624 (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	30.7590	24.6760	22.2180	16.2779	12.5735	10.2727	11.4700	14.9091	19.3655	25.4085	28.6989	31.6139 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-25.2774	-38.4581	-59.8234	-72.2497	-81.6860	-77.5332	-76.4078	-70.1197	-59.5142	-45.9550	-28.6541	-21.4685 (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)	-9.1062	-20.4857	-44.0500	-70.9135	-97.7949	-99.7934	-98.2235	-80.8708	-56.0983	-30.4104	-12.4550	-7.0762 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year												
Space heating fuel - main system 1												4164.2110 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.0000
Water heating fuel used												3129.3696 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:												
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												86.0000 (231)
Electricity for lighting (calculated in Appendix L)												248.2431 (232)

Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-1284.4250 (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												6343.3987 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4164.2110	0.2100	874.4843 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3129.3696	0.2100	657.1676 (264)
Space and water heating			1531.6519 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	248.2431	0.1443	35.8292 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-657.1470	0.1332	-87.5161
PV Unit electricity exported	-627.2780	0.1241	-77.8532
Total			-165.3693 (269)
Total CO2, kg/year			1414.0410 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.4400 (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	4164.2110	1.1300	4705.5584 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3129.3696	1.1300	3536.1877 (278)
Space and water heating			8241.7461 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	248.2431	1.5338	380.7636 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-657.1470	1.4921	-980.5406
PV Unit electricity exported	-627.2780	0.4555	-285.7222
Total			-1266.2628 (283)
Total Primary energy kWh/year			7486.3477 (286)
Dwelling Primary energy Rate (DPER)			65.8400 (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	45.0000 (1b)	x 3.0000 (2b)	= 135.0000 (1b) - (3b)
First floor	40.0000 (1c)	x 3.0000 (2c)	= 120.0000 (1c) - (3c)
Second floor	28.7000 (1d)	x 3.0000 (2d)	= 86.1000 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	113.7000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	341.1000 (5)

2. Ventilation rate

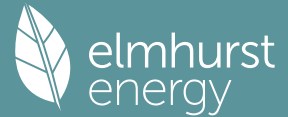
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) = 0.1173 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3673 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3673 (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	0.4683	0.4591	0.4499	0.4040	0.3948	0.3489	0.3489	0.3397	0.3673	0.3948	0.4132	0.4315 (22b)
Effective ac	0.6096	0.6054	0.6012	0.5816	0.5779	0.5609	0.5609	0.5577	0.5674	0.5779	0.5854	0.5931 (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			4.4000	1.0000	4.4000		(26)
TER Semi-glazed door			3.2000	1.0000	3.2000		(26a)

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TER Opening Type			11.7000	1.1450	13.3969	(27)
TER Roof Window			2.0000	1.1450	3.1835	(27a)
Heatloss Floor 1			45.0000	0.1300	5.8500	(28a)
External Wall	137.0000	19.3000	117.7000	0.1800	21.1860	(29a)
Roof	77.9000	2.0000	75.9000	0.1100	8.3490	(30)
Total net area of external elements Aum(A, m2)			259.9000			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		59.5655	(33)
Main dwelling						
Party Wall			75.0000	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 335.9956 (35)

List of Thermal Bridges						
K1 Element			Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)			13.1000	0.0500	0.6550	
E4 Jamb			30.0000	0.0500	1.5000	
E3 Sill			9.5000	0.0500	0.4750	
E16 Corner (normal)			30.8000	0.0900	2.7720	
E10 Eaves (insulation at ceiling level)			6.8000	0.0600	0.4080	
E12 Gable (insulation at ceiling level)			7.1000	0.0600	0.4260	
E5 Ground floor (normal)			22.7000	0.1600	3.6320	
E6 Intermediate floor within a dwelling			36.6000	0.0000	0.0000	
E24 Eaves (insulation at ceiling level - inverted)			13.3000	0.2400	3.1920	
E17 Corner (inverted - internal area greater than external area)			8.4000	-0.0900	-0.7560	
P1 Party wall - Ground floor			12.2000	0.0800	0.9760	
P2 Party wall - Intermediate floor within a dwelling			15.0000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)			5.9000	0.1200	0.7080	
P5 Party wall - Roof (insulation at rafter level)			10.6000	0.0800	0.8480	
R6 Flat ceiling			10.8000	0.0600	0.6480	
E13 Gable (insulation at rafter level)			4.1000	0.0800	0.3280	
E18 Party wall between dwellings			19.6000	0.0600	1.1760	
R7 Flat ceiling (inverted)			12.2000	0.0400	0.4880	
R9 Roof to wall (flat ceiling)			5.8000	0.0400	0.2320	
R4 Ridge (vaulted ceiling)			2.8000	0.0800	0.2240	
R1 Head of roof window			3.2000	0.0800	0.2560	
R2 Sill of roof window			3.2000	0.0600	0.1920	
R3 Jamb of roof window			6.6000	0.0800	0.5280	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 18.9080 (36)
Point Thermal bridges 0.0000
Total fabric heat loss (33) + (36) + (36a) = 78.4735 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
(38)m Jan 68.6225 Feb 68.1433 Mar 67.6736 Apr 65.4673 May 65.0545 Jun 63.1329 Jul 63.1329 Aug 62.7770 Sep 63.8731 Oct 65.0545 Nov 65.8896 Dec 66.7626 (38)
Heat transfer coeff 147.0960 146.6168 146.1471 143.9408 143.5280 141.6064 141.6064 141.2505 142.3465 143.5280 144.3630 145.2361 (39)
Average = Sum(39)m / 12 = 143.9388

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.2937	1.2895	1.2854	1.2660	1.2623	1.2454	1.2454	1.2423	1.2519	1.2623	1.2697	1.2774	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

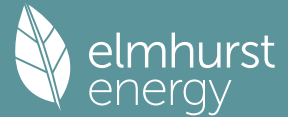
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8353 (42)
Hot water usage for mixer showers													
71.7586	70.6802	69.1087	66.1021	63.8833	61.4088	60.0024	61.5619	63.2715	65.9282	68.9995	71.4836	(42a)	
Hot water usage for baths													
30.9817	30.5216	29.8737	28.6790	27.7844	26.7925	26.2567	26.9001	27.6006	28.6620	29.8814	30.8770	(42b)	
Hot water usage for other uses													
43.6664	42.0785	40.4906	38.9028	37.3149	35.7270	35.7270	37.3149	38.9028	40.4906	42.0785	43.6664	(42c)	
Average daily hot water use (litres/day)													134.5806 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
146.4067	143.2803	139.4730	133.6838	128.9825	123.9283	121.9861	125.7769	129.7748	135.0809	140.9593	146.0270	(44)	
Energy conte	231.8723	204.0292	214.3648	183.0065	173.6353	152.3843	147.5316	155.7380	160.0254	183.3035	200.8224	228.6430	(45)
Energy content (annual)										Total = Sum(45)m =		2235.3562	
Distribution loss (46)m = 0.15 x (45)m													
34.7809	30.6044	32.1547	27.4510	26.0453	22.8576	22.1297	23.3607	24.0038	27.4955	30.1234	34.2964	(46)	
Water storage loss (or HIU loss):													
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.3938 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.7527 (55)
Total storage loss													
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(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													
278.4673	246.1149	260.9597	228.0983	220.2302	197.4762	194.1265	202.3329	205.1172	229.8984	245.9142	275.2379	(62)	
WWHRS	-32.8050	-29.0130	-30.3808	-25.1565	-23.4449	-20.0620	-18.8049	-19.9971	-20.7569	-24.4701	-27.7217	-32.1975	(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													
245.6622	217.1019	230.5790	202.9418	196.7853	177.4142	175.3215	182.3358	184.3603	205.4283	218.1925	243.0403	(64)	
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2479.1632	(64)
Electric shower(s)													2479 (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													
114.3735	101.5083	108.5522	96.9231	95.0097	86.7413	86.3302	89.0588	89.2819	98.2243	102.8469	113.2997	(65)	

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

Metabolic gains (Table 5), Watts												
	Jan	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	141.7652	141.7652	141.7652	141.7652	141.7652	141.7652	141.7652	141.7652	141.7652	141.7652	141.7652	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	153.8002	170.2788	153.8002	158.9269	153.8002	158.9269	153.8002	153.8002	158.9269	153.8002	158.9269	153.8002 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	276.7684	279.6404	272.4030	256.9956	237.5466	219.2672	207.0554	204.1834	211.4208	226.8282	246.2772	264.5566 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												

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Pumps, fans	37.1765	37.1765	37.1765	37.1765	37.1765	37.1765	37.1765	37.1765	37.1765	37.1765	37.1765	37.1765	37.1765 (69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
	-113.4122	-113.4122	-113.4122	-113.4122	-113.4122	-113.4122	-113.4122	-113.4122	-113.4122	-113.4122	-113.4122	-113.4122	-113.4122 (71)
Water heating gains (Table 5)	153.7278	151.0540	145.9035	134.6154	127.7012	120.4740	116.0352	119.7027	124.0026	132.0220	142.8429	152.2845	(72)
Total internal gains	652.8260	669.5027	640.6364	619.0676	587.5775	564.1976	542.4204	543.2159	559.8799	581.1799	616.5766	639.1710	(73)

6. Solar gains

[Jan]	Area m2			Solar flux Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
Northeast	2.8000			11.2829		0.6300		0.7000		0.7700		9.6550 (75)	
Southwest	4.0000			36.7938		0.6300		0.7000		0.7700		44.9787 (79)	
Northwest	4.9000			11.2829		0.6300		0.7000		0.7700		16.8962 (81)	
Southwest	2.0000			26.0000		0.6300		0.7000		1.0000		20.6388 (82)	
Solar gains	92.1687	173.5264	278.4067	408.8726	512.8517	532.3600	503.6580	423.1461	323.4451	203.1154	113.4778	76.8453	(83)
Total gains	744.9947	843.0291	919.0430	1027.9402	1100.4292	1096.5576	1046.0784	966.3621	883.3249	784.2953	730.0545	716.0162	(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	72.1424	72.3782	72.6108	73.7238	73.9358	74.9392	74.9392	75.1280	74.5495	73.9358	73.5082	73.0663	
alpha	5.8095	5.8252	5.8407	5.9149	5.9291	5.9959	5.9959	6.0085	5.9700	5.9291	5.9005	5.8711	
util living area	0.9993	0.9984	0.9957	0.9814	0.9242	0.7644	0.5846	0.6507	0.8978	0.9894	0.9984	0.9995	(86)
MIT	19.7566	19.8962	20.1245	20.4656	20.7682	20.9502	20.9915	20.9847	20.8618	20.4772	20.0688	19.7448	(87)
Th 2	19.8458	19.8491	19.8523	19.8676	19.8705	19.8838	19.8838	19.8863	19.8787	19.8705	19.8647	19.8586	(88)
util rest of house	0.9990	0.9976	0.9935	0.9709	0.8814	0.6588	0.4426	0.5052	0.8243	0.9817	0.9974	0.9992	(89)
MIT 2	18.4082	18.5895	18.8834	19.3243	19.6807	19.8596	19.8819	19.8823	19.7901	19.3456	18.8224	18.4026	(90)
Living area fraction	fLA = Living area / (4) =												0.2946 (91)
MIT	18.8055	18.9745	19.2491	19.6606	20.0011	20.1809	20.2089	20.2071	20.1059	19.6790	19.1896	18.7980	(92)
Temperature adjustment													0.0000
adjusted MIT	18.8055	18.9745	19.2491	19.6606	20.0011	20.1809	20.2089	20.2071	20.1059	19.6790	19.1896	18.7980	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9986	0.9968	0.9918	0.9684	0.8874	0.6893	0.4851	0.5491	0.8422	0.9798	0.9966	0.9989	(94)
Useful gains	743.9204	840.3124	911.4768	995.4423	976.4850	755.8383	507.4506	530.5931	743.8973	768.4373	727.5675	715.2065	(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	2133.7005	2063.5555	1863.2425	1548.8907	1191.4382	790.2955	511.0379	537.7581	854.9154	1303.0925	1745.2974	2120.1604	(97)
Space heating kWh	1033.9964	822.0194	708.1138	398.4828	159.9252	0.0000	0.0000	0.0000	0.0000	397.7835	732.7656	1045.2856	(98a)
Space heating requirement - total per year (kWh/year)												5298.3723	
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	1033.9964	822.0194	708.1138	398.4828	159.9252	0.0000	0.0000	0.0000	0.0000	397.7835	732.7656	1045.2856	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5298.3723	
Space heating per m2												(98c) / (4) =	46.5996 (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	1033.9964	822.0194	708.1138	398.4828	159.9252	0.0000	0.0000	0.0000	0.0000	397.7835	732.7656	1045.2856	(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)	1120.2562	890.5952	767.1872	431.7257	173.2667	0.0000	0.0000	0.0000	0.0000	430.9680	793.8955	1132.4872	(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	245.6622	217.1019	230.5790	202.9418	196.7853	177.4142	175.3215	182.3358	184.3603	205.4283	218.1925	243.0403	(64)
Efficiency of water heater	86.9181	86.7557	86.4062	85.5445	83.5987	79.8000	79.8000	79.8000	79.8000	85.5155	86.5601	86.9500	(216)
Fuel for water heating, kWh/month	282.6364	250.2450	266.8546	237.2355	235.3929	222.3235	219.7012	228.4910	231.0279	240.2236	252.0707	279.5172	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	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	31.9566	25.6368	23.0831	16.9117	13.0631	10.6726	11.9166	15.4896	20.1195	26.3978	29.8163	32.8448	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-42.9366	-60.9558	-88.1918	-99.7849	-108.0680	-100.9753	-99.6885	-93.8775	-83.7072	-69.9622	-47.3401	-37.0684	(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)

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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	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	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)														
(233b)m	-22.9523	-48.4412	-96.5958	-145.5564	-192.9525	-194.1046	-191.8614	-162.2526	-118.6391	-69.4782	-30.7059	-18.1412		(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	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	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)														
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year														
Space heating fuel - main system 1													5740.3817	(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													2945.7194	(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)													257.9085	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-2224.2377	(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													6805.7718	(238)

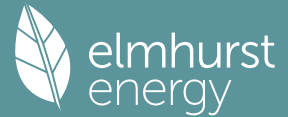
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	5740.3817	0.2100	1205.4802 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2945.7194	0.2100	618.6011 (264)
Space and water heating			1824.0812 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	257.9085	0.1443	37.2242 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-932.5563	0.1345	-125.3935
PV Unit electricity exported	-1291.6815	0.1258	-162.4850
Total			-287.8785 (269)
Total CO2, kg/year			1585.3561 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.9400 (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	5740.3817	1.1300	6486.6313 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2945.7194	1.1300	3328.6629 (278)
Space and water heating			9815.2942 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	257.9085	1.5338	395.5886 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-932.5563	1.4969	-1395.9833
PV Unit electricity exported	-1291.6815	0.4617	-596.4248
Total			-1992.4080 (283)
Total Primary energy kWh/year			8348.5756 (286)
Target Primary Energy Rate (TPER)			73.4300 (287)

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Plot Reference	Turnley- Be Green				Issued on Date	24/04/2026	
Assessment Reference	00001			Plot Type Ref			
Plot Address					SAP Version	10.2	
SAP Rating	88 B	DER	15.49	TER	15.75		
Environmental	87 B	% DER < TER				1.65	
CO ₂ Emissions (t/year)	1.17	DFEE	51.26	TFEE	58.12		
Compliance Check	See BREL	% DFEE < TFEE				11.81	
% DPER < TPER	0.69	DPER	82.46	TPER	83.03		
Assessor Details	Mr. Stephen Lloyd				Assessor ID	N350-0001	
Client	Miller Homes, Miller Homes						

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	44.0000 (1b)	x 3.0000 (2b)	= 132.0000 (1b) - (3b)
First floor	44.0000 (1c)	x 3.0000 (2c)	= 132.0000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.0000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 264.0000 (5)

2. Ventilation rate

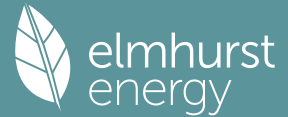
		m ³ per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
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	0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2000 (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	0.2550	0.2500	0.2450	0.2200	0.2150	0.1900	0.1900	0.1850	0.2000	0.2150	0.2250	0.2350 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
Effective ac	0.5050	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			10.8000	1.1450	12.3664		(27)
Glazed Door			3.2000	1.0000	3.2000		(26a)
Door			2.2000	1.0000	2.2000		(26)
Heatloss Floor 1			44.0000	0.1300	5.7200	110.0000	4840.0000 (28a)
External Wall	176.7000	16.2000	160.5000	0.1800	28.8900	190.0000	30495.0000 (29a)
Roof	68.6000		68.6000	0.1000	6.8600	9.0000	617.4000 (30)
Total net area of external elements Aum(A, m ²)			289.3000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	59.2364		(33)
Main dwelling							
Internal Floor 1			44.0000			18.0000	792.0000 (32d)
Internal Ceiling 1			44.0000			9.0000	396.0000 (32e)
Heat capacity Cm = Sum (A x k)						(28)...(30) + (32) + (32a)...(32e) =	37140.4000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							422.0500 (35)
Thermal bridges (User defined value 0.000 * total exposed area)							0.0000 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	59.2364 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(38)
(38)m	43.9956	43.5600	43.5600	43.5600	43.5600	43.5600	43.5600	43.5600	43.5600	43.5600	43.5600	43.5600	
Heat transfer coeff	103.2320	102.7964	102.7964	102.7964	102.7964	102.7964	102.7964	102.7964	102.7964	102.7964	102.7964	102.7964	(39)
Average = Sum(39)m / 12 =													102.8327

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(40)
HLP	1.1731	1.1681	1.1681	1.1681	1.1681	1.1681	1.1681	1.1681	1.1681	1.1681	1.1681	1.1681	
HLP (average)													1.1686
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5973 (42)
Hot water usage for mixer showers													
76.2397	75.0940	73.4244	70.2300	67.8726	65.2437	63.7494	65.4063	67.2226	70.0453	73.3083	75.9476	(42a)	
Hot water usage for baths													
29.2660	28.8313	28.2193	27.0907	26.2457	25.3087	24.8025	25.4103	26.0721	27.0747	28.2265	29.1670	(42b)	
Hot water usage for other uses													
41.2294	39.7301	38.2309	36.7316	35.2324	33.7331	33.7331	35.2324	36.7316	38.2309	39.7301	41.2294	(42c)	
Average daily hot water use (litres/day)													134.9059 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	146.7351	143.6555	139.8746	134.0524	129.3507	124.2855	122.2851	126.0491	130.0264	135.3509	141.2650	146.3441	(44)
Energy content	232.3925	204.5635	214.9820	183.5110	174.1309	152.8236	147.8932	156.0751	160.3355	183.6700	201.2579	229.1394	(45)
Energy content (annual)										Total = Sum(45)m =			2240.7747
Distribution loss (46)m = 0.15 x (45)m													
34.8589	30.6845	32.2473	27.5267	26.1196	22.9235	22.1840	23.4113	24.0503	27.5505	30.1887	34.3709	(46)	
Water storage loss (or HIU loss):													
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6000 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8640 (55)
Total storage loss													
26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840	(56)	
If cylinder contains dedicated solar storage													
26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840	(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	(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													
282.4389	249.7667	265.0284	231.9430	224.1773	201.2556	197.9396	206.1215	208.7675	233.7164	249.6899	279.1858	(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	-40.8770	-35.6386	-36.6219	-30.7577	-22.8485	-13.0816	-12.8661	-13.3979	-13.5699	-30.5484	-34.8208	-40.6247	(63d) eq. (G6)
Output from w/h	241.5619	214.1280	228.4065	201.1853	201.3289	188.1739	185.0736	192.7236	195.1976	203.1679	214.8691	238.5611	(64)
12Total per year (kWh/year)													2504.3775 (64)
Electric shower(s)													2504 (64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)	
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)
Heat gains from water heating, kWh/month													
117.3076	104.1799	111.5186	99.7630	97.9357	89.5594	89.2116	91.9321	92.0572	101.1074	105.6638	116.2260	(65)	

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	135.6068	150.1361	135.6068	140.1271	135.6068	140.1271	135.6068	135.6068	140.1271	135.6068	140.1271	135.6068 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	235.3498	237.7919	231.6377	218.5360	201.9975	186.4537	176.0694	173.6272	179.7815	192.8831	209.4216	224.9655 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867 (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)												
	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937 (71)
Water heating gains (Table 5)	157.6716	155.0296	149.8907	138.5597	131.6339	124.3881	119.9081	123.5646	127.8572	135.8970	146.7553	156.2177 (72)
Total internal gains	593.5883	607.9179	582.0953	562.1830	534.1985	512.9290	493.5445	494.7588	509.7258	529.3471	561.2642	581.7502 (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 data Table 6d	Gains W
Northeast	4.5000	11.2829	0.4500	0.6000	0.7700	9.5002 (75)
Southeast	0.7000	36.7938	0.4500	0.6000	0.7700	4.8191 (77)
Southwest	4.2000	36.7938	0.4500	0.6000	0.7700	28.9149 (79)
Northwest	1.4000	11.2829	0.4500	0.6000	0.7700	2.9556 (81)

Solar gains	46.1898	82.8156	124.3014	172.4355	209.9550	215.8321	205.0076	175.8857	140.7922	94.4920	56.0782	39.0413 (83)
Total gains	639.7781	690.7335	706.3968	734.6184	744.1534	728.7611	698.5521	670.6445	650.5180	623.8391	617.3424	620.7915 (84)

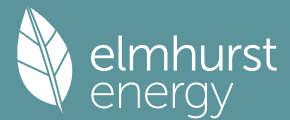
7. Mean internal temperature (heating season)

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	99.9378	100.3613	100.3613	100.3613	100.3613	100.3613	100.3613	100.3613	100.3613	100.3613	100.3613	100.3613
alpha	7.6625	7.6908	7.6908	7.6908	7.6908	7.6908	7.6908	7.6908	7.6908	7.6908	7.6908	7.6908
util living area												

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	0.9997	0.9993	0.9983	0.9928	0.9636	0.8349	0.6392	0.6902	0.9194	0.9933	0.9991	0.9998 (86)
MIT	20.1468	20.2405	20.3817	20.5950	20.8119	20.9611	20.9955	20.9922	20.9124	20.6462	20.3607	20.1290 (87)
Th 2	19.9416	19.9456	19.9456	19.9456	19.9456	19.9456	19.9456	19.9456	19.9456	19.9456	19.9456	19.9456 (88)
util rest of house												
	0.9995	0.9989	0.9972	0.9873	0.9338	0.7309	0.4912	0.5412	0.8469	0.9870	0.9985	0.9996 (89)
MIT 2	18.9570	19.0802	19.2609	19.5312	19.7913	19.9285	19.9448	19.9440	19.8951	19.5971	19.2343	18.9374 (90)
Living area fraction									fLA = Living area / (4) =			0.3227 (91)
MIT	19.3410	19.4546	19.6226	19.8745	20.1207	20.2618	20.2839	20.2823	20.2234	19.9357	19.5978	19.3220 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.1910	19.3046	19.4726	19.7245	19.9707	20.1118	20.1339	20.1323	20.0734	19.7857	19.4478	19.1720 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9993	0.9985	0.9964	0.9857	0.9347	0.7493	0.5184	0.5687	0.8578	0.9856	0.9980	0.9994 (94)
Useful gains	639.3259	689.6862	703.8801	724.0897	695.5733	546.0961	362.1252	381.4087	558.0307	614.8599	616.0993	620.4477 (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	1537.2244	1480.7450	1333.5412	1112.7232	850.1945	566.5894	363.2707	383.6650	614.0453	944.2553	1269.3124	1539.0631 (97)
Space heating kWh	668.0365	531.5916	468.4678	279.8161	115.0382	0.0000	0.0000	0.0000	0.0000	245.0702	470.3134	683.4498 (98a)
Space heating requirement - total per year (kWh/year)												3461.7836
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	668.0365	531.5916	468.4678	279.8161	115.0382	0.0000	0.0000	0.0000	0.0000	245.0702	470.3134	683.4498 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3461.7836
Space heating per m2										(98c) / (4) =		39.3385 (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 %)												89.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	668.0365	531.5916	468.4678	279.8161	115.0382	0.0000	0.0000	0.0000	0.0000	245.0702	470.3134	683.4498 (98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000 (210)
Space heating fuel (main heating system)	750.6028	597.2939	526.3684	314.4002	129.2564	0.0000	0.0000	0.0000	0.0000	275.3598	528.4420	767.9212 (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	241.5619	214.1280	228.4065	201.1853	201.3289	188.1739	185.0736	192.7236	195.1976	203.1679	214.8691	238.5611 (64)
Efficiency of water heater (217)m	86.4181	86.2149	85.8350	85.0003	83.0540	80.0000	80.0000	80.0000	80.0000	84.6819	85.9671	86.4826 (216)
Fuel for water heating, kWh/month	279.5269	248.3653	266.0994	236.6877	242.4073	235.2174	231.3420	240.9045	243.9971	239.9189	249.9432	275.8485 (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	26.2183	21.0333	18.9382	13.8749	10.7174	8.7562	9.7768	12.7082	16.5067	21.6577	24.4623	26.9470 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-19.3547	-29.6845	-46.5694	-56.7594	-64.6474	-61.5532	-60.6726	-55.4512	-46.7213	-35.6829	-22.0233	-16.4140 (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	-6.4330	-14.5234	-31.3356	-50.6130	-69.9632	-71.4418	-70.3009	-57.7917	-39.9881	-21.5912	-8.8086	-4.9946 (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												3889.6445 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.0000
Water heating fuel used												2990.2582 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												86.0000 (231)
Electricity for lighting (calculated in Appendix L)												211.5969 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-963.3188 (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												6214.1809 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3889.6445	0.2100	816.8253 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2990.2582	0.2100	627.9542 (264)
Space and water heating			1444.7796 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	211.5969	0.1443	30.5400 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-515.5338	0.1330	-68.5649
PV Unit electricity exported	-447.7849	0.1240	-55.5391
Total			-124.1040 (269)
Total CO2, kg/year			1363.1448 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			15.4900 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	3889.6445	1.1300	4395.2983 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2990.2582	1.1300	3378.9918 (278)
Space and water heating			7774.2901 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	211.5969	1.5338	324.5543 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-515.5338	1.4914	-768.8926
PV Unit electricity exported	-447.7849	0.4552	-203.8273
Total			-972.7199 (283)
Total Primary energy kWh/year			7256.2254 (286)
Dwelling Primary energy Rate (DPER)			82.4600 (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	44.0000 (1b)	x 3.0000 (2b)	= 132.0000 (1b) - (3b)
First floor	44.0000 (1c)	x 3.0000 (2c)	= 132.0000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	264.0000 (5)

2. Ventilation rate

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

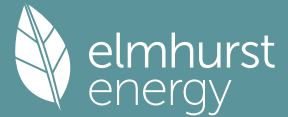
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1136 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3636	(18)
Number of sides sheltered	0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3636 (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	0.4636	0.4545	0.4455	0.4000	0.3909	0.3455	0.3455	0.3364	0.3636	0.3909	0.4091	0.4273 (22b)
Effective ac	0.6075	0.6033	0.5992	0.5800	0.5764	0.5597	0.5597	0.5566	0.5661	0.5764	0.5837	0.5913 (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			2.2000	1.0000	2.2000		(26)
TER Semi-glazed door			3.2000	1.0000	3.2000		(26a)
TER Opening Type			10.8000	1.1450	12.3664		(27)
Heatloss Floor 1			44.0000	0.1300	5.7200		(28a)
External Wall	176.7000	16.2000	160.5000	0.1800	28.8900		(29a)
Roof	68.6000		68.6000	0.1100	7.5460		(30)

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Total net area of external elements Aum(A, m2) 289.3000 (31)
Fabric heat loss, W/K = Sum (A x U) (26)...(30) + (32) = 59.9224 (33)

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

422.0500 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.4000	0.0500	0.5700
E4 Jamb	28.4000	0.0500	1.4200
E3 Sill	9.4000	0.0500	0.4700
E16 Corner (normal)	32.5000	0.0900	2.9250
E10 Eaves (insulation at ceiling level)	10.3000	0.0600	0.6180
E12 Gable (insulation at ceiling level)	20.4000	0.0600	1.2240
E5 Ground floor (normal)	25.2000	0.1600	4.0320
E6 Intermediate floor within a dwelling	25.2000	0.0000	0.0000
E24 Eaves (insulation at ceiling level - inverted)	4.6000	0.2400	1.1040
E17 Corner (inverted - internal area greater than external area)	5.9000	-0.0900	-0.5310
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			11.8320 (36)
Point Thermal bridges			0.0000 (36a) =
Total fabric heat loss		(33) + (36) + (36a) =	71.7544 (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	52.9236	52.5600	52.2036	50.5296	50.2164	48.7584	48.7584	48.4884	49.3200	50.2164	50.8500	51.5124 (38)
Average = Sum(39)m / 12 =	124.6780	124.3144	123.9580	122.2840	121.9708	120.5128	120.5128	120.2428	121.0744	121.9708	122.6044	123.2668 (39)
												122.2825
HLP	1.4168	1.4127	1.4086	1.3896	1.3860	1.3695	1.3695	1.3664	1.3758	1.3860	1.3932	1.4008 (40)
HLP (average)												1.3896
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5973 (42)
Hot water usage for mixer showers	67.7687	66.7502	65.2662	62.4267	60.3312	57.9944	56.6662	58.1390	59.7535	62.2625	65.1630	67.5090	(42a)
Hot water usage for baths	29.2660	28.8313	28.2193	27.0907	26.2457	25.3087	24.8025	25.4103	26.0721	27.0747	28.2265	29.1670	(42b)
Hot water usage for other uses	41.2294	39.7301	38.2309	36.7316	35.2324	33.7331	33.7331	35.2324	36.7316	38.2309	39.7301	41.2294	(42c)
Average daily hot water use (litres/day)												127.0959	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	138.2640	135.3117	131.7163	126.2491	121.8093	117.0362	115.2018	118.7817	122.5572	127.5681	133.1196	137.9054	(44)
Energy content (annual)	218.9764	192.6820	202.4431	172.8287	163.9788	143.9097	139.3266	147.0766	151.1253	173.1088	189.6533	215.9266	(45)
Distribution loss (46)m = 0.15 x (45)m	32.8465	28.9023	30.3665	25.9243	24.5968	21.5865	20.8990	22.0615	22.6688	25.9663	28.4480	32.3890	(46)
Water storage loss (or HIU loss):												150.0000	(47)
Store volume												1.3938	(48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400	(49)
Temperature factor from Table 2b												0.7527	(55)
Enter (49) or (54) in (55)													
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(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	265.5713	234.7678	249.0380	217.9205	210.5737	189.0015	185.9215	193.6715	196.2171	219.7037	234.7451	262.5215	(62)
WWHRS	-30.9810	-27.3999	-28.6915	-23.7577	-22.1414	-18.9465	-17.7593	-18.8853	-19.6028	-23.1095	-26.1803	-30.4073	(63a)
FV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	234.5903	207.3679	220.3464	194.1628	188.4323	170.0550	168.1622	174.7862	176.6143	196.5941	208.5649	232.1142	(64)
12Total per year (kWh/year)												2371.7906	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
												0.0000	(64a)
Heat gains from water heating, kWh/month	110.0856	97.7354	104.5882	93.5390	91.7989	83.9234	83.6020	86.1789	86.3226	94.8346	99.1332	109.0715	(65)

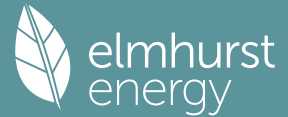
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	131.1059	145.1530	131.1059	135.4761	131.1059	135.4761	131.1059	131.1059	135.4761	131.1059	135.4761	131.1059 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	235.3498	237.7919	231.6377	218.5360	201.9975	186.4537	176.0694	173.6272	179.7815	192.8831	209.4216	224.9655 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867 (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)	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937 (71)
Water heating gains (Table 5)	147.9645	145.4395	140.5756	129.9153	123.3856	116.5603	112.3683	115.8318	119.8925	127.4658	137.6850	146.6015 (72)
Total internal gains	579.3803	593.3446	568.2793	548.8875	521.4491	500.4502	481.5038	482.5251	497.1102	516.4150	547.5429	567.6330 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	4.5000	11.2829	0.6300	0.7000	0.7700	15.5170 (75)

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Southeast	0.7000	36.7938	0.6300	0.7000	0.7700	7.8713 (77)
Southwest	4.2000	36.7938	0.6300	0.7000	0.7700	47.2276 (79)
Northwest	1.4000	11.2829	0.6300	0.7000	0.7700	4.8275 (81)

Solar gains	75.4434	135.2656	203.0257	281.6446	342.9265	352.5258	334.8457	287.2800	229.9606	154.3369	91.5944	63.7675 (83)
Total gains	654.8236	728.6101	771.3050	830.5321	864.3756	852.9761	816.3495	769.8050	727.0708	670.7519	639.1373	631.4005 (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	82.7474	82.9894	83.2280	84.3673	84.5840	85.6073	85.6073	85.7995	85.2102	84.5840	84.1469	83.6947
alpha	6.5165	6.5326	6.5485	6.6245	6.6389	6.7072	6.7072	6.7200	6.6807	6.6389	6.6098	6.5796
util living area	0.9996	0.9991	0.9978	0.9903	0.9552	0.8225	0.6365	0.6947	0.9218	0.9931	0.9990	0.9997 (86)
MIT	19.9081	20.0255	20.2131	20.4958	20.7631	20.9464	20.9918	20.9859	20.8731	20.5376	20.1827	19.8968 (87)
Th 2	19.7505	19.7536	19.7567	19.7713	19.7741	19.7868	19.7868	19.7892	19.7819	19.7741	19.7685	19.7685 (88)
util rest of house	0.9994	0.9986	0.9962	0.9829	0.9184	0.7060	0.4689	0.5259	0.8445	0.9863	0.9983	0.9996 (89)
MIT 2	18.5022	18.6549	18.8973	19.2662	19.5860	19.7643	19.7855	19.7865	19.7090	19.3236	18.8679	18.4970 (90)
Living area fraction	0.9994	0.9986	0.9962	0.9829	0.9184	0.7060	0.4689	0.5259	0.8445	0.9863	0.9983	0.9996 (89)
MIT	18.9559	19.0973	19.3219	19.6630	19.9659	20.1458	20.1748	20.1736	20.0847	19.7154	19.2922	18.9488 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9559	19.0973	19.3219	19.6630	19.9659	20.1458	20.1748	20.1736	20.0847	19.7154	19.2922	18.9488 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9992	0.9982	0.9955	0.9820	0.9257	0.7446	0.5243	0.5824	0.8683	0.9859	0.9979	0.9994 (94)
Useful gains	654.2996	727.2865	767.8024	815.5708	800.1833	635.0940	427.9959	448.3175	631.3257	661.2626	637.8037	631.0086 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1827.2702	1764.9239	1589.3822	1316.1462	1008.1976	668.3389	430.8131	453.7491	724.5933	1111.8104	1494.8224	1818.0373 (97)
Space heating kWh	872.6901	697.2923	611.2554	360.4143	154.7626	0.0000	0.0000	0.0000	0.0000	335.2075	617.0535	883.1493 (98a)
Space heating requirement - total per year (kWh/year)												4531.8251
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	872.6901	697.2923	611.2554	360.4143	154.7626	0.0000	0.0000	0.0000	0.0000	335.2075	617.0535	883.1493 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4531.8251
Space heating per m2										(98c) / (4) =		51.4980 (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	872.6901	697.2923	611.2554	360.4143	154.7626	0.0000	0.0000	0.0000	0.0000	335.2075	617.0535	883.1493 (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)	945.4931	755.4630	662.2486	390.4813	167.6735	0.0000	0.0000	0.0000	0.0000	363.1718	668.5303	956.8248 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	234.5903	207.3679	220.3464	194.1628	188.4323	170.0550	168.1622	174.7862	176.6143	196.5941	208.5649	232.1142 (64)
Efficiency of water heater (217)m	86.7277	86.5622	86.2234	85.4268	83.6219	79.8000	79.8000	79.8000	79.8000	85.2459	86.3401	79.8000 (216)
Fuel for water heating, kWh/month	270.4906	239.5595	255.5531	227.2855	225.3386	213.1015	210.7296	219.0303	221.3212	230.6201	241.5619	267.5254 (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	27.2412	21.8539	19.6770	14.4162	11.1355	9.0978	10.1582	13.2040	17.1507	22.5026	25.4167	27.9983 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-40.7762	-57.2747	-82.0091	-91.8201	-98.6619	-91.9446	-90.8030	-85.9037	-77.1885	-65.3216	-44.7530	-35.2779 (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	-23.6485	-49.6912	-98.6720	-148.0692	-195.6693	-196.5780	-194.2681	-164.5346	-120.6613	-71.0202	-31.5587	-18.7048 (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												4909.8863 (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												2822.1173 (219)
Space cooling fuel												0.0000 (221)

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Electricity for pumps and fans:	86.0000 (231)
Total electricity for the above, kWh/year	219.8522 (232)
Electricity for lighting (calculated in Appendix L)	

Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2174.8102 (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	5863.0456 (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	4909.8863	0.2100	1031.0761 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2822.1173	0.2100	592.6446 (264)
Space and water heating			1623.7208 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	219.8522	0.1443	31.7315 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-861.7345	0.1347	-116.0540
PV Unit electricity exported	-1313.0758	0.1259	-165.3434
Total			-281.3974 (269)
Total CO2, kg/year			1385.9841 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.7500 (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	4909.8863	1.1300	5548.1716 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2822.1173	1.1300	3188.9925 (278)
Space and water heating			8737.1640 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	219.8522	1.5338	337.2167 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-861.7345	1.4977	-1290.6547
PV Unit electricity exported	-1313.0758	0.4622	-606.9252
Total			-1897.5799 (283)
Total Primary energy kWh/year			7306.9016 (286)
Target Primary Energy Rate (TPER)			83.0300 (287)

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